



JUNOS® Software

Network Interfaces Configuration Guide

Release 9.3

Juniper Networks, Inc.

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Abbreviated Table of Contents

About This Guide

xlix

Part 1	Overview of Network Interfaces Configuration Statements	
Chapter 1	Network Interfaces Configuration Statements and Hierarchy	3
Part 2	Router Interfaces Configuration Concepts	
Chapter 2	Router Interfaces Overview	29
Chapter 3	Configuring Physical Interface Properties	59
Chapter 4	Configuring Logical Interface Properties	133
Chapter 5	Configuring Protocol Family and Interface Address Properties	157
Chapter 6	Configuring Circuit and Translational Cross-Connects	203
Chapter 7	Tracing Interface Operations	221
Part 3	Configuring Special Router Interfaces	
Chapter 8	Displaying the Internal Ethernet Interface	225
Chapter 9	Configuring Discard Interfaces	227
Chapter 10	Configuring IP Demultiplexing Interfaces	229
Chapter 11	Configuring the Loopback Interface	235
Chapter 12	Configuring Serial Interfaces	239
Part 4	Configuring ATM Interfaces	
Chapter 13	Configuring ATM Interfaces	257
Chapter 14	Configuring ATM-over-ADSL Interfaces	331
Chapter 15	Configuring ATM-over-SHDSL Interfaces	337
Part 5	Configuring Frame Relay Interfaces	
Chapter 16	Configuring Frame Relay Interfaces	347
Part 6	Configuring Channelized Interfaces	
Chapter 17	Configuring Channelized Interfaces	361
Chapter 18	Configuring Channelized E1 Interfaces	377
Chapter 19	Configuring Channelized E1 PRI and T1 PRI Interfaces	385
Chapter 20	Configuring Channelized OC3 IQ and IQE Interfaces	393

Chapter 21	Configuring Channelized OC12 Interfaces	401
Chapter 22	Configuring Channelized STM1 Interfaces	423
Chapter 23	Configuring Channelized T1 IQ Interfaces	437
Chapter 24	Configuring Channelized T3 Interfaces	443
Part 7	Configuring Circuit Emulation Interfaces	
Chapter 25	Configuring Circuit Emulation Interfaces	461
Part 8	Configuring E1, E3, T1, and T3 Interfaces	
Chapter 26	Configuring E1 Interfaces	469
Chapter 27	Configuring E3 Interfaces	477
Chapter 28	Configuring T1 Interfaces	485
Chapter 29	Configuring T3 Interfaces	495
Part 9	Configuring Ethernet Interfaces	
Chapter 30	Configuring Ethernet Interfaces	511
Chapter 31	Configuring 802.1Q VLANs	525
Chapter 32	Configuring Aggregated Ethernet Interfaces	535
Chapter 33	Stacking and Rewriting Gigabit Ethernet IQ VLAN Tags	547
Chapter 34	Configuring Layer 2 Bridging Interfaces	567
Chapter 35	Configuring TCC and Layer 2.5 Switching	569
Chapter 36	Configuring Static ARP Table Entries	573
Chapter 37	Configuring Unrestricted Proxy ARP	575
Chapter 38	Configuring MAC Address Validation on Static Ethernet Interfaces	579
Chapter 39	Enabling Passive Monitoring on Ethernet Interfaces	581
Chapter 40	Configuring IEEE 802.1ag OAM Connectivity-Fault Management	583
Chapter 41	Configuring IEEE 802.1x Port-Based Network Access Control	591
Chapter 42	Configuring IEEE 802.3ah OAM Link-Fault Management	595
Chapter 43	Configuring VRRP and VRRP for IPv6	603
Chapter 44	Specifying the IP Demux Underlying Interface Family Type	605
Chapter 45	Configuring Gigabit Ethernet Accounting and Policing	607
Chapter 46	Configuring Gigabit Ethernet Autonegotiation	619
Chapter 47	Configuring the Management Ethernet Interface	627
Chapter 48	Configuring the 10-Gigabit Ethernet DWDM Interface Wavelength	631
Chapter 49	Configuring 10-Gigabit Ethernet Framing	633
Chapter 50	Configuring 10-Gigabit Ethernet Notification of Link Down Alarm	635
Chapter 51	Configuring Point-to-Point Protocol over Ethernet	637
Chapter 52	Example Ethernet Configurations	651
Part 10	Configuring ISDN Interfaces	
Chapter 53	Configuring ISDN Interfaces	657

Part 11	Configuring SONET Interfaces	
Chapter 54	Configuring SONET/SDH Interfaces	679
Part 12	Interface Configuration Statements	
Chapter 55	Summary of Interface Configuration Statements	725
Part 13	Index	
	Index	1129
	Index of Statements and Commands	1151

Table of Contents

	About This Guide	xlix
	Objectives	xlix
	Audience	xlix
	Supported Routing Platforms	l
	Using the Indexes	l
	Using the Examples in This Manual	l
	Merging a Full Example	li
	Merging a Snippet	li
	Documentation Conventions	lii
	List of Technical Publications	liv
	Documentation Feedback	lxi
	Requesting Technical Support	lxi
Part 1	Overview of Network Interfaces Configuration Statements	
Chapter 1	Network Interfaces Configuration Statements and Hierarchy	3
	[edit chassis] Hierarchy Level	3
	[edit interfaces] Hierarchy Level	4
	[edit logical-systems] Hierarchy Level	18
	[edit protocols connections] Hierarchy Level	23
	[edit protocols dot1x] Hierarchy Level	24
	[edit protocols lacp] Hierarchy Level	24
	[edit protocols oam] Hierarchy Level	24
	[edit protocols ppp] Hierarchy Level	25
	[edit protocols vrrp] Hierarchy Level	26
	[edit system processes] Hierarchy Level	26
Part 2	Router Interfaces Configuration Concepts	
Chapter 2	Router Interfaces Overview	29
	Types of Interfaces	30
	Permanent Interfaces	30
	Transient Interfaces	31

Services Interfaces	31
Container Interfaces	32
Traditional APS Concept	33
Container Interfaces Concept	33
APS Support for Container-Based Interfaces	34
Autocopy of APS Parameters	34
Interface Encapsulations	35
Interface Descriptors	46
Interface Naming	47
Physical Part of an Interface Name	47
Logical Part of an Interface Name	51
Separators in an Interface Name	51
Channel Part of an Interface Name	51
Interface Naming for a Routing Matrix	52
Chassis Interface Naming	54
Examples: Interface Naming	55
Displaying Interface Configurations	56
Interface and Router Clock Sources	56
Configuring an External Synchronization Interface	57

Chapter 3

Configuring Physical Interface Properties

59

Physical Interface Configuration Statements	60
Physical Interfaces Properties Statements List	69
Specifying an Aggregated Interface	84
Specifying a USB Modem Interface on J-series Routers	85
Specifying OC768-over-OC192 Mode	87
Adding an Interface Description to the Configuration	88
Example: Adding an Interface Description to the Configuration	88
Configuring the Link Characteristics	89
Configuring the Media MTU	89
Configuring Interface Encapsulation	98
Configuring the Encapsulation on a Physical Interface	98
Encapsulation Capabilities	102
Example: Configuring the Encapsulation on a Physical Interface	103
Configuring the PPP Challenge Handshake Authentication Protocol	103
Assigning an Access Profile to an Interface	105
Configuring a Default CHAP Secret	105
Configuring the Local Name	105
Configuring Passive Mode	105
Example: Configuring the PPP Challenge Handshake Authentication Protocol	106
Configuring the PPP Password Authentication Protocol	106
Configuring the Local Name	108
Configuring the Local Password	108
Configuring Passive Mode	108
Example: Configuring PAP Authentication Protocol	109
Monitoring a PPP Session	110
Tracing Operations of the pppd Process	110
Configuring PPP Address and Control Field Compression	111

Configuring the PPP Protocol Field Compression	113
Configuring the Interface Speed	114
Management Ethernet Interface on M-series and T-series Routing Platforms	114
Gigabit Ethernet Interfaces on J-series Services Routers	115
Fast Ethernet Interface	115
Tri-Rate Ethernet Copper Interface	116
SONET/SDH Interface	116
Configuring Keepalives	118
Configuring the Clock Source	119
Configuring the Router as a DCE	120
Configuring Receive and Transmit Leaky Bucket Properties	120
Configuring Accounting for the Physical Interface	121
Applying an Accounting Profile to the Physical Interface	122
Example: Applying an Accounting Profile to the Physical Interface	122
Interface Diagnostics	122
Configuring Loopback Testing	123
Interface Diagnostics	125
Starting and Stopping a BERT Test	127
Example: Configuring Bit Error Rate Testing	127
Tracing Operations of an Individual Router Interface	128
Damping Interface Transitions	128
Configuring Multiservice Physical Interface Properties	129
Enabling or Disabling SNMP Notifications on Physical Interfaces	129
Enabling Unidirectional Traffic Flow on Physical Interfaces	129
Disabling a Physical Interface	130
Example: Disabling a Physical Interface	131

Chapter 4

Configuring Logical Interface Properties

133

Logical Interfaces Configuration Statements	133
Logical Interfaces Statements List	137
Specifying the Logical Interface Number	144
Configuring Logical System Interface Properties	145
Example: Configuring Logical System Interface Properties	146
Adding a Logical Unit Description to the Configuration	146
Configuring a Point-to-Point Connection	146
Configuring a Multipoint Connection	147
Configuring Accounting for the Logical Interface	147
Applying an Accounting Profile to the Logical Interface	148
Example: Applying an Accounting Profile to the Logical Interface	148
Configuring the Interface Bandwidth	148
Enabling or Disabling SNMP Notifications on Logical Interfaces	149
Configuring Interface Encapsulation	149
Configuring the Encapsulation on a Logical Interface	150
Configuring the PPP Restart Timers	151
Configuring the PPP Clear Loop Detected Timer	152
Configuring PPP CHAP Authentication	152

Configuring PPP PAP Authentication	152
Configuring a Default PAP Password	153
Configuring the Local Name	153
Configuring the Local Password	154
Configuring Passive Mode	154
Configuring Dynamic Call Admission Control	155
Example: Configuring Dynamic CAC	156
Disabling a Logical Interface	156

Chapter 5

Configuring Protocol Family and Interface Address Properties 157

Protocol Family Configuration and Interface Address Statements	157
Configuring the Protocol Family	160
IPv6 Overview	161
IPv4-to-IPv6 Transition	162
VRRP Properties	162
Configuring the Interface Address	162
Configuring the Interface IPv6 Address	164
Configuring IPCP Options	164
Configuring an IP Address for an Interface	165
Negotiating an IP Address Assignment from the Remote End	165
Configuring an Interface to Be Unnumbered	166
Assigning a Destination Profile to the Remote End	166
Configuring LLC2 Options	167
Configuring LLC2 Properties	167
Configuring DLSw Ethernet Redundancy Using LLC2 Properties	168
Example: Configuring LLC Options on an Interface	170
Example: Configuring DLSw Ethernet Redundancy	170
Configuring an Unnumbered Interface	172
Configuring an Unnumbered Point-to-Point Interface	172
Example: Configuring an Unnumbered Point-to-Point Interface	173
Configuring an Unnumbered Ethernet or Demux Interface	173
Configuring a Preferred Source Address for Unnumbered Ethernet or Demux Interfaces	174
Configuring Static Routes on Unnumbered Ethernet Interfaces	175
Restrictions for Configuring Unnumbered Ethernet Interfaces	175
Example: Configuring an Unnumbered Ethernet Interface	176
Example: Configuring the Preferred Source Address for an Unnumbered Ethernet Interface	176
Example: Configuring an Unnumbered Ethernet Interface as the Next Hop for a Static Route	177
Setting the Protocol MTU	177
Disabling the Removal of Address and Control Bytes	178
Disabling the Transmission of Redirect Messages on an Interface	178
Configuring Default, Primary, and Preferred Addresses and Interfaces	179
Configuring the Primary Interface for the Routing Platform	179
Configuring the Primary Address for an Interface	180
Configuring the Preferred Address for an Interface	180

Applying Policers	181
Applying Aggregate Policers	182
Example: Applying Aggregate Policers	183
Applying a Filter to an Interface	184
Defining Interface Groups in Firewall Filters	186
Filter-Based Forwarding on the Output Interface	186
Example: Applying a Filter to an Interface	186
Configuring Unicast RPF	189
Configuring Unicast RPF Strict Mode	189
Configuring Unicast RPF Loose Mode	190
Unicast RPF and Default Routes	191
Unicast RPF Behavior with a Default Route	191
Unicast RPF Behavior Without a Default Route	192
Unicast RPF with Routing Asymmetry	192
Configuring Unicast RPF on a VPN	193
Example: Configuring Unicast RPF on a VPN	193
Example: Configuring Unicast RPF	193
Enabling Source Class and Destination Class Usage	194
Examples: Enabling Source Class and Destination Class Usage	197

Chapter 6

Configuring Circuit and Translational Cross-Connects 203

Circuit and Translational Cross-Connects Overview	203
Defining the Encapsulation for Switching Cross-Connects	205
Configuring PPP or Cisco HDLC Circuits	205
Configuring ATM Circuits	205
Configuring Frame Relay Circuits	206
Configuring Ethernet CCC Circuits	207
Configuring Ethernet VLAN Circuits	208
Defining the Connection for Switching Cross-Connects	208
Configuring MPLS for Switching Cross-Connects	209
Configuring IS-IS or MPLS Traffic for TCC Interfaces	209
Configuring ATM-to-Ethernet Interworking	210
Enabling ATM-to-Ethernet Interworking	210
Configuring the ATM-to-Ethernet Interworking Ethernet Interface	211
Configuring the ATM-to-Ethernet Interworking Ethernet	
Encapsulation	211
Configuring the ATM-to-Ethernet Interworking Outer VLAN	
Identifier	211
Configuring the ATM-to-Ethernet Interworking Inner VLAN Identifier	
Range	211
Configuring the ATM-to-Ethernet Interworking Physical Interface	
VPI	212
Configuring the ATM-to-Ethernet Interworking ATM Logical	
Interface	212
Configuring the ATM-to-Ethernet Interworking Protocol Family	212

	Configuring the ATM-to-Ethernet Interworking Logical Interface VPI	213
	Configuring the ATM-to-Ethernet Interworking Logical Interface VCI	213
	Examples: Configuring Switching Cross-Connects	213
	Example: Configuring a CCC over Frame Relay Encapsulated Interface	213
	Example: Configuring a TCC	214
	Example: Configuring CCC over Aggregated Ethernet	216
	Example: Configuring a Remote LSP CCC over Aggregated Ethernet	217
	Example: Configuring ATM-to-Ethernet Interworking	219
Chapter 7	Tracing Interface Operations	221
	Tracing Operations of an Individual Router Interface	221
	Tracing Operations of the Interface Process	222
Part 3	Configuring Special Router Interfaces	
Chapter 8	Displaying the Internal Ethernet Interface	225
	Displaying the Internal Ethernet Interface	225
Chapter 9	Configuring Discard Interfaces	227
Chapter 10	Configuring IP Demultiplexing Interfaces	229
	Configuring an IP Demultiplexing Interface	229
	Specifying the Demux Underlying Interface	230
	Configuring IP Demux Prefixes	230
	Configuring an IP Demux Underlying Interface	231
	Configuring MAC Address Validation on Static Demux Interfaces	231
	Example: Configuring a Demux Interface	232
Chapter 11	Configuring the Loopback Interface	235
	Configuring the Loopback Interface	235
	Example: Configuring the Loopback Interface	236
Chapter 12	Configuring Serial Interfaces	239
	Serial Interfaces Overview	239
	Physical Interface Configuration Statements	240

Configuring the Serial Line Protocol	241
Serial Interface Default Settings	241
EIA-530 Interface Default Settings	242
V.35 Interface Default Settings	242
X.21 Interface Default Settings	243
Invalid Serial Interface Statements	243
Invalid EIA-530 Interface Statements	243
Invalid V.35 interface Statements	243
Invalid X.21 Interface Statements	244
Configuring the Serial Clocking Mode	244
Inverting the Serial Interface Transmit Clock	245
Configuring the DTE Clock Rate	246
Configuring the Serial Idle Cycle Flag	247
Configuring the Serial Signal Handling	247
Configuring the Serial DTR Circuit	250
Configuring Serial Signal Polarities	250
Configuring Serial Loopback Capability	251
Example: Configuring Serial Loopback Capability	252
Configuring Serial Line Encoding	253

Part 4

Configuring ATM Interfaces

Chapter 13

Configuring ATM Interfaces 257

Overview of ATM Interfaces	258
ATM1 Physical and Logical Configuration Hierarchies	259
ATM2 IQ Physical and Logical Configuration Hierarchies	261
Supported Features on ATM1 and ATM2 IQ Interfaces	263
Configuring Communication with Directly Attached ATM Switches and Routers	267
Example: Configuring Communication with Directly Attached ATM Switches and Routers	268
Enabling ILMI for Cell Relay	268
Example: Enabling ILMI for Cell Relay	269
Enabling Passive Monitoring on ATM Interfaces	269
Removing MPLS Labels from Incoming Packets	270
Configuring the ATM PIC Type	271
Example: Configuring the ATM PIC Type	272
Configuring ATM Cell-Relay Promiscuous Mode	272
Examples: Configuring ATM Cell-Relay Promiscuous Mode	273
Configuring the Maximum Number of ATM1 VCs on a VP	276
Configuring Layer 2 Circuit Transport Mode	276
Examples: Configuring IQ Layer 2 Circuit Transport Mode	279
Configuring Layer 2 Circuit Cell-Relay Promiscuous Mode	284
Example: Configuring Layer 2 Circuit Cell-Relay Promiscuous Mode	284
Configuring Layer 2 Circuit Trunk Mode Scheduling	285
Example: Configuring Layer 2 Circuit Trunk Mode Scheduling	286

Configuring CoS Queues in Layer 2 Circuit Trunk Mode	287
Example: Configuring CoS Queues in Layer 2 Circuit Trunk Mode	289
Configuring the Layer 2 Circuit Cell-Relay Cell Maximum	289
Class-Based Cell Bundling	290
Configuring the OAM F4 Cell Flows	291
Defining Virtual Path Tunnels	292
Configuring a Point-to-Point ATM1 or ATM2 IQ Connection	292
Configuring a Point-to-Multipoint ATM1 or ATM2 IQ Connection	293
Configuring a Multicast-Capable ATM1 or ATM2 IQ Connection	294
Configuring Inverse ATM1 or ATM2 ARP	294
Defining the ATM Traffic-Shaping Profile	295
Configuring ATM CBR	296
Configuring ATM2 IQ Real-Time VBR	296
Configuring ATM VBR	297
Specifying ATM1 Shaping Values	297
Example: Specifying ATM1 Shaping Values	300
Specifying ATM2 IQ Shaping Values	301
Configuring the ATM1 Queue Length	301
Configuring the ATM2 IQ EPD Threshold	302
Example: Configuring the ATM2 IQ EPD Threshold	303
Configuring Two EPD Thresholds per Queue	304
Configuring the ATM2 IQ Transmission Weight	304
Defining the ATM OAM F5 Loopback Cell Period	305
Configuring the ATM OAM F5 Loopback Cell Threshold	305
Configuring ATM Interface Encapsulation	306
Configuring an ATM1 Cell-Relay Circuit	308
Example: Configuring an ATM1 Cell-Relay Circuit	308
Configuring PPP over ATM2 Encapsulation	310
Example: Configuring PPP over ATM2 IQ Encapsulation	311
Configuring E3 and T3 Parameters on ATM Interfaces	313
Configuring SONET/SDH Parameters on ATM Interfaces	314
Configuring ATM2 IQ VC Tunnel CoS Components	315
Configuring Linear RED Profiles	316
Configuring an ATM Scheduler Map	317
Enabling Eight Queues on ATM2 IQ Interfaces	318
Example: Enabling Eight Queues on T-series, M120, and M320 Platforms	319
Configuring VC CoS Mode	324
Enabling the PLP Setting to Be Copied to the CLP Bit	324
Configuring ATM CoS on the Logical Interface	325
Example: Configuring ATM2 IQ VC Tunnel CoS Components	325
Example: Configuring ATM1 Interfaces	326
Example: Configuring ATM2 IQ Interfaces	328

Chapter 14

Configuring ATM-over-ADSL Interfaces

331

ATM-over-ADSL Overview	331
Configuring Physical ATM Interfaces and Logical Interface Properties for ADSL	332
Configuring the ATM-over-ADSL Virtual Path Identifier	332

Configuring the ATM-over-ADSL Physical Interface Operating Mode	333
Configuring the ATM-over-ADSL Physical Interface Encapsulation Type	334
Configuring the ATM-over-ADSL Logical Interface Encapsulation Type	334
Configuring the ATM-over-ADSL Protocol Family	335
Configuring the ATM-over-ADSL Virtual Channel Identifier	336

Chapter 15**Configuring ATM-over-SHDSL Interfaces 337**

ATM-overSHDSL	337
Configuring ATM Mode for SHDSL Overview	338
Configuring ATM Mode on the PIM	339
Configuring SHDSL Operating Mode on an ATM Physical Interface	340
Configuring Encapsulation on the ATM Physical Interface	341
Configuring Logical Interface Properties	341
Example: Configuring an ATM-over-SHDSL Interface	342
Verifying an ATM-over-SHDSL Interface Configuration	343

Part 5**Configuring Frame Relay Interfaces****Chapter 16****Configuring Frame Relay Interfaces 347**

Overview of Frame Relay Interfaces	347
Configuring Frame Relay Interface Encapsulation	348
Configuring the Frame Relay Encapsulation on a Physical Interface	348
Example: Configuring the Encapsulation on a Physical Interface	350
Configuring the Frame Relay Encapsulation on a Logical Interface	351
Configuring Frame Relay Control Bit Translation	351
Configuring the Media MTU	353
Setting the Protocol MTU	353
Configuring Frame Relay Keepalives	353
Configuring Tunable Keepalives for Frame Relay LMI	354
Configuring Inverse Frame Relay ARP	355
Configuring the Router as a DCE	356
Configuring Frame Relay DLCIs	356
Configuring a Point-to-Point Frame Relay Connection	356
Configuring a Point-to-Multipoint Frame Relay Connection	357
Configuring a Multicast-Capable Frame Relay Connection	357

Part 6**Configuring Channelized Interfaces****Chapter 17****Configuring Channelized Interfaces 361**

Overview of Channelized Interfaces	361
Channelized Interface Capabilities	361
Data-Link Connection Identifiers on Channelized Interfaces	362

Clock Sources on Channelized Interfaces	364
Channelized E1 and T1 PIM Properties	366
Channelized IQ and IQE Interfaces Properties	367
Structure of Channelized IQ and Channellized IQE PICs	369

Chapter 18 Configuring Channelized E1 Interfaces 377

Configuring Channelized E1 IQ Interfaces	377
Configuring E1 IQ Interfaces	377
Configuring Fractional E1 IQ Interfaces	378
Example: Configuring Fractional E1 IQ Interfaces	378
Configuring NxDS0 IQ Interfaces	378
Example: Configuring an NxDS0 IQ Interface	379
Configuring Channelized E1 Interfaces	379
Configuring Channelized E1 Interface Properties	381
Example: Configuring Channelized E1 IQ Interfaces	381
Example: Configuring Channelized E1 Interfaces	382

Chapter 19 Configuring Channelized E1 PRI and T1 PRI Interfaces 385

Channelized E1 PRI and T1 PRI Overview	385
Configuring a Clear Channel	386
Configuring a Channelized T1/E1 Interface to Drop and Insert Time Slots	387
Configuring Primary Rate Interfaces	388
Allocating B-Channels for Dialout	389
Configuring PRI Interfaces	389
Example: Configuring a Channelized T1 Interface as Primary Rate Interface	390

Chapter 20 Configuring Channelized OC3 IQ and IQE Interfaces 393

Channelized OC3 IQ and IQE Overview	393
Partitions, OC Slices, Interface Types, and Time Slots	394
Configuring a Clear Channel	395
Configuring T3 IQ Interfaces	395
Example: Configuring T3 IQ Interfaces	396
Configuring T1 and NxDS0 Interfaces	396
Examples: Configuring T1 and NxDS0 IQ Interfaces	398
Setting Remote Loopback and Running BERT Tests on NxDS0 Interfaces	399
Configuring Fractional T1 IQ Interfaces	399
Example: Configuring Fractional T1 IQ Interfaces	400
Configuring Link PIC Failover	400

Chapter 21 Configuring Channelized OC12 Interfaces 401

Channelized OC12 Overview	401
Configuring Channelized OC12 IQ and IQE Interfaces (SONET Mode)	403
Configuring an OC12 IQ and IQE Interface	403
Configuring T3 IQ Interfaces	404
Example: Configuring T3 IQ Interfaces	404
Configuring OC3 IQ Interfaces	404
Example: Configuring OC3 IQ Interfaces	405
Configuring T1 IQ Interfaces	405
Example: Configuring T1 IQ Interfaces	406
Configuring NxDS0 IQ Interfaces	407
Example: Configuring NxDS0 IQ Interfaces	409
Configuring Fractional T1 IQ Interfaces	409
Example: Configuring Fractional T1 IQ Interfaces	410
Configuring Channelized OC12 IQ or IQE Interfaces (SDH Mode)	410
Configuring a Channelized OC12 IQ or IQE PIC for SDH Mode	410
Configuring an Unpartitioned SDH (VC-4-4C) Interface	411
Example: Configuring an Unpartitioned SDH (VC-4-4C) Interface	411
Configuring SDH (VC-4) Interfaces	411
Example: Configuring SDH (VC-4) Interfaces	412
Configuring Channelized AU-4 Interfaces	412
Example: Configuring Channelized AU-4 Interfaces	413
Configuring T3 or Channelized T3 Interfaces	413
Example: Configuring T3 or Channelized T3 Interfaces	413
Configuring T1 or Channelized T1 Interfaces	414
Example: Configuring T1 or Channelized T1 Interfaces	414
Configuring NxDS0 IQ Interfaces	414
Example: Configuring NxDS0 IQ Interfaces	415
Configuring Channelized OC12 Interfaces	415
Configuring Link PIC Failover	416
Example: Configuring Channelized OC12 IQ Interfaces	416
Example: Configuring Channelized OC12 Interfaces	420

Chapter 22 Configuring Channelized STM1 Interfaces 423

Configuring Channelized STM1 IQ and IQE Interfaces	423
Configuring an STM1 IQ or STM1 IQE Interface	423
Configuring E1 IQ and IQE Interfaces	424
Example: Configuring E1 IQ and IQE Interfaces	424
Configuring Fractional E1 IQ Interfaces	425
Example: Configuring Fractional E1 IQ Interfaces	426
Configuring an NxDS0 IQ Interface	426
Example: Configuring an NxDS0 IQ Interface	427
Example: Configuring Channelized STM1 IQ and IQE Interfaces	427
Configuring Channelized STM1 Interfaces	429
Configuring Channelized STM1 Interface Properties	429
Configuring Virtual Tributary Mapping of Channelized STM1 Interfaces	430

Configuring Link PIC Failover	433
Example: Configuring Channelized STM1 Interfaces	433

Chapter 23 Configuring Channelized T1 IQ Interfaces 437

Configuring Channelized T1 IQ Interfaces	437
Configuring T1 IQ Interfaces	437
Configuring Fractional T1 IQ Interfaces	438
Example: Configuring Fractional T1 IQ Interfaces	438
Configuring NxDS0 IQ Interfaces	439
Example: Configuring an NxDS0 IQ Interface	439
Configuring Payload Loopback	439
Configuring Channelized T1 Interface Properties	441
Example: Configuring Channelized T1 IQ Interfaces	441

Chapter 24 Configuring Channelized T3 Interfaces 443

Configuring Channelized T3 IQ Interfaces	443
Configuring T3 IQ Interfaces	443
Configuring T1 IQ Interfaces	444
Example: Configuring T1 IQ and IQE Interfaces	444
Configuring Fractional T1 IQ and IQE Interfaces	444
Example: Configuring Fractional T1 IQ Interfaces	445
Configuring an NxDS0 IQ Interface	445
Example: Configuring an NxDS0 IQ Interface	446
Configuring Channelized DS3-to-DS0 Interfaces	446
Configuring Channelized DS3-to-DS1 Interfaces	449
Example: Configuring Channelized T3 IQ Interfaces	450
Examples: Configuring Channelized DS3-to-DS0 Interfaces	451
Examples: Configuring Channelized DS3-to-DS1 Interfaces	454

Part 7 Configuring Circuit Emulation Interfaces

Chapter 25 Configuring Circuit Emulation Interfaces 461

Circuit Emulation Interface Types	461
Channelized OC3/STM1 Circuit Emulation PIC	461
12xT1/E1 Circuit Emulation PIC Overview	461
Clocking Features	461
Example: Mobile Backhaul Application	462
Configuring SAToP Emulation on 12x T1/E1 CE PICs	462
Configuring SAToP Emulation on Channelized OC3/STM1 CE PICs	464
Configuring Circuit Emulation PICs	465
Setting the Emulation Mode	465
T1/E1 Loopback Support	465
T1 FDL Support	465
Viewing the PIC in the CLI Chassis Hardware Configuration	466

Part 8**Configuring E1, E3, T1, and T3 Interfaces****Chapter 26****Configuring E1 Interfaces****469**

E1 Interfaces Overview	469
Configuring E1 Specific Interface Properties	470
Configuring E1 BERT Properties	470
Configuring the E1 Frame Checksum	471
Configuring E1 Framing	471
Configuring the E1 Idle Cycle Flag	472
Configuring E1 Data Inversion	472
Configuring E1 Loopback Capability	472
Example: Configuring E1 Loopback Capability	473
Configuring E1 Start and End Flags	474
Configuring Fractional E1 Time Slots	474
Example: Configuring Fractional E1 Time Slots	475

Chapter 27**Configuring E3 Interfaces****477**

E3 Interfaces Overview	477
Configuring E3 Physical Interface Properties	478
Configuring E3 BERT Properties	478
Configuring the E3 CSU Compatibility Mode	479
Configuring the E3 Frame Checksum	480
Configuring the E3 Idle Cycle Flag	481
Configuring E3 Data Inversion	481
Configuring E3 Loopback Capability	481
Example: Configuring E3 Loopback Capability	482
Configuring E3 HDLC Payload Scrambling	483
Configuring the E3 Start and End Flags	483
Configuring E3 IQ and IQE Unframed Mode	484

Chapter 28**Configuring T1 Interfaces****485**

T1 Interfaces Overview	485
Configuring T1 Physical Interface Properties	486
Configuring T1 BERT Properties	486
Configuring the T1 Buildout	487
Configuring T1 Byte Encoding	487
Configuring T1 CRC Error Major Alarm Thresholds	487
Configuring T1 CRC Error Minor Alarm Thresholds	488
Configuring T1 Data Inversion	489
Configuring the T1 Frame Checksum	489
Configuring the T1 Remote Loopback Response	489
Configuring T1 Framing	490
Configuring T1 Line Encoding	490
Configuring T1 Loopback Capability	490
Configuring the T1 Idle Cycle Flag	492

Configuring T1 Start and End Flags	492
Configuring Fractional T1 Time Slots	493
Example: Configuring Fractional T1 Time Slots	493

Chapter 29 Configuring T3 Interfaces 495

T3 Interfaces Overview	495
Configuring T3 Physical Interface Properties	496
Configuring T3 BERT Properties	496
Disabling T3 C-Bit Parity Mode	497
Configuring the T3 CSU Compatibility Mode	498
Configuring the T3 Frame Checksum	500
Configuring the T3 FEAC Response	500
Configuring the T3 Idle Cycle Flag	501
Configuring the T3 Line Buildout	501
Configuring the Channelized T3 Loop Timing	502
Configuring T3 Loopback Capability	502
Configuring T3 HDLC Payload Scrambling	504
Configuring T3 Start and End Flags	505
Examples: Configuring T3 Interfaces	505

Part 9 Configuring Ethernet Interfaces

Chapter 30 Configuring Ethernet Interfaces 511

Overview of Ethernet Interfaces	511
Configuring Ethernet Physical Interface Properties	512
Configuring J-series Services Router Switching Interfaces	515
Example: Configuring J-series Services Router Switching Interfaces	516
MX-series Router Interface Identifiers	517
Enabling Ethernet MAC Address Filtering	517
Filtering Specific MAC Addresses	518
Configuring Ethernet Loopback Capability	519
Configuring Flow Control	520
Ignoring Layer 3 Incomplete Errors	520
Configuring the Link Characteristics	520
Configuring Gratuitous ARP	521
Adjusting the ARP Aging Timer	522
Configuring the Interface Speed	522
Configuring the Ingress Rate Limit	523

Chapter 31 Configuring 802.1Q VLANs 525

Overview of 802.1Q VLANs	525
Enabling VLAN Tagging	525
Configuring Single-Tag or Dual-Tag Framing	526
Configuring Mixed Tagging	526

Configuring Mixed Tagging Support for Untagged Packets	527
Example: Configuring Mixed Tagging	527
Example: Configuring Mixed Tagging to Support Untagged Packets	528
Configuring a Logical Interface for Trunk Mode	528
Configuring the VLAN ID List for a Trunk Interface	529
Configuring a Logical Interface for Access Mode	529
Example: Configuring a Logical Interface for Access Mode	530
Binding a VLAN ID to a Logical Interface	530
Binding a VLAN ID Range to a Logical Interface	531
Example: Binding a VLAN ID Range to a Logical Interface	531
Configuring VLAN Encapsulation	532
Example: Configuring VLAN Encapsulation on a Gigabit Ethernet Interface	533
Example: Configuring VLAN Encapsulation on an Aggregated Ethernet Interface	533
Configuring Extended VLAN Encapsulation	533
Example: Configuring Extended VLAN Encapsulation on a Gigabit Ethernet Interface	534
Example: Configuring Extended VLAN Encapsulation on an Aggregated Ethernet Interface	534

Chapter 32**Configuring Aggregated Ethernet Interfaces****535**

Overview of Aggregated Ethernet Interfaces	535
Configuring Aggregated Ethernet Interfaces	535
Configuring Ethernet Link Aggregation	537
Configuring Aggregated Ethernet Link Protection	537
Setting the Number of Aggregated Ethernet Interfaces on the Chassis	538
Configuring Aggregated Ethernet LACP	539
Configuring the LACP Interval	540
Configuring LACP Link Protection	540
Enabling LACP Link Protection	541
Configuring LACP System Priority	542
Configuring LACP Port Priority	542
Tracing LACP Operations	542
Example: Configuring Aggregated Ethernet LACP	543
Configuring Tagged Aggregated Ethernet Interfaces	544
Configuring Untagged Aggregated Ethernet Interfaces	544
Example: Configuring Untagged Aggregated Ethernet Interfaces	545
Configuring Aggregated Ethernet Link Speed	546
Configuring Aggregated Ethernet Minimum Links	546

Chapter 33**Stacking and Rewriting Gigabit Ethernet IQ VLAN Tags****547**

Overview of Stacking and Rewriting Gigabit Ethernet IQ VLAN Tags	547
Stacking and Rewriting Gigabit Ethernet IQ VLAN Tags	548
Configuring Frames with Particular TPIDs to Be Processed as Tagged Frames	550
Configuring Stacked VLAN Tagging	551
Configuring Dual VLAN Tags	551

	Configuring Inner and Outer TPIDs and VLAN IDs	551
	Stacking a VLAN Tag	554
	Removing a VLAN Tag	555
	Removing the Outer and Inner VLAN Tags	555
	Removing the Outer VLAN Tag and Rewriting the Inner VLAN Tag	556
	Stacking Two VLAN Tags	557
	Rewriting the VLAN Tag	557
	Rewriting a VLAN Tag and Adding a New Tag	558
	Rewriting the Inner and Outer VLAN Tags	559
	Examples: Stacking and Rewriting Gigabit Ethernet IQ VLAN Tags	559
Chapter 34	Configuring Layer 2 Bridging Interfaces	567
	Overview of Layer 2 Bridging Interfaces	567
	Configuring Layer 2 Bridging Interfaces	567
	Example: Configuring Layer 2 Bridging Interfaces	568
Chapter 35	Configuring TCC and Layer 2.5 Switching	569
	Overview of TCC and Layer 2.5 Switching	569
	Configuring VLAN TCC Encapsulation	569
	Configuring Ethernet TCC	570
	Example: Configuring an Ethernet TCC or Extended VLAN TCC	571
Chapter 36	Configuring Static ARP Table Entries	573
	Overview of Static ARP Table Entries	573
	Configuring Static ARP Table Entries	573
	Example: Configuring Static ARP Table Entries	574
Chapter 37	Configuring Unrestricted Proxy ARP	575
	Overview of Unrestricted Proxy ARP	575
	Configuring Unrestricted Proxy ARP	576
Chapter 38	Configuring MAC Address Validation on Static Ethernet Interfaces	579
	Overview of MAC Address Validation on Static Ethernet Interfaces	579
	Configuring MAC Address Validation on Static Ethernet Interfaces	579
	Example of Strict MAC Validation on a Static Ethernet Interface	580
Chapter 39	Enabling Passive Monitoring on Ethernet Interfaces	581
	Overview of Passive Monitoring on Ethernet Interfaces	581
	Enabling Passive Monitoring on Ethernet Interfaces	581

Chapter 40	Configuring IEEE 802.1ag OAM Connectivity-Fault Management	583
	Overview of IEEE 802.1ag OAM Connectivity-Fault Management	584
	Connectivity Fault Management Key Elements	584
	Continuity Check Protocol	585
	Linktrace Protocol	585
	Creating the Maintenance Domain	585
	Configuring the Maintenance Domain Name Format	586
	Configuring the Maintenance Domain Level	586
	Creating the Maintenance Association	586
	Configuring the Maintenance Association Short Name Format	586
	Configuring the Continuity Check	586
	Configuring the Continuity Check Hold Interval	587
	Configuring the Continuity Check Interval	587
	Configuring the Continuity Check Loss Threshold	587
	Creating a Maintenance End Point	587
	Enabling Maintenance End Point Automatic Discovery	588
	Configuring the Maintenance End Point Direction	588
	Configuring the Maintenance End Point Interface	588
	Configuring the Maintenance End Point Priority	588
	Creating a Remote Maintenance End Point	589
	Configuring the Remote Maintenance End Point Action Profile	589
	Creating a Connectivity-Fault Management Action Profile	589
	Configuring a CFM Action Profile Action	589
	Configuring a CFM Interface Down Action Profile Action	589
	Configuring the Linktrace Path Age Timer	590
	Configuring the Linktrace Database Size	590
Chapter 41	Configuring IEEE 802.1x Port-Based Network Access Control	591
	Overview of IEEE 802.1x Port-Based Network Access Control	591
	Administrative State of the Authenticator Port	592
	Administrative Mode of the Authenticator Port	592
	Configuring the Authenticator	592
	Viewing the dot1x Configuration	593
Chapter 42	Configuring IEEE 802.3ah OAM Link-Fault Management	595
	Overview of IEEE 802.3ah OAM Link-Fault Management	595
	Configuring IEEE 802.3ah OAM Link-Fault Management	596
	Enabling IEEE 802.3ah OAM Support	596
	Configuring Link Discovery	596
	Configuring the OAM PDU Interval	597
	Configuring the OAM PDU Threshold	597
	Configuring Threshold Values for Local Fault Events on an Interface	597
	Disabling the Sending of Link Event TLVs	598
	Detecting Remote Faults	598
	Configuring an OAM Action Profile	598
	Specifying the Actions to Be Taken for Link-Fault Management Events	599
	Monitoring the Loss of Link Adjacency	600

	Monitoring Protocol Status	600
	Configuring Threshold Values for Fault Events in an Action Profile	600
	Applying an Action Profile	601
	Setting a Remote Interface into Loopback Mode	601
	Enabling Remote Loopback Support on the Local Interface	601
	Example: Configuring IEEE 802.3ah OAM Support on an Interface	602
Chapter 43	Configuring VRRP and VRRP for IPv6	603
	Overview of VRRP and VRRP for IPv6	603
	Configuring VRRP and VRRP for IPv6	603
Chapter 44	Specifying the IP Demux Underlying Interface Family Type	605
	Overview of IP Demux Underlying Interface Family Type	605
	Specifying the IP Demux Underlying Interface Family Type	605
Chapter 45	Configuring Gigabit Ethernet Accounting and Policing	607
	Overview of Gigabit Ethernet Accounting and Policing	607
	Configuring Gigabit Ethernet Policers	609
	Configuring a Policer	609
	Specifying an Input Priority Map	610
	Specifying an Output Priority Map	610
	Applying a Policer	611
	Configuring MAC Address Filtering	613
	Example: Configuring Gigabit Ethernet Policers	613
	Configuring Gigabit Ethernet Two-Color and Tricolor Policers	614
	Configuring a Policer	615
	Applying a Policer	616
	Example: Configuring and Applying a Policer	617
	Configuring MAC Address Accounting	618
Chapter 46	Configuring Gigabit Ethernet Autonegotiation	619
	Overview of Gigabit Ethernet Autonegotiation	619
	Configuring Gigabit Ethernet Autonegotiation	619
Chapter 47	Configuring the Management Ethernet Interface	627
	Overview of the Management Ethernet Interface	627
	Configuring a Consistent Management IP Address	627
	Configuring the MAC Address on the Management Ethernet Interface	628

Chapter 48	Configuring the 10-Gigabit Ethernet DWDM Interface Wavelength	631
	Overview of the 10-Gigabit Ethernet DWDM Interface Wavelength	631
	Configuring the 10-Gigabit Ethernet DWDM Interface Wavelength	631
Chapter 49	Configuring 10-Gigabit Ethernet Framing	633
	Overview of 10-Gigabit Ethernet Framing	633
	Configuring 10-Gigabit Ethernet Framing	633
Chapter 50	Configuring 10-Gigabit Ethernet Notification of Link Down Alarm	635
	Overview of 10-Gigabit Ethernet Notification of Link Down Alarm	635
	Configuring 10-Gigabit Ethernet Notification of Link Down Alarm	635
Chapter 51	Configuring Point-to-Point Protocol over Ethernet	637
	PPPoE Overview	637
	PPPoE Interfaces	638
	Ethernet Interface	638
	PPPoE Stages	638
	PPPoE Discovery Stage	639
	PPPoE Session Stage	639
	Optional CHAP Authentication	640
	Configuring the PPPoE Interfaces MTU	640
	Disabling the Sending of PPPoE Keepalive Messages	640
	Configuring PPPoE	641
	Setting the Appropriate Encapsulation on the PPPoE Interface	641
	Configuring PPPoE Encapsulation on an Ethernet Interface	642
	Configuring PPPoE Encapsulation on an ATM-over-ADSL Interface	642
	Configuring a PPPoE Interface	643
	Configuring the PPPoE Underlying Interface	643
	Identifying the Access Concentrator	644
	Configuring the PPPoE Automatic Reconnect Wait Timer	644
	Configuring the PPPoE Service Name	645
	Configuring the PPPoE Server Mode	645
	Configuring the PPPoE Client Mode	646
	Configuring the PPPoE Source and Destination Addresses	646
	Deriving the PPPoE Source Address From a Specified Interface	646
	Configuring the PPPoE IP Address by Negotiation	647
	Configuring the Protocol MTU PPPoE	647
	Example: Configuring a PPPoE Client Interface on a J-Series Services Router	647
	Example: Configuring a PPPoE Server Interface on an M120 Router	648
	Verifying a PPPoE Configuration	649

Chapter 52 **Example Ethernet Configurations** **651**

Example: Configuring Fast Ethernet Interfaces	651
Example: Configuring Gigabit Ethernet Interfaces	651
Example: Configuring Aggregated Ethernet Interfaces	652
Example: Configuring Aggregated Ethernet Link Protection	653

Part 10 **Configuring ISDN Interfaces**

Chapter 53 **Configuring ISDN Interfaces** **657**

ISDN Interfaces Overview	657
Configuring ISDN Services Physical and Logical Interface Properties	658
Configuring ISDN Physical Interface Properties	659
Configuring an ISDN Interface to Screen Incoming Calls	661
Configuring ISDN Logical Interface Properties	661
Configuring an ISDN Dialer Interface as a Backup Interface	664
Example: Configuring an ISDN Interface as the Backup Interface	665
Applying the Dial-on-Demand Dialer Filter to the Dialer Interfaces	666
Example: Applying the Dialer Filter	666
Configuring Bandwidth on Demand	667
Configuring the Dialer Interface	668
Configuring the ISDN Interface	669
Example: Configuring Bandwidth on Demand	669
Configuring Dial-In and Callback	670
Configuring Dial-In	671
Disabling Dial-In	671
Configuring Callback	672
Example: Configuring Dial-In and Callback	672
Configuring Dialer Watch	673
Configuring the Dialer Interface	673
Configuring the Physical Interface	674
Example: Configuring Dialer Watch	674
Disabling ISDN Processes	675

Part 11 **Configuring SONET Interfaces**

Chapter 54 **Configuring SONET/SDH Interfaces** **679**

SONET/SDH Interfaces Overview	679
Configuring SONET/SDH Physical Interface Properties	680
Configuring SONET/SDH Framing	682
Configuring SONET/SDH Interface Speed	683
Configuring SONET/SDH Header Byte Values	685
Configuring an Incrementing STM ID	686

Configuring the SONET/SDH Frame Checksum	687
Configuring Channelized IQ and IQE SONET/SDH Loop Timing	687
Configuring SONET/SDH Loopback Capability	688
Example: Configuring SONET/SDH Loopback Capability	688
Configuring the SONET/SDH Path Trace Identifier	689
Configuring SONET/SDH HDLC Payload Scrambling	689
Configuring SONET/SDH RFC 2615 Support	690
Configuring SONET/SDH Defect Triggers to Be Ignored	691
Configuring SONET/SDH Defect Hold Times	692
Example: Configuring SONET/SDH Defects to Be Ignored	693
Configuring Virtual Tributary Mapping	694
Configuring APS and MSP	694
Configuring Basic APS Support	696
Configuring Container Interfaces	697
Configuring Switching Between the Working and Protect Circuits	700
Configuring Revertive Mode	702
Configuring Unidirectional Switching Mode Support	702
Configuring APS Timers	703
Configuring Link PIC Redundancy	704
Example: Configuring Link PIC Redundancy	704
Configuring APS Load Sharing Between Circuit Pairs	705
Example: Configuring APS Load Sharing Between Circuit Pairs	707
Configuring SONET Options for 10-Gigabit Ethernet Interfaces	707
Configuring the Media MTU	708
Enabling Passive Monitoring on SONET/SDH Interfaces	709
Removing MPLS Labels from Incoming Packets	709
Configuring the Clock Source	710
Configuring Receive and Transmit Leaky Bucket Properties	711
Damping Interface Transitions	712
Configuring Interface Encapsulation	713
Configuring the Encapsulation on a Physical Interface	713
Example: Configuring the Encapsulation on a Physical Interface	715
Configuring the Encapsulation on a Logical Interface	715
Example: Configuring SONET/SDH Interfaces	716
Configuring Aggregated SONET/SDH Interfaces	716
Configuring SONET/SDH Link Aggregation	718
Configuring Aggregated SONET/SDH Link Speed	718
Configuring Aggregated SONET/SDH Minimum Links	718
Configuring Filters or Sampling on Aggregated SONET/SDH Links	719
Examples: Configuring Filters or Sampling on Aggregated SONET/SDH Links	719
Example: Configuring Aggregated SONET/SDH Interfaces	720

Part 12**Interface Configuration Statements****Chapter 55****Summary of Interface Configuration Statements****725**

802.3ad	725
accept-source-mac	726
access-concentrator	727
access-profile	728
accounting	729
accounting-profile	729
acfc	730
ack-delay-time	730
ack-max	731
acknowledge-retries	731
acknowledge-timer	732
action	733
action (OAM)	733
action (Policer)	733
action-profile	734
action-profile (Applying to CFM)	734
action-profile (Defining for CFM)	734
action-profile (Defining for LFM)	735
action-red-differential-delay	736
activation-delay	736
activation-priority	737
address	738
advertise-interval	740
advertise-interval (APS)	740
advertise-interval (DLSw)	741
age	741
aggregate	742
aggregate (Gigabit Ethernet CoS Policer)	742
aggregate (SONET/SDH)	742
aggregate-ports	743
aggregated-ether-options	744
aggregated-sonet-options	745
allow-any-vci	745
allow-fragmentation	746
allow-remote-loopback	746
annex	747
apply-action-profile	747
aps	748
arp	749
asynchronous-notification	750
atm-encapsulation	750
atm-options	751
atm-scheduler-map	752
authentication-key	752
authentication-profile-name	753
authenticator	754

auto-discovery	755
auto-negotiation	756
auto-negotiation (Gigabit Ethernet)	756
auto-negotiation (J-series uPIM)	757
auto-reconnect	757
backup-destination	758
backup-interface	758
backup-options	759
bandwidth	759
bandwidth-limit	760
bchannel-allocation	760
bearer-bandwidth-limit	761
bert-algorithm	762
bert-error-rate	764
bert-period	765
broadcast	765
buildout	766
buildout (E3 or T3 over ATM Interfaces)	766
buildout (T1 Interfaces)	767
bundle	768
burst-size-limit	768
byte-encoding	769
bytes	770
callback	771
callback-wait-period	772
caller	773
calling-number	774
cbit-parity	774
cbr	775
cell-bundle-size	776
chap	777
chap-secret	778
cisco-interoperability	778
classifier	779
clear-dont-fragment-bit	779
client	780
clocking	780
clocking-mode	781
clock-rate	782
compatibility-mode	783
compression	784
compression (PPP Properties)	784
compression (Voice Services)	785
compression-device	785
connections	786
connectivity-fault-management	787
container-devices	788
container-list	788
container-options	789
container-type	789
continuity-check	790

control-polarity	790
control-signal	791
copy-tos-to-outer-ip-header	791
core-dump	792
crc-major-alarm-threshold	792
crc-minor-alarm-threshold	793
cts	793
cts-polarity	794
current	794
data-input	795
dcd	796
dcd-polarity	796
dce	797
dce-options	797
deactivation-delay	798
default-action	798
default-chap-secret	799
default-pap-password	799
demux0	800
demux-destination	801
demux-destination (Underlying Interface)	801
demux-destination (Demux Interface)	801
demux-options	802
demux-source	803
demux-source (Underlying Interface)	803
demux-source (Demux Interface)	803
description	804
destination	805
destination (DLSw)	805
destination (IPCP)	806
destination (Routing Instance)	806
destination (Tunnels)	807
destination-class-usage	807
destination-profile	808
dialer	808
dialer-options	809
dialin	810
dial-options	810
dial-string	811
direction	811
disable	812
disable	812
disable	812
disable-mlppp-inner-ppp-pfc	813
dlci	813
dls w	814
do-not-fragment	814
dot1 x	815
down-count	816
drop-timeout	817
ds0-options	817

dsl-options	818
dsr	818
dsr-polarity	819
dte-options	819
dtr	820
dtr-circuit	821
dtr-polarity	821
dynamic-call-admission-control	822
e1-options	823
e3-options	824
encapsulation	825
encapsulation (Container Interface)	825
encapsulation (Logical Interface)	826
encapsulation (Physical Interface)	829
encoding	832
epd-threshold	833
epd-threshold (Logical Interface)	833
epd-threshold (Physical Interface)	834
es-options	834
ethernet	835
ethernet-policer-profile	837
ethernet-switch-profile	838
event	839
event-thresholds	839
eui-64	840
facility-override	840
family	841
fastether-options	845
fcs	846
feac-loop-respond	847
filter	848
flexible-vlan-tagging	849
flow-control	850
f-max-period	850
force	851
forwarding-class	852
forwarding-class (ATM2 IQ Scheduler Maps)	852
forwarding-class (Gigabit Ethernet IQ Classifier)	853
fragment-threshold	853
frame-error	854
frame-period	855
frame-period-summary	856
framing	857
framing (E1, E3, and T1 Interfaces)	857
framing (10-Gigabit Ethernet Interfaces)	858
framing (SONET and SDH Interfaces)	858
gether-options	859
gratuitous-arp-reply	860
hello-timer	861
high-plp-max-threshold	861
high-plp-threshold	862

hold-interval	862
hold-time	863
hold-time (APS)	863
hold-time (DLSw)	864
hold-time (Physical Interface)	865
hold-time (SONET/SDH Defect Triggers)	866
host	867
idle-cycle-flag	868
idle-time	869
idle-timeout	869
ieee802.1p	870
ignore	870
ignore-all	871
ignore-l3-incompletes	871
ilmi	872
inactivity-timeout	872
incoming-called-number	873
incoming-map	873
indication	874
indication-polarity	874
ingress-rate-limit	875
init-command-string	876
initial-route-check	877
inner-tag-protocol-id	877
inner-vlan-id	878
inner-vlan-id-range	879
input	879
input-list	880
input-policer	880
input-priority-map	881
input-three-color	881
input-vlan-map	882
input-vlan-map (Gigabit Ethernet IQ)	882
input-vlan-map (Aggregated Ethernet)	883
interface	884
interface (DLSw Ethernet Redundancy)	884
interface (Hierarchical CoS Schedulers)	885
interface (IEEE 802.1ag OAM Connectivity-Fault Management)	885
interface (IEEE 802.3ah OAM Link-Fault Management)	886
interface (IEEE 802.1x (dot1x)—Port-Based Network Access Control)	887
interfaces	888
interface-down	888
interface-mode	889
interface-set	890
interface-set (Ethernet Interfaces)	890
interface-set (IP Demux Interfaces)	890
interface-switch	891
interface-type	892
interleave-fragments	893
interval	894
inverse-arp	895

invert-data	895
ipsec-sa	896
isdn-options	897
keep-address-and-control	898
keepalives	899
key	900
l2tp-interface-id	900
lACP	901
lACP (802.3ad)	901
lACP (aggregated-ether-options)	902
layer2-policer	903
lcp-restart-timer	904
level	904
linear-red-profile	905
linear-red-profiles	906
line-encoding	906
line-protocol	907
line-rate	907
link-adjacency-loss	908
link-down	908
link-discovery	909
link-event-rate	909
link-fault-management	910
link-layer-overhead	911
link-mode	912
link-protection	913
link-speed	914
link-speed (Aggregated Ethernet)	914
link-speed (Aggregated SONET/SDH)	915
linktrace	915
llc2	916
lmi	917
lmi-type	918
load-interval	918
load-threshold	919
local-mac	919
local-name	920
local-password	921
local-window	921
lockout	922
logical-interface-policer	922
logical-systems	923
log-prefix	923
long-buildout	924
loopback	925
loopback (ADSL, DS0, E1/E3, SONET/SDH, SHDSL, and T1/T3)	925
loopback (Aggregated Ethernet, Fast Ethernet, and Gigabit Ethernet)	926
loopback (Serial)	926
loopback-clear-timer	927
loop-timing	927
loss-priority	928

loss-threshold	928
low-plp-max-threshold	929
low-plp-threshold	929
lsq-failure-options	930
mac	930
mac-address	931
mac-learn-enable	932
mac-validate	933
maintenance-association	934
maintenance-domain	935
map	936
master-only	937
maximum-contexts	937
maximum-vcs	938
maximum-requests	938
max-retry	939
member-interface-speed	939
member-interface-type	940
mep	941
minimum-links	942
mlfr-uni-nni-bundle-options	943
mode	944
modem-options	944
monitor-session	945
mpls	945
mrru	946
mtu	946
multicast-dlci	947
multicast-vci	948
multicast-only	948
multilink-max-classes	949
multipoint	949
multipoint-destination	950
multiservice-options	951
n391	951
n392	952
n393	952
name-format	953
native-vlan-id	954
ncp-restart-timer	955
negotiate-address	955
negotiation-options	956
neighbor	956
no-allow-link-events	957
no-asynchronous-notification	957
no-auto-negotiation	957
no-cbit-parity	957
no-core-dump	957
no-feac-loop-respond	957
no-flow-control	957
no-gratuitous-arp-reply	958

no-gratuitous-arp-request	958
no-keepalives	959
no-long-buildout	959
no-loopback	959
no-mac-learn-enable	959
non-revertive	960
no-partition	961
no-partition (Channelized E1 IQ Interfaces)	961
no-partition (Channelized OC1 IQ Interfaces)	962
no-partition (Channelized OC12 IQ Interfaces)	962
no-partition (Channelized STM1 IQ Interfaces)	963
no-partition (Channelized T3 IQ Interfaces)	963
no-payload-scrambler	963
no-preempt	964
no-redirects	964
no-source-filtering	964
no-syslog	964
no-termination-request	965
no-translate-discard-eligible	965
no-translate-fecn-and-becn	965
no-unframed	965
no-z0-increment	965
oam	966
oam-liveness	968
oam-period	969
oc-slice	970
open-timeout	970
operating-mode	971
optics-options	972
output	972
output-list	973
output-policer	973
output-priority-map	974
output-three-color	974
output-vlan-map	975
output-vlan-map (Gigabit Ethernet IQ)	975
output-vlan-map (Aggregated Ethernet)	976
overflow	977
overflow (Receive Bucket)	977
overflow (Transmit Bucket)	977
paired-group	978
pap	979
pap-password	980
partition	981
passive	982
passive (CHAP)	982
passive (PAP)	983
passive-monitor-mode	983
path-database-size	984
path-trace	985
payload-scrambler	986

p-bit-timeout	987
pdu-interval	987
pdu-threshold	988
peer	988
peer-unit	989
periodic	989
per-unit-scheduler	990
pfc	990
pic-type	991
plp1	992
plp-to-clp	993
point-to-point	993
policer	994
policer (CoS)	994
policer (Interface)	995
policer (MAC)	996
pool	997
pop	998
pop-all-labels	999
pop-pop	1000
pop-swap	1000
port	1001
port-priority	1001
post-service-filter	1002
pppoe-options	1002
ppp-options	1003
preempt	1004
preferred	1005
preferred-source-address	1006
premium	1007
premium (Output Priority Map)	1007
premium (Policer)	1008
preserve-interface	1008
primary	1009
primary (Address on Interface)	1009
primary (AS PIC or MultiServices PIC Interfaces)	1009
priority	1010
priority (DLSw)	1010
priority (IEEE 802.1ag OAM Connectivity-Fault Management)	1011
priority (Schedulers)	1011
priority-cost	1012
promiscuous-mode	1012
protect-circuit	1013
protocol-down	1013
protocols	1014
proxy	1014
proxy-arp	1015
push	1015
push-push	1016
queue-depth	1016
queue-length	1017

queues	1017
quiet-period	1018
rate	1018
reassemble-packets	1019
reauthentication	1019
receive-bucket	1020
receive-options-packets	1020
receive-ttl-exceeded	1021
red-differential-delay	1021
redial-delay	1022
redundancy-group	1023
redundancy-options	1024
remote	1025
remote-loopback	1025
remote-loopback-respond	1026
remote-mep	1026
request	1027
required-depth	1028
retries	1029
revertive	1029
revert-time	1030
rfc-2615	1030
routing-instance	1031
rpf-check	1031
rtp	1032
rts	1032
rts-polarity	1033
rtvbr	1034
sampling	1035
scheduler-maps	1035
schedulers	1036
secondary	1036
send-critical-event	1037
serial-options	1038
server	1039
server-timeout	1039
service	1040
service-domain	1040
service-filter	1041
service-name	1041
service-set	1042
services	1042
services-options	1043
shaping	1044
shdsl-options	1045
short-name-format	1045
short-sequence	1046
snext	1046
snr-margin	1047
sonet-options	1048
source	1050

source-address-filter	1051
source-class-usage	1052
source-filtering	1053
speed	1054
speed (Ethernet)	1054
speed (SONET/SDH)	1055
spid1	1055
spid2	1056
stacked-vlan-tagging	1056
start-end-flag	1057
static-tei-val	1057
supplicant	1058
supplicant-timeout	1058
swap	1059
swap-push	1059
swap-swap	1060
switching-mode	1060
switch-options	1061
switch-port	1062
switch-type	1063
symbol-period	1064
syslog	1065
syslog (Interfaces)	1065
syslog (Monitoring)	1066
syslog (OAM Action)	1066
system-priority	1067
t1-options	1068
t1-time	1069
t2-time	1069
t310	1070
t391	1070
t392	1071
t3-options	1072
tag-protocol-id	1073
tag-protocol-id (TPIDs Expected to Be Sent or Received)	1073
tag-protocol-id (TPID to Rewrite)	1074
tei-option	1074
threshold	1075
timeslots	1076
tm	1077
tm-polarity	1077
traceoptions	1078
traceoptions (Individual Interfaces)	1079
traceoptions (Interface Process)	1080
traceoptions (LACP)	1082
traceoptions (PPP process)	1084
track	1087
translate-discard-eligible	1088
translate-fecn-and-becn	1088
transmit-bucket	1089
transmit-clock	1089

transmit-period	1090
transmit-weight	1091
transmit-weight (ATM2 IQ CoS Forwarding Class)	1091
transmit-weight (ATM2 IQ Virtual Circuit)	1092
traps	1092
trej-time	1093
trigger	1094
trigger-link-failure	1095
trunk-bandwidth	1095
trunk-id	1096
ttl	1096
tunnel	1097
underlying-interface	1098
unframed	1099
unidirectional	1099
unit	1100
unnumbered-address	1106
unnumbered-address (Demux)	1106
unnumbered-address (Ethernet)	1107
unnumbered-address (PPP)	1107
up-count	1108
vbr	1109
vc-cos-mode	1110
vci	1111
vci-range	1112
vlan-id	1113
vlan-id (VLAN ID to Be Bound to a Logical Interface)	1113
vlan-id (Family Bridge)	1114
vlan-id (VLAN ID to Rewrite)	1114
vlan-id (Outer VLAN ID)	1115
vlan-id-list	1115
vlan-id-range	1116
vlan-tagging	1116
vlan-tags	1117
vlan-tags-outer	1117
vlan-vci-tagging	1118
vpi	1119
vpi (ATM CCC Cell-Relay Promiscuous Mode)	1119
vpi (Define Virtual Path)	1120
vpi (Logical Interface and Interworking)	1120
vtmapping	1121
watch-list	1121
wavelength	1122
working-circuit	1124
yellow-differential-delay	1124
z0-increment	1125

Part 13

Index

Index1129

Index of Statements and Commands1151

List of Figures

Figure 1: APS Interface	33
Figure 2: Container Interface	33
Figure 3: Routing Matrix	52
Figure 4: Interface Slot, PIC, and Port Locations	55
Figure 5: Clock Sources	57
Figure 6: DLSw Ethernet Redundancy Topology	171
Figure 7: Unicast RPF with Routing Asymmetry	192
Figure 8: Prefix Accounting with Source and Destination Classes	195
Figure 9: Layer 2 Switching Circuit Cross-Connect	204
Figure 10: Example Topology of a Switching Circuit Cross-Connect with Frame Relay CCC Encapsulation	214
Figure 11: Layer 2.5 Switching Translational Cross-Connect	215
Figure 12: Interface-to-Interface Circuit Cross-Connect over Aggregated Ethernet Interfaces	216
Figure 13: Remote Interface-LSP-Interface Circuit Cross-Connect over Aggregated Ethernet Interfaces	218
Figure 14: ATM-to-Ethernet Interworking	220
Figure 15: Serial Interface Clocking Mode	245
Figure 16: Serial Interface LIU Loopback	251
Figure 17: Serial Interface Local Loopback	252
Figure 18: Layer 2 Circuit Trunk Topology	280
Figure 19: Example Topology for Router with Eight Queues	319
Figure 20: Structure of the Channelized OC3 IQ PIC	369
Figure 21: Structure of the Channelized OC12 IQ PIC	370
Figure 22: Structure of the Channelized STM1 IQ PIC	370
Figure 23: Structure of the Channelized DS3 IQ PIC	371
Figure 24: Structure of the Channelized E1 IQ PIC	371
Figure 25: Structure of the Channelized OC3/STM1 IQE PIC (port in SONET Mode)	371
Figure 26: Structure of the Channelized OC3/STM1 IQE PIC (port in SDH Mode)	372
Figure 27: Structure of the Channelized OC12/STM4 IQE PIC (port in SONET Mode)	372
Figure 28: Structure of the Channelized OC12/STM4 IQE PIC (port in SDH Mode)	373
Figure 29: Structure of the Channelized CDS3/E3 IQE PIC (port in DS3 Mode)	373
Figure 30: Structure of the Channelized CDS3/E3 IQE PIC (port in E3 Mode)	373
Figure 31: Channelized OC3 IQ Interface Example for Show Interfaces Controller	394
Figure 32: T1 Interfaces on a Channelized OC3 PIC	397

Figure 33: Sample Channelization of OC3 IQ or IQE PIC	398
Figure 34: Sample Channelization of OC12 IQ or IQE PIC (SONET Mode)	401
Figure 35: Sample Channelization of OC12 IQ or IQE PIC (SDH Mode)	402
Figure 36: Sample Channelization of OC12 PIC	403
Figure 37: T1 Interfaces on a Channelized OC12 PIC	406
Figure 38: Sample Channelization of OC12 IQ or IQE PIC	408
Figure 39: Sample Channelization of DS3 IQ or IQE PIC	451
Figure 40: Mobile Backhaul Application	462
Figure 41: Remote and Local E1 Loopback	473
Figure 42: Remote and Local E3 Loopback	482
Figure 43: Remote and Local T1 Loopback	491
Figure 44: Remote and Local T3 Loopback	503
Figure 45: Topology of Layer 2.5 Translational Cross-Connect	572
Figure 46: Edge Device Case for Unrestricted Proxy ARP	576
Figure 47: Core Device Case for Unrestricted Proxy ARP	576
Figure 48: Relationship of MEPs, MIPs, and Maintenance Domain Levels	584
Figure 49: Relationship of Bridges, Maintenance Domains, Maintenance Associations, and MEPs	585
Figure 50: PPPoE Session on an Ethernet Loop	638
Figure 51: ISDN Backup Topology	665
Figure 52: Dialer Filter Topology	667
Figure 53: Bandwidth-on-Demand Topology	669
Figure 54: Dialer Watch Topology	674
Figure 55: APS/MSP Configuration Topologies	695
Figure 56: APS Load Sharing Between Circuit Pairs	706

List of Tables

Table 1: Notice Icons	lii
Table 2: Text and Syntax Conventions	lii
Table 3: Technical Documentation for Supported Routing Platforms	liv
Table 4: JUNOS Software Network Operations Guides	lviii
Table 5: JUNOS Software with Enhanced Services Documentation	lix
Table 6: Additional Books Available Through http://www.juniper.net/books	lx
Table 7: Encapsulation Support by Interface Type	35
Table 8: FPC Numbering for T640 Routing Nodes in a Routing Matrix	53
Table 9: One-to-One FPC Numbering for T640 Routing Nodes in a Routing Matrix	54
Table 10: Statements for Physical Interface Properties	69
Table 11: Media MTU Sizes by Interface Type for M5, M7i, M10, M10i, M20, and M40 Routers	90
Table 12: Media MTU Sizes by Interface Type for M40e Routers	90
Table 13: Media MTU Sizes by Interface Type for M160 Routers	91
Table 14: Media MTU Sizes by Interface Type for M320 and M120 Platforms	92
Table 15: Media MTU Sizes by Interface Type for T320 Platforms	93
Table 16: Media MTU Sizes by Interface Type for T640 Platforms	93
Table 17: Media MTU Sizes by Interface Type for J2300 Platforms	93
Table 18: Media MTU Sizes by Interface Type for J4300 and J6300 Platforms	94
Table 19: Media MTU Sizes by Interface Type for J4350 and J6350 Platforms	94
Table 20: Encapsulation Overhead by Encapsulation Type	95
Table 21: Type 1 PIC Mode Combinations	116
Table 22: Type 2 PIC Mode Combinations	117
Table 23: Loopback Modes by Interface Type	124
Table 24: BERT Capabilities by Interface Type	126
Table 25: Statements for Logical Interface Properties	137
Table 26: Signal Handling by Serial Interface Type	247
Table 27: ATM1 and ATM2 IQ Supported Features	263
Table 28: ILMI Support by Encapsulation Type	268
Table 29: Shaping Rate Range by Interface Type	296
Table 30: ATM1 Traffic-Shaping Rates	299
Table 31: EPD Threshold Range by Interface Type	303
Table 32: ATM Logical Interface Encapsulation Types	307
Table 33: ATM-over-ADSL Operational Modes	333
Table 34: ATM-over-ADSL Encapsulation Types	334
Table 35: PIC Support for Enhanced Frame Relay Encapsulation Types	350
Table 36: Frame Relay DLCI Limitations for Channelized Interfaces	363

Table 37: Clocking Capabilities by Channelized PIC Type	365
Table 38: Structural Differences: Channelized PICs, Channelized IQ PICs, and Channelized IQE PICs	373
Table 39: Ranges for Channelized E1 Configuration	380
Table 40: OC12-to-DS3 Numbering Scheme	415
Table 41: Channelized STM1-to-E1 Channel Mapping	431
Table 42: Ranges for Channelized T1 IQ Configuration	440
Table 43: Ranges for Channelized DS3-to-DS0 Configuration	447
Table 44: Subrate Values for E3 Digital Link Compatibility Mode	480
Table 45: Subrate Values for T3 Digital Link Compatibility Mode	499
Table 46: VLAN ID Range by Interface Type	531
Table 47: Untagged Aggregated Ethernet and LACP Support by PIC and Platform	545
Table 48: Rewrite Operations on Not Tagged, Single-Tagged, and Dual-Tagged Frames	549
Table 49: Applying Rewrite Operations to VLAN Maps	550
Table 50: Rewrite Operations and Statement Usage for Input VLAN Maps	553
Table 51: Rewrite Operations and Statement Usage for Output VLAN Maps	553
Table 52: Capabilities of Gigabit Ethernet IQ and Gigabit Ethernet with SFPS	608
Table 53: Default Forwarding Classes	611
Table 54: Mode and Autonegotiation Status (Local)	620
Table 55: Mode and Autonegotiation Status (Remote)	622
Table 56: Wavelength-to-Frequency Conversion Matrix	632
Table 57: Type 1 PIC Mode Combinations	683
Table 58: Type 2 PIC Mode Combinations	684
Table 59: SONET/SDH Framing Bytes for Specific Speeds	685
Table 60: SONET/SDH Default Settings	690
Table 61: SONET/SDH and ATM Active Alarms and Defects	691

About This Guide

This preface provides the following guidelines for using the *JUNOS® Software Network Interfaces Configuration Guide*:

- Objectives on page xlix
- Audience on page xlix
- Supported Routing Platforms on page l
- Using the Indexes on page l
- Using the Examples in This Manual on page l
- Documentation Conventions on page lii
- List of Technical Publications on page liv
- Documentation Feedback on page lxi
- Requesting Technical Support on page lxi

Objectives

This guide provides an overview of the network interfaces features of the JUNOS software and describes how to configure these properties on the routing platform.



NOTE: This guide documents Release 9.3 of the JUNOS software. For additional information about the JUNOS software—either corrections to or information that might have been omitted from this guide—see the software release notes at <http://www.juniper.net/>.

Audience

This guide is designed for network administrators who are configuring and monitoring a Juniper Networks M-series, MX-series, T-series, EX-series, or J-series routing platform.

To use this guide, you need a broad understanding of networks in general, the Internet in particular, networking principles, and network configuration. You must also be familiar with one or more of the following Internet routing protocols:

- Border Gateway Protocol (BGP)
- Distance Vector Multicast Routing Protocol (DVMRP)
- Intermediate System-to-Intermediate System (IS-IS)

- Internet Control Message Protocol (ICMP) router discovery
- Internet Group Management Protocol (IGMP)
- Multiprotocol Label Switching (MPLS)
- Open Shortest Path First (OSPF)
- Protocol-Independent Multicast (PIM)
- Resource Reservation Protocol (RSVP)
- Routing Information Protocol (RIP)
- Simple Network Management Protocol (SNMP)

Personnel operating the equipment must be trained and competent; must not conduct themselves in a careless, willfully negligent, or hostile manner; and must abide by the instructions provided by the documentation.

Supported Routing Platforms

For the features described in this manual, the JUNOS software currently supports the following routing platforms:

- J-series
- M-series
- MX-series
- T-series

Using the Indexes

This reference contains two indexes: a complete index that includes topic entries, and an index of statements and commands only.

In the index of statements and commands, an entry refers to a statement summary section only. In the complete index, the entry for a configuration statement or command contains at least two parts:

- The primary entry refers to the statement summary section.
- The secondary entry, *usage guidelines*, refers to the section in a configuration guidelines chapter that describes how to use the statement or command.

Using the Examples in This Manual

If you want to use the examples in this manual, you can use the **load merge** or the **load merge relative** command. These commands cause the software to merge the incoming configuration into the current candidate configuration. If the example configuration contains the top level of the hierarchy (or multiple hierarchies), the example is a *full example*. In this case, use the **load merge** command.

If the example configuration does not start at the top level of the hierarchy, the example is a *snippet*. In this case, use the **load merge relative** command. These procedures are described in the following sections.

Merging a Full Example

To merge a full example, follow these steps:

1. From the HTML or PDF version of the manual, copy a configuration example into a text file, save the file with a name, and copy the file to a directory on your routing platform.

For example, copy the following configuration to a file and name the file **ex-script.conf**. Copy the **ex-script.conf** file to the **/var/tmp** directory on your routing platform.

```
system {
  scripts {
    commit {
      file ex-script.xsl;
    }
  }
}
interfaces {
  fxp0 {
    disable;
    unit 0 {
      family inet {
        address 10.0.0.1/24;
      }
    }
  }
}
```

2. Merge the contents of the file into your routing platform configuration by issuing the **load merge** configuration mode command:

```
[edit]
user@host# load merge /var/tmp/ex-script.conf
load complete
```

Merging a Snippet

To merge a snippet, follow these steps:

1. From the HTML or PDF version of the manual, copy a configuration snippet into a text file, save the file with a name, and copy the file to a directory on your routing platform.

For example, copy the following snippet to a file and name the file **ex-script-snippet.conf**. Copy the **ex-script-snippet.conf** file to the **/var/tmp** directory on your routing platform.

```
commit {
```

```
file ex-script-snippet.xml; }
```

2. Move to the hierarchy level that is relevant for this snippet by issuing the following configuration mode command:

```
[edit]
user@host# edit system scripts
[edit system scripts]
```

3. Merge the contents of the file into your routing platform configuration by issuing the load merge relative configuration mode command:

```
[edit system scripts]
user@host# load merge relative /var/tmp/ex-script-snippet.conf
load complete
```

For more information about the load command, see the *JUNOS CLI User Guide*.

Documentation Conventions

Table 1 on page lii defines notice icons used in this guide.

Table 1: Notice Icons





Icon	Meaning	Description
	Informational note	Indicates important features or instructions.
	Caution	Indicates a situation that might result in loss of data or hardware damage.
	Warning	Alerts you to the risk of personal injury or death.
	Laser warning	Alerts you to the risk of personal injury from a laser.

Table 2 on page lii defines the text and syntax conventions used in this guide.

Table 2: Text and Syntax Conventions

Convention	Description	Examples
Bold text like this	Represents text that you type.	To enter configuration mode, type the configure command: user@host> configure

Table 2: Text and Syntax Conventions (*continued*)

Convention	Description	Examples
Fixed-width text like this	Represents output that appears on the terminal screen.	<code>user@host> show chassis alarms</code> <code>No alarms currently active</code>
<i>Italic text like this</i>	<ul style="list-style-type: none"> Introduces important new terms. Identifies book names. Identifies RFC and Internet draft titles. 	<ul style="list-style-type: none"> A policy <i>term</i> is a named structure that defines match conditions and actions. <i>JUNOS System Basics Configuration Guide</i> RFC 1997, <i>BGP Communities Attribute</i>
<i>Italic text like this</i>	Represents variables (options for which you substitute a value) in commands or configuration statements.	Configure the machine's domain name: [edit] root@# set system domain-name <i>domain-name</i>
Plain text like this	Represents names of configuration statements, commands, files, and directories; IP addresses; configuration hierarchy levels; or labels on routing platform components.	<ul style="list-style-type: none"> To configure a stub area, include the stub statement at the [edit protocols ospf area area-id] hierarchy level. The console port is labeled CONSOLE.
< > (angle brackets)	Enclose optional keywords or variables.	stub <default-metric <i>metric</i> >;
(pipe symbol)	Indicates a choice between the mutually exclusive keywords or variables on either side of the symbol. The set of choices is often enclosed in parentheses for clarity.	broadcast multicast (<i>string1</i> <i>string2</i> <i>string3</i>)
# (pound sign)	Indicates a comment specified on the same line as the configuration statement to which it applies.	rsvp { # Required for dynamic MPLS only
[] (square brackets)	Enclose a variable for which you can substitute one or more values.	community name members [<i>community-ids</i>]
Indentation and braces ({ })	Identify a level in the configuration hierarchy.	[edit] routing-options { static { route default { nexthop <i>address</i> ; retain; } } }
; (semicolon)	Identifies a leaf statement at a configuration hierarchy level.	
J-Web GUI Conventions		
Bold text like this	Represents J-Web graphical user interface (GUI) items you click or select.	<ul style="list-style-type: none"> In the Logical Interfaces box, select All Interfaces. To cancel the configuration, click Cancel.

Table 2: Text and Syntax Conventions (*continued*)

Convention	Description	Examples
> (bold right angle bracket)	Separates levels in a hierarchy of J-Web selections.	In the configuration editor hierarchy, select Protocols > Ospf .

List of Technical Publications

Table 3 on page liv lists the software and hardware guides and release notes for Juniper Networks J-series, M-series, MX-series, and T-series routing platforms and describes the contents of each document. Table 4 on page lviii lists the books included in the *Network Operations Guide* series. Table 5 on page lix lists the manuals and release notes supporting JUNOS software with enhanced services. All documents are available at <http://www.juniper.net/techpubs/>.

Table 6 on page lx lists additional books on Juniper Networks solutions that you can order through your bookstore. A complete list of such books is available at <http://www.juniper.net/books>.

Table 3: Technical Documentation for Supported Routing Platforms

Book	Description
JUNOS Software for Supported Routing Platforms	
<i>Access Privilege</i>	Explains how to configure access privileges in user classes by using permission flags and regular expressions. Lists the permission flags along with their associated command-line interface (CLI) operational mode commands and configuration statements.
<i>Class of Service</i>	Provides an overview of the class-of-service (CoS) functions of the JUNOS software and describes how to configure CoS features, including configuring multiple forwarding classes for transmitting packets, defining which packets are placed into each output queue, scheduling the transmission service level for each queue, and managing congestion through the random early detection (RED) algorithm.
<i>CLI User Guide</i>	Describes how to use the JUNOS command-line interface (CLI) to configure, monitor, and manage Juniper Networks routing platforms. This material was formerly covered in the <i>JUNOS System Basics Configuration Guide</i> .
<i>Feature Guide</i>	Provides a detailed explanation and configuration examples for several of the most complex features in the JUNOS software.
<i>High Availability</i>	Provides an overview of hardware and software resources that ensure a high level of continuous routing platform operation and describes how to configure high availability (HA) features such as nonstop active routing (NSR) and graceful Routing Engine switchover (GRES).
<i>MPLS Applications</i>	Provides an overview of traffic engineering concepts and describes how to configure traffic engineering protocols.

Table 3: Technical Documentation for Supported Routing Platforms (*continued*)

Book	Description
<i>Multicast Protocols</i>	Provides an overview of multicast concepts and describes how to configure multicast routing protocols.
<i>Multiplay Solutions</i>	Describes how you can deploy IPTV and voice over IP (VoIP) services in your network.
<i>MX-series Layer 2 Configuration Guide</i>	Provides an overview of the Layer 2 functions of the MX-series routers, including configuring bridging domains, MAC address and VLAN learning and forwarding, and spanning-tree protocols. It also details the routing instance types used by Layer 2 applications. All of this material was formerly covered in the <i>JUNOS Routing Protocols Configuration Guide</i> .
<i>MX-series Layer 2 Solutions Guide</i>	Describes common configuration scenarios for the Layer 2 features supported on the MX-series routers, including basic bridged VLANs with normalized VLAN tags, aggregated Ethernet links, bridge domains, Multiple Spanning Tree Protocol (MSTP), and integrated routing and bridging (IRB).
<i>Network Interfaces</i>	Provides an overview of the network interface functions of the JUNOS software and describes how to configure the network interfaces on the routing platform.
<i>Network Management</i>	Provides an overview of network management concepts and describes how to configure various network management features, such as SNMP and accounting options.
<i>Policy Framework</i>	Provides an overview of policy concepts and describes how to configure routing policy, firewall filters, and forwarding options.
<i>Protected System Domain</i>	Provides an overview of the JCS 1200 platform and the concept of Protected System Domains (PSDs). The JCS 1200 platform, which contains up to six redundant pairs of Routing Engines running JUNOS software, is connected to a T320 router or to a T640 or T1600 routing node. To configure a PSD, you assign any number of Flexible PIC concentrators (FPCs) in the T-series routing platform to a pair of Routing Engines on the JCS 1200 platform. Each PSD has the same capabilities and functionality as a physical router, with its own control plane, forwarding plane, and administration.
<i>Routing Protocols</i>	Provides an overview of routing concepts and describes how to configure routing instances, and unicast routing protocols.
<i>Secure Configuration Guide for Common Criteria and JUNOS-FIPS</i>	Provides an overview of secure Common Criteria and JUNOS-FIPS protocols for the JUNOS software and describes how to install and configure secure Common Criteria and JUNOS-FIPS on a routing platform.
<i>Services Interfaces</i>	Provides an overview of the services interfaces functions of the JUNOS software and describes how to configure the services interfaces on the router.
<i>Software Installation and Upgrade Guide</i>	Describes the JUNOS software components and packaging and explains how to initially configure, reinstall, and upgrade the JUNOS system software. This material was formerly covered in the <i>JUNOS System Basics Configuration Guide</i> .

Table 3: Technical Documentation for Supported Routing Platforms (*continued*)

Book	Description
<i>Subscriber Access</i>	Provides an overview of the subscriber access features of the JUNOS software and describes how to configure subscriber access support on the router, including dynamic profiles, class of service, AAA, and access methods.
<i>System Basics</i>	Describes Juniper Networks routing platforms and explains how to configure basic system parameters, supported protocols and software processes, authentication, and a variety of utilities for managing your router on the network.
<i>VPNs</i>	Provides an overview and describes how to configure Layer 2 and Layer 3 virtual private networks (VPNs), virtual private LAN service (VPLS), and Layer 2 circuits. Provides configuration examples.
JUNOS References	
<i>Hierarchy and RFC Reference</i>	Describes the JUNOS configuration mode commands. Provides a hierarchy reference that displays each level of a configuration hierarchy, and includes all possible configuration statements that can be used at that level. This material was formerly covered in the <i>JUNOS System Basics Configuration Guide</i> .
<i>Interfaces Command Reference</i>	Describes the JUNOS software operational mode commands you use to monitor and troubleshoot interfaces.
<i>Routing Protocols and Policies Command Reference</i>	Describes the JUNOS software operational mode commands you use to monitor and troubleshoot routing policies and protocols, including firewall filters.
<i>System Basics and Services Command Reference</i>	Describes the JUNOS software operational mode commands you use to monitor and troubleshoot system basics, including commands for real-time monitoring and route (or path) tracing, system software management, and chassis management. Also describes commands for monitoring and troubleshooting services such as class of service (CoS), IP Security (IPsec), stateful firewalls, flow collection, and flow monitoring.
<i>System Log Messages Reference</i>	Describes how to access and interpret system log messages generated by JUNOS software modules and provides a reference page for each message.
J-Web User Guide	
<i>J-Web Interface User Guide</i>	Describes how to use the J-Web graphical user interface (GUI) to configure, monitor, and manage Juniper Networks routing platforms.
JUNOS API and Scripting Documentation	
<i>JUNOScript API Guide</i>	Describes how to use the JUNOScript application programming interface (API) to monitor and configure Juniper Networks routing platforms.
<i>JUNOS XML API Configuration Reference</i>	Provides reference pages for the configuration tag elements in the JUNOS XML API.

Table 3: Technical Documentation for Supported Routing Platforms (*continued*)

Book	Description
<i>JUNOS XML API Operational Reference</i>	Provides reference pages for the operational tag elements in the JUNOS XML API.
<i>NETCONF API Guide</i>	Describes how to use the NETCONF API to monitor and configure Juniper Networks routing platforms.
<i>JUNOS Configuration and Diagnostic Automation Guide</i>	Describes how to use the commit script and self-diagnosis features of the JUNOS software. This guide explains how to enforce custom configuration rules defined in scripts, how to use commit script macros to provide simplified aliases for frequently used configuration statements, and how to configure diagnostic event policies.
Hardware Documentation	
<i>Hardware Guide</i>	Describes how to install, maintain, and troubleshoot routing platforms and components. Each platform has its own hardware guide.
<i>PIC Guide</i>	Describes the routing platform's Physical Interface Cards (PICs). Each platform has its own PIC guide.
<i>DPC Guide</i>	Describes the Dense Port Concentrators (DPCs) for all MX-series routers.
JUNOScope Documentation	
<i>JUNOScope Software User Guide</i>	Describes the JUNOScope software graphical user interface (GUI), how to install and administer the software, and how to use the software to manage routing platform configuration files and monitor routing platform operations.
Advanced Insight Solutions (AIS) Documentation	
<i>Advanced Insight Solutions Guide</i>	Describes the Advanced Insight Manager (AIM) application, which provides a gateway between JUNOS devices and Juniper Support Systems (JSS) for case management and intelligence updates. Explains how to run AI-Scripts on Juniper Networks devices.
J-series Routing Platform Documentation	
<i>Getting Started Guide</i>	Provides an overview, basic instructions, and specifications for J-series routing platforms. The guide explains how to prepare your site for installation, unpack and install the router and its components, install licenses, and establish basic connectivity. Use the <i>Getting Started Guide</i> for your router model.
<i>Basic LAN and WAN Access Configuration Guide</i>	Explains how to configure the interfaces on J-series Services Routers for basic IP routing with standard routing protocols, ISDN backup, and digital subscriber line (DSL) connections.
<i>Advanced WAN Access Configuration Guide</i>	Explains how to configure J-series Services Routers in virtual private networks (VPNs) and multicast networks, configure data link switching (DLSw) services, and apply routing techniques such as policies, stateless and stateful firewall filters, IP Security (IPsec) tunnels, and class-of-service (CoS) classification for safer, more efficient routing.

Table 3: Technical Documentation for Supported Routing Platforms (*continued*)

Book	Description
<i>Administration Guide</i>	Shows how to manage users and operations, monitor network performance, upgrade software, and diagnose common problems on J-series Services Routers.
Release Notes	
<i>JUNOS Release Notes</i>	Summarize new features and known problems for a particular software release, provide corrections and updates to published JUNOS, JUNOScript, and NETCONF manuals, provide information that might have been omitted from the manuals, and describe upgrade and downgrade procedures.
<i>Hardware Release Notes</i>	Describe the available documentation for the routing platform and summarize known problems with the hardware and accompanying software. Each platform has its own release notes.
<i>JUNOScope Release Notes</i>	Contain corrections and updates to the published JUNOScope manual, provide information that might have been omitted from the manual, and describe upgrade and downgrade procedures.
<i>AIS Release Notes</i>	Summarize AIS new features and guidelines, identify known and resolved problems, provide information that might have been omitted from the manuals, and provide initial setup, upgrade, and downgrade procedures.
<i>AIS AI-Scripts Release Notes</i>	Summarize AI-Scripts new features, identify known and resolved problems, provide information that might have been omitted from the manuals, and provide instructions for automatic and manual installation, including deleting and rolling back.
<i>J-series Services Router Release Notes</i>	Briefly describe Services Router features, identify known hardware problems, and provide upgrade and downgrade instructions.

Table 4: JUNOS Software Network Operations Guides

Book	Description
<i>Baseline</i>	Describes the most basic tasks for running a network using Juniper Networks products. Tasks include upgrading and reinstalling JUNOS software, gathering basic system management information, verifying your network topology, and searching log messages.
<i>Interfaces</i>	Describes tasks for monitoring interfaces. Tasks include using loopback testing and locating alarms.
<i>MPLS</i>	Describes tasks for configuring, monitoring, and troubleshooting an example MPLS network. Tasks include verifying the correct configuration of the MPLS and RSVP protocols, displaying the status and statistics of MPLS running on all routing platforms in the network, and using the layered MPLS troubleshooting model to investigate problems with an MPLS network.

Table 4: JUNOS Software Network Operations Guides (*continued*)

Book	Description
<i>MPLS Log Reference</i>	Describes MPLS status and error messages that appear in the output of the <code>show mpls lsp extensive</code> command. The guide also describes how and when to configure Constrained Shortest Path First (CSPF) and RSVP trace options, and how to examine a CSPF or RSVP failure in a sample network.
<i>MPLS Fast Reroute</i>	Describes operational information helpful in monitoring and troubleshooting an MPLS network configured with fast reroute (FRR) and load balancing.
<i>Hardware</i>	Describes tasks for monitoring M-series and T-series routing platforms.

To configure and operate a J-series Services Router running JUNOS software with enhanced services, you must also use the configuration statements and operational mode commands documented in JUNOS configuration guides and command references. To configure and operate a WX Integrated Services Module, you must also use WX documentation.

Table 5: JUNOS Software with Enhanced Services Documentation

Book	Description
All Platforms	
<i>JUNOS Software Interfaces and Routing Configuration Guide</i>	Explains how to configure J-series interfaces for basic IP routing with standard routing protocols, ISDN service, firewall filters (access control lists), and class-of-service (CoS) traffic classification.
<i>JUNOS Software Security Configuration Guide</i>	Explains how to configure and manage security services such as stateful firewall policies, IP Security (IPsec) virtual private networks (VPNs), firewall screens, Network Address Translation (NAT), Public Key Cryptography, and Application Layer Gateways (ALGs).
<i>JUNOS Software Administration Guide</i>	Shows how to monitor J-series devices and routing operations, firewall and security services, system alarms and events, and network performance. This guide also shows how to administer user authentication and access, upgrade software, and diagnose common problems.
<i>JUNOS Software CLI Reference</i>	Provides the complete JUNOS software with enhanced services configuration hierarchy and describes the configuration statements and operational mode commands not documented in the standard JUNOS manuals.
J-series Only	
<i>JUNOS Software with Enhanced Services Design and Implementation Guide</i>	Provides guidelines and examples for designing and implementing IPsec VPNs, firewalls, and routing on J-series Services Routers running JUNOS software with enhanced services.

Table 5: JUNOS Software with Enhanced Services Documentation (continued)

Book	Description
<i>JUNOS Software with Enhanced Services Quick Start</i>	Explains how to quickly set up a J-series Services Router. This document contains router declarations of conformity.
<i>JUNOS Software with Enhanced Services J-series Services Router Hardware Guide</i>	Provides an overview, basic instructions, and specifications for J-series Services Routers. This guide explains how to prepare a site, unpack and install the router, replace router hardware, and establish basic router connectivity. This guide contains hardware descriptions and specifications.
<i>JUNOS Software with Enhanced Services Migration Guide</i>	Provides instructions for migrating an SSG device running ScreenOS software or a J-series Services Router running the JUNOS software to JUNOS software with enhanced services.
<i>WXC Integrated Services Module Installation and Configuration Guide</i>	Explains how to install and initially configure a WXC Integrated Services Module in a J-series Services Router for application acceleration.
<i>JUNOS Software with Enhanced Services for J-series Services Router Release Notes</i>	Summarizes new features and known problems for a particular release of JUNOS software with enhanced services on J-series Services Routers, including J-Web interface features and problems. The release notes also contain corrections and updates to the manuals and software upgrade and downgrade instructions for JUNOS software with enhanced services.

Table 6: Additional Books Available Through <http://www.juniper.net/books>

Book	Description
<i>Interdomain Multicast Routing</i>	Provides background and in-depth analysis of multicast routing using Protocol Independent Multicast sparse mode (PIM SM) and Multicast Source Discovery Protocol (MSDP); details any-source and source-specific multicast delivery models; explores multiprotocol BGP (MBGP) and multicast IS-IS; explains Internet Gateway Management Protocol (IGMP) versions 1, 2, and 3; lists packet formats for IGMP, PIM, and MSDP; and provides a complete glossary of multicast terms.
<i>JUNOS Cookbook</i>	Provides detailed examples of common JUNOS software configuration tasks, such as basic router configuration and file management, security and access control, logging, routing policy, firewalls, routing protocols, MPLS, and VPNs.
<i>MPLS-Enabled Applications</i>	Provides an overview of Multiprotocol Label Switching (MPLS) applications (such as Layer 3 virtual private networks [VPNs], Layer 2 VPNs, virtual private LAN service [VPLS], and pseudowires), explains how to apply MPLS, examines the scaling requirements of equipment at different points in the network, and covers the following topics: point-to-multipoint label switched paths (LSPs), DiffServ-aware traffic engineering, class of service, interdomain traffic engineering, path computation, route target filtering, multicast support for Layer 3 VPNs, and management and troubleshooting of MPLS networks.
<i>OSPF and IS-IS: Choosing an IGP for Large-Scale Networks</i>	Explores the full range of characteristics and capabilities for the two major link-state routing protocols: Open Shortest Path First (OSPF) and IS-IS. Explains architecture, packet types, and addressing; demonstrates how to improve scalability; shows how to design large-scale networks for maximum security and reliability; details protocol extensions for MPLS-based traffic engineering, IPv6, and multipoint-to-multipoint routing; and covers troubleshooting for OSPF and IS-IS networks.

Table 6: Additional Books Available Through <http://www.juniper.net/books> (continued)

Book	Description
<i>Routing Policy and Protocols for Multivendor IP Networks</i>	Provides a brief history of the Internet, explains IP addressing and routing (Routing Information Protocol [RIP], OSPF, IS-IS, and Border Gateway Protocol [BGP]), explores ISP peering and routing policies, and displays configurations for both Juniper Networks and other vendors' routers.
<i>The Complete IS-IS Protocol</i>	Provides the insight and practical solutions necessary to understand the IS-IS protocol and how it works by using a multivendor, real-world approach.

Documentation Feedback

We encourage you to provide feedback, comments, and suggestions so that we can improve the documentation. You can send your comments to techpubs-comments@juniper.net, or fill out the documentation feedback form at <https://www.juniper.net/cgi-bin/docbugreport/>. If you are using e-mail, be sure to include the following information with your comments:

- Document name
- Document part number
- Page number
- Software release version (not required for *Network Operations Guides [NOGs]*)

Requesting Technical Support

Technical product support is available through the Juniper Networks Technical Assistance Center (JTAC). If you are a customer with an active J-Care or JNASC support contract, or are covered under warranty, and need postsales technical support, you can access our tools and resources online or open a case with JTAC.

- JTAC policies—For a complete understanding of our JTAC procedures and policies, review the JTAC User Guide located at <http://www.juniper.net/customers/support/downloads/710059.pdf>.
- Product warranties—For product warranty information, visit <http://www.juniper.net/support/warranty/>.
- JTAC Hours of Operation —The JTAC centers have resources available 24 hours a day, 7 days a week, 365 days a year.

Self-Help Online Tools and Resources

For quick and easy problem resolution, Juniper Networks has designed an online self-service portal called the Customer Support Center (CSC) that provides you with the following features:

- Find CSC offerings: <http://www.juniper.net/customers/support/>
- Search for known bugs: <http://www2.juniper.net/kb/>

- Find product documentation: <http://www.juniper.net/techpubs/>
- Find solutions and answer questions using our Knowledge Base:
<http://kb.juniper.net/>
- Download the latest versions of software and review release notes:
<http://www.juniper.net/customers/csc/software/>
- Search technical bulletins for relevant hardware and software notifications:
<https://www.juniper.net/alerts/>
- Join and participate in the Juniper Networks Community Forum:
<http://www.juniper.net/company/communities/>
- Open a case online in the CSC Case Management tool: <http://www.juniper.net/cm/>

To verify service entitlement by product serial number, use our Serial Number Entitlement (SNE) Tool located at <https://tools.juniper.net/SerialNumberEntitlementSearch/>.

Opening a Case with JTAC

You can open a case with JTAC on the Web or by telephone.

- Use the Case Management tool in the CSC at <http://www.juniper.net/cm/> .
- Call 1-888-314-JTAC (1-888-314-5822 toll-free in the USA, Canada, and Mexico).

For international or direct-dial options in countries without toll-free numbers, visit us at <http://www.juniper.net/support/requesting-support.html>.

Part 1

Overview of Network Interfaces Configuration Statements

- Network Interfaces Configuration Statements and Hierarchy on page 3

Chapter 1

Network Interfaces Configuration Statements and Hierarchy

This chapter shows the complete configuration statement hierarchy, listing all possible configuration statements and showing their level in the configuration hierarchy. When you are configuring the JUNOS software, your current hierarchy level is shown in the banner on the line preceding the `user@host#` prompt.

This section contains the following topics:

- [edit chassis] Hierarchy Level on page 3
- [edit interfaces] Hierarchy Level on page 4
- [edit logical-systems] Hierarchy Level on page 18
- [edit protocols connections] Hierarchy Level on page 23
- [edit protocols dot1x] Hierarchy Level on page 24
- [edit protocols lacp] Hierarchy Level on page 24
- [edit protocols oam] Hierarchy Level on page 24
- [edit protocols ppp] Hierarchy Level on page 25
- [edit protocols vrrp] Hierarchy Level on page 26
- [edit system processes] Hierarchy Level on page 26

[edit chassis] Hierarchy Level

```
chassis {
  aggregated-devices {
    ethernet {
      device-count number;
    }
    sonet {
      device-count number;
    }
  }
  channel-group number {
    ethernet {
      device-count number;
    }
    fpc slot-number{
      pic pic-number {
```

```

aggregate-ports;
atm-cell-relay-accumulation;
atm-l2circuit-mode (aal5 | cell | trunk trunk);
ce1 {
    e1 link-number {
        channel-group group-number;
        timeslots time-slot-range;
    }
}
ct1 {
    t1 link-number {
        channel-group group-number;
        timeslots time-slot-range;
    }
}
ct3 {
    port port-number {
        t1 link-number {
            channel-group group-number;
            timeslots time-slot-range;
        }
    }
    framing sdh;
}
max-queues-per-interface number;
no-concatenate;
shdsl {
    pic-mode (1-port-atm | 2-port-atm);
}
vtmapping (klm | itu-t);
}
}
}

```

[edit interfaces] Hierarchy Level

The statements at the [edit interfaces *interface-name* unit *logical-unit-number*] hierarchy level can also be configured at the [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*] hierarchy level.



NOTE: The `accounting-profile` statement is an exception to this rule. The `accounting-profile` statement can be configured at the [edit interfaces *interface-name* unit *logical-unit-number*] hierarchy level, but it cannot be configured at the [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*] hierarchy level.

```

interfaces {
    traceoptions {
        file filename <files number> <size size> <world-readable | no-world-readable>
        <match regex>;
        flag flag <disable>;
    }
}

```

```

}
interface-name {
  accounting-profile name;
  aggregated-ether-options {
    (flow-control | no-flow-control);
    lacp {
      (active | passive);
      link-protection{
        disable;
        (revertive | non-revertive);
        periodic interval;
        system-priority priority;
      }
      link-protection;
      link-speed speed;
      (loopback | no-loopback);
      minimum-links number;
      source-address-filter {
        mac-address;
      }
      (source-filtering | no-source-filtering);
    }
  }
  aggregated-sonet-options {
    link-speed speed | mixed;
    minimum-links number;
  }
  atm-options {
    cell-bundle-size cells;
    ilmi;
    linear-red-profiles profile-name {
      high-plp-max-threshold percent;
      low-plp-max-threshold percent;
      queue-depth cells high-plp-threshold percent low-plp-threshold percent;
    }
    mpls {
      pop-all-labels {
        required-depth number;
      }
    }
  }
  pic-type (atm1 | atm2);
  plp-to-clp;
  promiscuous-mode {
    vpi vpi-identifier;
  }
  scheduler-maps map-name {
    forwarding-class class-name {
      epd-threshold cells plp1 cells;
      linear-red-profile profile-name;
      priority (high | low);
      transmit-weight (cells number | percent number);
    }
    vc-cos-mode (alternate | strict);
  }
  vpi vpi-identifier {
    maximum-vcs maximum-vcs;
    oam-liveness {

```

```

        down-count cells;
        up-count cells;
    }
    oam-period (seconds | disable);
    shaping {
        (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate
         sustained rate burst length);
        queue-length number;
    }
}
}
clocking clock-source;
data-input (system | interface interface-name);
dce;
serial-options {
    clock-rate rate;
    clocking-mode (dce | dte | loop);
    control-polarity (negative | positive);
    cts-polarity (negative | positive);
    dcd-polarity (negative | positive);
    dce-options {
        control-signal (assert | de-assert | normal);
        cts (ignore | normal | require);
        dcd (ignore | normal | require);
        dsr (ignore | normal | require);
        dtr signal-handling-option;
        ignore-all;
        indication (ignore | normal | require);
        rts (assert | de-assert | normal);
        tm (ignore | normal | require);
    }
    dsr-polarity (negative | positive);
    dte-options {
        control-signal (assert | de-assert | normal);
        cts (ignore | normal | require);
        dcd (ignore | normal | require);
        dsr (ignore | normal | require);
        dtr signal-handling-option;
        ignore-all;
        indication (ignore | normal | require);
        rts (assert | de-assert | normal);
        tm (ignore | normal | require);
    }
}
dtr-circuit (balanced | unbalanced);
dtr-polarity (negative | positive);
encoding (nrz | nrzi);
indication-polarity (negative | positive);
line-protocol protocol;
loopback mode;
rts-polarity (negative | positive);
tm-polarity (negative | positive);
transmit-clock invert;
}
description text;
dialer-options {
    pool pool-name <priority priority>;

```



```

}
disable;
ds0-options {
    bert-algorithm algorithm;
    bert-error-rate rate;
    bert-period seconds;
    byte-encoding (nx56 | nx64);
    fcs (16 | 32);
    idle-cycle-flag (flags | ones);
    invert-data;
    loopback payload;
    start-end-flag (filler | shared);
}
e1-options {
    bert-error-rate rate;
    bert-period seconds;
    fcs (16 | 32);
    framing (g704 | g704-no-crc4 | unframed);
    idle-cycle-flag (flags | ones);
    invert-data;
    loopback (local | remote);
    start-end-flag (filler | shared);
    timeslots time-slot-range;
}
e3-options {
    atm-encapsulation (direct | plcp);
    bert-algorithm algorithm;
    bert-error-rate rate;
    bert-period seconds;
    buildout feet;
    compatibility-mode (digital-link | kentrox | larscom) <subrate value>;
    fcs (16 | 32);
    framing (g.751 | g.832);
    idle-cycle-flag (filler | shared);
    invert-data;
    loopback (local | remote);
    (payload-scrambler | no-payload-scrambler);
    start-end-flag (filler | shared);
    (unframed | no-unframed);
}
encapsulation type;
es-options {
    backup-interface es-fpc/pic/port;
}
fastether-options {
    802.3ad aex;
    (flow-control | no-flow-control);
    ignore-l3-incompletes;
    ingress-rate-limit rate;
    (loopback | no-loopback);
    mpls {
        pop-all-labels {
            required-depth number;
        }
    }
}
source-address-filter {

```

```

    mac-address;
}
(source-filtering | no-source-filtering);
}
flexible-vlan-tagging;
gigether-options {
    802.3ad aex;
    (asynchronous-notification | no-asynchronous-notification);
    (auto-negotiation | no-auto-negotiation) remote-fault <local-interface-online |
        local-interface-offline>;
    auto-reconnect seconds;
    (flow-control | no-flow-control);
    ignore-l3-incompletes;
    (loopback | no-loopback);
    mpls {
        pop-all-labels {
            required-depth number;
        }
    }
    source-address-filter {
        mac-address;
    }
    (source-filtering | no-source-filtering);
    ethernet-switch-profile {
        (mac-learn-enable | no-mac-learn-enable);
        tag-protocol-id [ tpids ];
        ethernet-policer-profile {
            input-priority-map {
                ieee802.1p premium [ values ];
            }
            output-priority-map {
                classifier {
                    premium {
                        forwarding-class class-name {
                            loss-priority (high | low);
                        }
                    }
                }
            }
        }
        policer cos-policer-name {
            aggregate {
                bandwidth-limit bps;
                burst-size-limit bytes;
            }
            premium {
                bandwidth-limit bps;
                burst-size-limit bytes;
            }
        }
    }
}
}
(gratuitous-arp-reply | no-gratuitous-arp-reply);
hold-time up milliseconds down milliseconds;
interface-set interface-set-name {
    interface ethernet-interface-name {

```

```

        (unit unit-number | vlan-tags-outer vlan-tag);
    }
    interface interface-name {
        (unit unit-number);
    }
}
isdn-options {
    bchannel-allocation (ascending | descending);
    calling-number number;
    pool pool-name <priority priority>;
    spid1 spid-string;
    spid2 spid-string;
    static-tei-val value;
    switch-type (att5e | etsi | ni1 | ntdms100 | ntt);
    t310 seconds;
    tei-option (first-call | power-up);
}
keepalives <down-count number> <interval seconds> <up-count number>;
link-mode mode;
lmi {
    lmi-type (ansi | itu);
    n391dte number;
    n392dce number;
    n392dte number;
    n393dce number;
    n393dte number;
    t391dte seconds;
    t392dce seconds;
}
lsq-failure-options {
    no-termination-request;
    [ trigger-link-failure interface-name ];
}
mac mac-address;
mlfr-uni-nni-bundle-options {
    acknowledge-retries number;
    acknowledge-timer milliseconds;
    action-red-differential-delay (disable-tx | remove-link);
    drop-timeout milliseconds;
    fragment-threshold bytes;
    cisco-interoperability send-lip-remove-link-for-link-reject;
    hello-timer milliseconds;
    link-layer-overhead percent;
    lmi-type (ansi | itu);
    minimum-links number;
    mrru bytes;
    n391 number;
    n392 number;
    n393 number;
    red-differential-delay milliseconds;
    t391 seconds;
    t392 seconds;
    yellow-differential-delay milliseconds;
    encapsulation type;
}

```

```

modem-options {
    dialin (console | routable);
    init-command-string initialization-command-string;
}
mtu bytes;
multiservice-options {
    (core-dump | no-core-dump);
    (syslog | no-syslog);
}
native-vlan-id number;
no-gratuitous-arp-request;
no-keepalives;
no-partition {
    interface-type type;
}
optics-options {
    wavelength nm;
}
partition partition-number oc-slice oc-slice-range interface-type type;
timeslots time-slot-range;
passive-monitor-mode;
per-unit-scheduler;
ppp-options {
    chap {
        access-profile name;
        default-chap-secret name;
        local-name name;
        passive;
    }
    compression {
        acfc;
        pfc;
    }
    no-termination-request;
    pap {
        access-profile name;
        local-name name;
        local-password password;
        passive;
    }
}
receive-bucket {
    overflow (discard | tag);
    rate percentage;
    threshold bytes;
}
redundancy-options {
    primary sp-fpc/pic/port;
    secondary sp-fpc/pic/port;
}
schedulers number;
serial-options {
    clock-rate rate;
    clocking-mode (dce | dte | loop);
    control-polarity (negative | positive);
    cts-polarity (negative | positive);
}

```

```

dcd-polarity (negative | positive);
dce-options {
    control-signal (assert | de-assert | normal);
    cts (ignore | normal | require);
    dcd (ignore | normal | require);
    dsr (ignore | normal | require);
    dtr signal-handling-option;
    ignore-all;
    indication (ignore | normal | require);
    rts (assert | de-assert | normal);
    tm (ignore | normal | require);
}
dsr-polarity (negative | positive);
dte-options {
    control-signal (assert | de-assert | normal);
    cts (ignore | normal | require);
    dcd (ignore | normal | require);
    dsr (ignore | normal | require);
    dtr signal-handling-option;
    ignore-all;
    indication (ignore | normal | require);
    rts (assert | de-assert | normal);
    tm (ignore | normal | require);
}
dtr-circuit (balanced | unbalanced);
dtr-polarity (negative | positive);
encoding (nrz | nrzi);
indication-polarity (negative | positive);
line-protocol protocol;
loopback mode;
rts-polarity (negative | positive);
tm-polarity (negative | positive);
transmit-clock invert;
}
services-options {
    inactivity-timeout seconds;
    open-timeout seconds;
    syslog {
        host hostname {
            facility-override facility-name;
            log-prefix prefix-number;
            services priority-level;
        }
    }
}
shdsl-options {
    annex (annex-a | annex-b);
    line-rate line-rate;
    loopback (local | remote);
    snr-margin {
        current margin;
        snext margin;
    }
}
sonet-options {
    aggregate asx;

```

```

aps {
    advertise-interval milliseconds;
    authentication-key key;
    force;
    hold-time milliseconds;
    lockout;
    neighbor address;
    paired-group group-name;
    preserve-interface;
    protect-circuit group-name;
    request;
    revert-time seconds;
    switching-mode (bidirectional | unidirectional);
    working-circuit group-name;
}
bytes {
    c2 value;
    e1-quiet value;
    f1 value;
    f2 value;
    s1 value;
    z3 value;
    z4 value;
}
fcs (16 | 32);
loopback (local | remote);
mpls {
    pop-all-labels {
        required-depth number;
    }
}
path-trace trace-string;
(payload-scrambler | no-payload-scrambler);
rfc-2615;
trigger {
    defect ignore;
    hold-time up milliseconds down milliseconds;
}
vtmapping (itu-t | klm);
(z0-increment | no-z0-increment);
}
speed (10m | 100m | 1g | oc3 | oc12 | oc48);
stacked-vlan-tagging;
switch-options {
    switch-port port-number {
        (auto-negotiation | no-auto-negotiation);
        speed (10m | 100m | 1g);
        link-mode (full-duplex | half-duplex);
    }
}
}
t1-options {
    bert-algorithm algorithm;
    bert-error-rate rate;
    bert-period seconds;
    buildout value;
    byte-encoding (nx56 | nx64);
}

```

```

    crc-major-alarm-threshold (1e-3 | 5e-4 | 1e-4 | 5e-5 | 1e-5);
    crc-minor-alarm-threshold (1e-3 | 5e-4 | 1e-4 | 5e-5 | 1e-5 | 5e-6 | 1e-6);
    fcs (16 | 32);
    framing (esf | sf);
    idle-cycle-flag (flags | ones);
    invert-data;
    line-encoding (ami | b8zs);
    loopback (local | payload | remote);
    remote-loopback-respond;
    start-end-flag (filler | shared);
    timeslots time-slot-range;
}
t3-options {
    atm-encapsulation (direct | plcp);
    bert-algorithm algorithm;
    bert-error-rate rate;
    bert-period seconds;
    buildout feet;
    (cbit-parity | no-cbit-parity);
    compatibility-mode (adtran | digital-link | kentrox | larscom | verilink) <subrate
        value>;
    fcs (16 | 32);
    (feac-loop-respond | no-feac-loop-respond);
    idle-cycle-flag value;
    (long-buildout | no-long-buildout);
    (loop-timing | no-loop-timing);
    loopback (local | payload | remote);
    (mac | no-mac);
    (payload-scrambler | no-payload-scrambler);
    start-end-flag (filler | shared);
}
traceoptions {
    flag flag <flag-modifier> <disable>;
}
transmit-bucket {
    overflow discard;
    rate percentage;
    threshold bytes;
}
(traps | no-traps);
unidirectional;
vlan-tagging;
vlan-vci-tagging;
unit logical-unit-number {
    accept-source-mac {
        mac-address mac-address {
            policer {
                input cos-policer-name;
                output cos-policer-name;
            }
        }
    }
}
accounting-profile name;
allow-any-vci;
atm-scheduler-map (map-name | default);
backup-options {

```

```

    interface interface-name;
  }
  bandwidth rate;
  cell-bundle-size cells;
  clear-dont-fragment-bit;
  compression {
    rtp {
      f-max-period number;
      maximum-contexts number <force>;
      queues [ queue-numbers ];
      port {
        minimum port-number;
        maximum port-number;
      }
    }
  }
  compression-device interface-name;
  copy-tos-to-outer-ip-header;
  demux-destination family;
  demux-source family;
  demux-options {
    underlying-interface interface-name;
  }
  description text;
  dial-options {
    l2tp-interface-id name;
    (dedicated | shared);
  }
  dialer-options {
    activation-delay seconds;
    callback;
    callback-wait-period time;
    deactivation-delay seconds;
    dial-string [ dial-string-numbers ];
    idle-timeout seconds;
    incoming-map {
      caller caller-id) | accept-all;
      initial-route-check seconds;
      load-interval seconds;
      load-threshold percent;
      pool pool-name;
      redial-delay time;
      watch-list {
        [ routes ];
      }
    }
  }
  disable;
  disable-mlppp-inner-ppp-pfc;
  dlci dlci-identifier;
  drop-timeout milliseconds;
  dynamic-call-admission-control {
    activation-priority priority;
    bearer-bandwidth-limit kilobits-per-second;
  }
  encapsulation type;

```



```

epd-threshold cells plp1 cells;
fragment-threshold bytes;
inner-vlan-id-range start start-id end end-id;
input-vlan-map {
    (pop | pop-pop | pop-swap | push | push-push | swap | swap-push | swap-swap);
    inner-tag-protocol-id tpid;
    inner-vlan-id number;
    tag-protocol-id tpid;
    vlan-id number;
}
interleave-fragments;
inverse-arp;
layer2-policer {
    input-policer policer-name;
    input-three-color policer-name;
    output-policer policer-name;
    output-three-color policer-name;
}
link-layer-overhead percent;
minimum-links number;
mrru bytes;
multicast-dlci dlcid-identifier;
multicast-vci vpi-identifier.vci-identifier;
multilink-max-classes number;
multipoint;
oam-liveness {
    down-count cells;
    up-count cells;
}
oam-period (seconds | disable);
output-vlan-map {
    (pop | pop-pop | pop-swap | push | push-push | swap | swap-push | swap-swap);
    inner-tag-protocol-id tpid;
    inner-vlan-id number;
    tag-protocol-id tpid;
    vlan-id number;
}
passive-monitor-mode;
peer-unit unit-number;
plp-to-clp;
point-to-point;
ppp-options {
    chap {
        access-profile name;
        default-chap-secret name;
        local-name name;
        passive;
    }
    compression {
        acfc;
        pfc;
        pap;
        default-pap-password password;
        local-name name;
        local-password password;
        passive;
    }
}

```

```

    }
    lcp-restart-timer milliseconds;
    loopback-clear-timer seconds;
    ncp-restart-timer milliseconds;
  }
  pppoe-options {
    access-concentrator name;
    auto-reconnect seconds;
    (client | server);
    service-name name;
    underlying-interface interface-name;
  }
  proxy-arp;
  service-domain (inside | outside);
  shaping {
    (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained
      rate burst length);
    queue-length number;
  }
  short-sequence;
  transmit-weight number;
  (traps | no-traps);
  trunk-bandwidth rate;
  trunk-id number;
  tunnel {
    backup-destination address;
    destination address;
    key number;
    routing-instance {
      destination routing-instance-name;
    }
    source source-address;
    ttl number;
  }
  vci vpi-identifier.vci-identifier;
  vci-range start start-vci end end-vci;
  vpi vpi-identifier;
  vlan-id number;
  vlan-id-range number-number;
  vlan-tags inner tpid.vlan-id outer tpid.vlan-id;
  family family {
    accounting {
      destination-class-usage;
      source-class-usage {
        direction;
      }
    }
  }
  address address {
    destination address;
  }
  bundle ml-fpc-pic/port | ls-fpc-pic/port;
  filter {
    group filter-group-number;
    input filter-name;
    input-list {
      [ filter-names ];
    }
  }

```

```

        output filter-name;
    }
    output-list {
        [ filter-names ];
    }
}
ipsec-sa sa-name;
keep-address-and-control;
mtu bytes;
multicast-only;
negotiate-address;
no-redirects;
policer {
    arp policer-template-name;
    input policer-template-name;
    output policer-template-name;
}
primary;
proxy inet-address address;
receive-options-packets;
receive-ttl-exceeded;
remote (inet-address address | mac-address address);
rpf-check <fail-filter filter-name> {
    <mode loose>;
}
sampling {
    direction;
}
service {
    input {
        service-set service-set-name <service-filter filter-name>;
        post-service-filter filter-name;
    }
    output {
        service-set service-set-names <service-filter filter-name>;
    }
}
(translate-discard-eligible | no-translate-discard-eligible);
(translate-fecn-and-becn | no-translate-fecn-and-becn);
unnumbered-address interface-name <destination address destination-profile
    profile-name | preferred-source-address address>;
address address {
    arp ip-address (mac | multicast-mac) mac-address <publish>;
    broadcast address;
    destination address;
    destination-profile name;
    eui-64;
    multipoint-destination address (dlci dlci-identifier | vci vci-identifier);
    multipoint-destination address {
        epd-threshold cells plp1 cells;
        inverse-arp;
        oam-liveness {
            up-count cells;
            down-count cells;
        }
        oam-period (seconds | disable);
    }
}

```

```

shaping {
  (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate
    sustained rate burst length);
  queue-length number;
}
vci vpi-identifier.vci-identifier;
}
preferred;
primary;
(vrrp-group | vrrp-inet6-group) group-number {
  (accept-data | no-accept-data);
  advertise-interval seconds;
  authentication-type authentication;
  authentication-key key;
  fast-interval milliseconds;
  (preempt | no-preempt) {
    hold-time seconds;
  }
  priority-number number;
  track {
    priority-cost seconds;
    priority-hold-time interface-name {
      bandwidth-threshold bits-per-second {
        priority;
      }
      interface priority;
    }
    route ip-address/mask routing-instance instance-name priority-cost
      cost;
  }
  virtual-address [ addresses ];
}
}
}
}
}
}
}

```

[edit logical-systems] Hierarchy Level

The following lists the statements that can be configured at the [edit logical-systems] hierarchy level that are also documented in this manual. For more information about logical systems, see the *JUNOS Routing Protocols Configuration Guide*.

```

logical-systems logical-system-name {
  interfaces interface-name {
    unit logical-unit-number {
      accept-source-mac {
        mac-address mac-address {
          policer {
            input cos-policer-name;
            output cos-policer-name;
          }
        }
      }
    }
  }
}

```

```

allow-any-vci;
atm-scheduler-map (map-name | default);
bandwidth rate;
backup-options {
    interface interface-name;
}
cell-bundle-size cells;
clear-dont-fragment-bit;
compression {
    rtp {
        f-max-period number;
        port {
            minimum port-number;
            maximum port-number;
        }
        queues [ queue-numbers ];
    }
}
compression-device interface-name;
description text;
dial-options {
    l2tp-interface-id name;
    (dedicated | shared);
}
dialer-options {
    activation-delay seconds;
    deactivation-delay seconds;
    dial-string [ dial-string-numbers ];
    idle-timeout seconds;
    initial-route-check seconds;
    load-threshold number;
    pool pool;
    remote-name remote-callers;
    watch-list {
        [ routes ];
    }
}
disable;
dlci dlci-identifier;
drop-timeout milliseconds;
dynamic-call-admission-control {
    activation-priority priority;
    bearer-bandwidth-limit kilobits-per-second;
}
encapsulation type;
epd-threshold cells plp1 cells;
fragment-threshold bytes;
input-vlan-map {
    inner-tag-protocol-id;
    inner-vlan-id;
    (pop | pop-pop | pop-swap | push | push-push | swap | swap-push | swap-swap);
    tag-protocol-id tpid;
    vlan-id number;
}
interleave-fragments;
inverse-arp;

```

```

layer2-policer {
    input-policer policer-name;
    input-three-color policer-name;
    output-policer policer-name;
    output-three-color policer-name;
}
link-layer-overhead percent;
minimum-links number;
mrru bytes;
multicast-dlci dlci-identifier;
multicast-vci vpi-identifier.vci-identifier;
multilink-max-classes number;
multipoint;
oam-liveness {
    up-count cells;
    down-count cells;
}
oam-period (seconds | disable);
output-vlan-map {
    inner-tag-protocol-id;
    inner-vlan-id;
    (pop | pop-pop | pop-swap | push | push-push | swap | swap-swap);
    tag-protocol-id tpid;
    vlan-id number;
}
passive-monitor-mode;
peer-unit unit-number;
plp-to-clp;
point-to-point;
ppp-options {
    chap {
        access-profile name;
        default-chap-secret name;
        local-name name;
        passive;
    }
    compression {
        acfc;
        pfc;
    }
}
pap {
    default-pap-password password;
    local-name name;
    local-password password;
    passive;
}
}
proxy-arp;
service-domain (inside | outside);
shaping {
    (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained rate burst length);
    queue-length number;
}
short-sequence;

```

```

transmit-weight number;
(traps | no-traps);
trunk-bandwidth rate;
trunk-id number;
tunnel {
    backup-destination address;
    destination address;
    key number;
    routing-instance {
        destination routing-instance-name;
    }
    source source-address;
    ttl number;
}
vci vpi-identifier.vci-identifier;
vlan-id number;
vlan-tags inner tpid.vlan-id outer tpid.vlan-id;
vpi vpi-identifier;
family family {
    accounting {
        destination-class-usage;
        source-class-usage {
            direction;
        }
    }
}
bundle interface-name;
filter {
    group filter-group-number;
    input filter-name;
    input-list {
        [ filter-names ];
    }
    output filter-name;
    output-list {
        [ filter-names ];
    }
}
ipsec-sa sa-name;
keep-address-and-control;
llc2 {
    ack-delay-time time;
    ack-max count;
    idle-time time;
    local-window count;
    max-retry count;
    p-bit-timeout time;
    redundancy-group group-number {
        advertise-interval seconds;
        map {
            local-mac mac-address request mac-address;
        }
        preempt hold-time seconds;
        no-preempt;
        priority priority;
        track {
            dls {

```

```

        peer ip-address priority-cost priority;
        destination mac-address priority-cost priority;
    }
    interface interface-name priority-cost priority;
}
}
t1-time time;
t2-time time;
trej-time time;
}
mtu bytes;
multicast-only;
no-redirects;
policer {
    arp policer-template-name;
    input policer-template-name;
    output policer-template-name;
}
primary;
proxy inet-address address;
receive-options-packets;
receive-ttl-exceeded;
remote (inet-address address | mac-address address);
rpf-check <fail-filter filter-name> {
    <mode loose>;
}
sampling {
    direction;
}
service {
    input {
        service-set service-set-name <service-filter filter-name>;
        post-service-filter filter-name;
    }
    output {
        service-set service-set-name <service-filter filter-name>;
    }
}
(translate-discard-eligible | no-translate-discard-eligible);
(translate-fecn-and-becn | no-translate-fecn-and-becn);
unnumbered-address interface-name destination address destination-profile
profile-name;
address address {
    arp ip-address (mac | multicast-mac) mac-address <publish>;
    broadcast address;
    destination address;
    destination-profile name;
    eui-64;
    multipoint-destination address (dlci dlci-identifier | vci vci-identifier);
    multipoint-destination address {
        epd-threshold cells plp1 cells;
        inverse-arp;
        oam-liveness {
            up-count cells;
            down-count cells;
        }
    }
}

```



```

oam-period (seconds | disable);
shaping {
    (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate
    sustained rate burst length);
    queue-length number;
}
vci vpi-identifier.vci-identifier;
}
preferred;
primary;
(vrrp-group | vrrp-inet6-group) group-number {
    (accept-data | no-accept-data);
    advertise-interval seconds;
    authentication-type authentication;
    authentication-key key;
    fast-interval milliseconds;
    (preempt | no-preempt) {
        hold-time seconds;
    }
    priority-number number;
    track {
        priority-cost seconds;
        priority-hold-time interface-name {
            interface priority;
            bandwidth-threshold bits-per-second {
                priority;
            }
        }
        route ip-address/mask routing-instance instance-name priority-cost
        cost;
    }
}
virtual-address [ addresses ];
}
}
}
}
}
}
}

```

[edit protocols connections] Hierarchy Level

The following statements can also be configured at the [edit logical-systems *logical-system-name* protocols connections] hierarchy level.

```

interface-switch connection-name {
    interface interface-name.unit-number;
    interface interface-name.unit-number;
}

```

[edit protocols dot1x] Hierarchy Level

```

dot1x {
  authenticator
    authentication-profile-name access-profile-name;
    interface (IEEE 802.1x (dot1x)—Port-Based Network Access Control) interface-ids
    {
      maximum-requests integer;
      retries integer;
      quiet-period seconds;
      transmit-period seconds;
      reauthentication (disable | interval seconds);
      server-timeout seconds;
      supplicant (single);
      supplicant-timeoutseconds;
    }
  }
}

```

[edit protocols lacp] Hierarchy Level

```

traceoptions {
  file filename <files number> <size size> <world-readable | no-world-readable>;
  flag flag <disable>;
}

```

[edit protocols oam] Hierarchy Level

```

ethernet {
  connectivity-fault-management {
    action-profile profile-name {
      default-action {
        interface-down;
      }
    }
  }
  linktrace {
    age (30m | 10m | 1m | 30s | 10s);
    path-database-size path-database-size;
  }
  maintenance-domain domain-name {
    level number;
    name-format (character-string | none | dns | mac+2oct);
    short-name-format (character-string | vlan | 2octet | rfc-2685-vpn-id);
    continuity-check {
      hold-interval minutes;
      interval (10m | 10s | 1m | 1s| 100ms);
      loss-threshold number;
    }
    maintenance-association ma-name {
      mep mep-id {
        auto-discovery;
        direction (up | down);
      }
    }
  }
}

```

```

        interface interface-name;
        priority number;
        remote-mep mep-id {
            action-profile profile-name;
        }
    }
}
}
link-fault-management {
    action-profile profile-name {
        action {
            syslog;
            link-down;
            send-critical-event;
        }
        event {
            link-adjacency-loss;
            link-event-rate {
                frame-error count;
                frame-period count;
                frame-period-summary count;
                symbol-period count;
            }
            protocol-down;
        }
    }
}
interface interface-name {
    apply-action-profile profile-name;
    event-thresholds {
        frame-error count;
        frame-period count;
        frame-period-summary count;
        symbol-period count;
    }
    link-discovery (active | passive);
    negotiation-options {
        allow-remote-loopback;
        no-allow-link-events;
    }
    pdu-interval interval;
    pdu-threshold threshold-value;
    remote-loopback;
}
}
}

```

[edit protocols ppp] Hierarchy Level

```

monitor-session (interface-name | all);
traceoptions {
    flag flag <disable>;
    file filename <files number> <size size> <world-readable | no-world-readable>
    <match regex>;
    flag flag <disable>;
}

```

```
}
```

[edit protocols vrrp] Hierarchy Level

```
tracoptions {  
  file {  
    filename filename;  
    files number;  
    size size;  
    match regex;  
    microsecond-stamp;  
    (world-readable | no-world-readable);  
  }  
  flag flag;  
}
```

[edit system processes] Hierarchy Level

```
dialer-services {  
  disable;  
}  
isdn-signaling {  
  disable;  
  reject-incoming;  
}
```

Part 2

Router Interfaces Configuration Concepts

This part of the *Network Interfaces Configuration Guide* describes the various interface types and the processes used to configure them for typical usage.

- Router Interfaces Overview on page 29
- Configuring Physical Interface Properties on page 59
- Configuring Logical Interface Properties on page 133
- Configuring Protocol Family and Interface Address Properties on page 157
- Configuring Circuit and Translational Cross-Connects on page 203
- Tracing Interface Operations on page 221

Chapter 2

Router Interfaces Overview

Routers typically contain several different types of interfaces suited to various functions. For the interfaces on a routing platform to function, you must configure them, specifying properties such as the interface location (that is, the slot in which the Flexible PIC Concentrator [FPC] or Dense Port Concentrator [DPC] is installed, and the location where the Physical Interface Card [PIC] is installed), the interface type (such as SONET/SDH, Asynchronous Transfer Mode [ATM], or Ethernet), encapsulation, and interface-specific properties. You can configure the interfaces that are currently present in the routing platform, and you can also configure interfaces that are not currently present but that you might add in the future. When a configured interface appears, the JUNOS software detects its presence and applies the appropriate configuration to it.

To determine which interfaces are currently installed in the routing platform, issue the **show interfaces terse** operational mode command. If an interface is listed in the output, it is installed in the routing platform. If an interface is not listed in the output, it is not installed in the routing platform.

For information about which PICs are supported on your platform, see your platform's PIC guide.

You can configure JUNOS class-of-service (CoS) properties to provide a variety of classes of service for different applications, including multiple forwarding classes for managing packet transmission, congestion management, and CoS-based forwarding. For more information about configuring CoS properties, see the *JUNOS Class of Service Configuration Guide*.

This chapter discusses the following topics:

- Types of Interfaces on page 30
- Interface Encapsulations on page 35
- Interface Descriptors on page 46
- Interface Naming on page 47
- Displaying Interface Configurations on page 56
- Interface and Router Clock Sources on page 56

Types of Interfaces

Interfaces can be permanent or transient, and are used for networking or services:

- Permanent interfaces—Interfaces that are always present in the routing platform.
- Transient interfaces—Interfaces that can be inserted into or removed from the routing platform depending on your network configuration needs.
- Networking interfaces—Interfaces, such as Ethernet or SONET/SDH interfaces, that primarily provide traffic connectivity.
- Services interfaces—Interfaces that provide specific capabilities for manipulating traffic before it is delivered to its destination.
- Container interfaces—Interfaces that support APS on physical SONET links using a virtual container infrastructure.

Permanent Interfaces

Each routing platform uses multiple permanent interfaces as follows:

- Management Ethernet interface—For M-series, T-series, and MX-series routing platforms, the JUNOS software automatically creates the routing platform's management Ethernet interface, **fxp0**. The management Ethernet interface provides an out-of-band method for connecting to the routing platform. To use **fxp0** as a management port, you must configure its logical port, **fxp0.0**, with a valid IP address. You can connect to the management interface over the network using utilities such as ssh and telnet. Simple Network Management Protocol (SNMP) can use the management interface to gather statistics from the routing platform.
- For the J-series Services Routers, you can use any of the built-in Ethernet ports as a management interface. To use a built-in interface as a management Ethernet interface, configure it with a valid IP address. The factory configuration for the J4350 and J6350 Services Routers automatically enables the J-Web user interface on the **ge-0/0/0**, **ge-0/0/1**, **ge-0/0/2**, and **ge-0/0/3** interfaces. To manually configure J-Web access, include the **interface interface-name** statement at the **[edit system services web-management http]** hierarchy level. For information about establishing basic connectivity and configuring a management port, see the *Getting Started* guide for your router.
- Internal Ethernet interface—The JUNOS software creates the internal Ethernet interface **fxp1**. The internal Ethernet interface connects the Routing Engine **re0** (the portion of the routing platform running the JUNOS software) to the Packet Forwarding Engine. If the routing platform has redundant Routing Engines, another internal Ethernet interface, **fxp2**, is created on each Routing Engine (**re0** and **re1**) in order to support fault tolerance. Two physical links between **re0** and **re1** connect the independent control planes. If one of the links fails, both Routing Engines can use the other link for IP communication.

The JUNOS software boots the packet forwarding component hardware. When these components are running, the control board uses the internal Ethernet interface to transmit hardware status information to the JUNOS software. Information transmitted includes the internal routing platform temperature, the condition of the fans, whether

an FPC has been removed or inserted, and information from the craft interface on the LCD panel. The internal Ethernet interface is configured automatically when the JUNOS software boots.

Each routing platform also has two serial ports, labeled *console* and *auxiliary*, for connecting tty-type terminals to the routing platform using standard PC-type tty cables. Although these ports are not network interfaces, they do provide access to the routing platform.

Transient Interfaces

The M-series and T-series routing platforms contain slots for installing FPC boards, and each FPC can accommodate up to four PICs. The PICs provide the actual physical interfaces to the network. The MX-series routing platforms contain slots for installing DPC boards, and the DPC provides the physical interfaces to the network. These physical interfaces are transient interfaces of the routing platform. They are referred to as transient because you can hot-swap a DPC or FPC and its PICs at any time.

You can insert any FPC or DPC into any slot of the appropriate routing platform. You can generally place any combination of PICs in any location on an FPC. (You are limited by the total FPC bandwidth, and by the fact that some PICs physically require two or four of the PIC locations on the FPC.)

You must configure each of the transient interfaces based on the slot in which the FPC is installed, the location in which the PIC is installed, and for some PICs, the port to which you are connecting.

You can configure the interfaces on PICs that are already installed in the routing platform as well as interfaces on PICs that you plan to install later. The JUNOS software detects which interfaces are actually present, so when the software activates its configuration, it activates only present interfaces and retains the configuration information for the interfaces that are not present. When the JUNOS software detects that an FPC containing PICs has been inserted into the routing platform, the software activates the configuration for those interfaces.

Services Interfaces

Services interfaces enable you to incrementally add services to your network. The JUNOS software supports the following services PICs:

- Adaptive Services (AS) PICs—Allow you to provide multiple services on a single PIC by configuring a set of services and applications. The AS PICs offer a special range of services you configure in one or more service sets.
- ES PIC—Provides a security suite for the IP version 4 (IPv4) and IP version 6 (IPv6) network layers. The suite provides functionality such as authentication of origin, data integrity, confidentiality, replay protection, and nonrepudiation of source. It also defines mechanisms for key generation and exchange, management of security associations, and support for digital certificates.
- Monitoring Services PICs—Enable you to monitor traffic flow and export the monitored traffic. Monitoring traffic allows you to gather and export detailed information about IPv4 traffic flows between source and destination nodes in your network; sample all incoming IPv4 traffic on the monitoring interface and

present the data in cflowd record format; perform discard accounting on an incoming traffic flow; encrypt or tunnel outgoing cflowd records, intercepted IPv4 traffic, or both; and direct filtered traffic to different packet analyzers and present the data in its original format. On a Monitoring Services II PIC, you can configure either monitoring interfaces or collector interfaces. A collector interface allows you to combine multiple cflowd records into a compressed ASCII data file and export the file to an FTP server.

- Multilink Services, MultiServices, Link Services, and Voice Services PICs—Enable you to split, recombine, and sequence datagrams across multiple logical data links. The goal of multilink operation is to coordinate multiple independent links between a fixed pair of systems, providing a virtual link with greater bandwidth than any of the members.
- Tunnel Services PIC—By encapsulating arbitrary packets inside a transport protocol, tunneling provides a private, secure path through an otherwise public network. Tunnels connect discontinuous subnetworks and enable encryption interfaces, virtual private networks (VPNs), and Multiprotocol Label Switching (MPLS).
- On M-series and T-series routing platforms, logical tunnel interfaces allow you to connect logical systems, virtual routers, or VPN instances. For more information about VPNs, see the *JUNOS VPNs Configuration Guide*. For more information about configuring tunnels, see the *JUNOS Services Interfaces Configuration Guide*.
- Services (J-series)—On J-series Services Routers, the *lt* interface is an internal interface only and is not associated with a physical medium or PIM. You can configure the logical tunnel interface to provide class-of-service (CoS) support for data link switching (DLSw) traffic and real-time performance monitoring (RPM) probe packets. For more information, see the *J-series Services Router Basic LAN and WAN Access Configuration Guide*.



NOTE: The *lt* interface on the J-series Services Router does not support logical systems.

Container Interfaces

Container interfaces provide the following features:

- APS on SONET links are supported using container infrastructure.
- Container physical interfaces and logical interfaces remain up on switchover.
- APS parameters are auto-copied from the container interface to the member links.

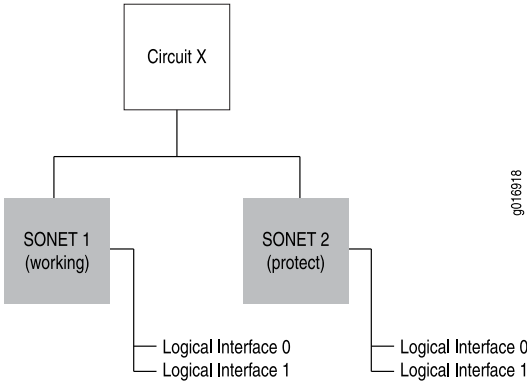


NOTE: Paired groups and true unidirectional APS are not currently supported.

Traditional APS Concept

Traditional APS is configured on two independent physical SONET interfaces: one configured as the working circuit and the other as the protect circuit (see Figure 1 on page 33). The circuit, named Circuit X in the figure, is the link between the two SONET interfaces.

Figure 1: APS Interface

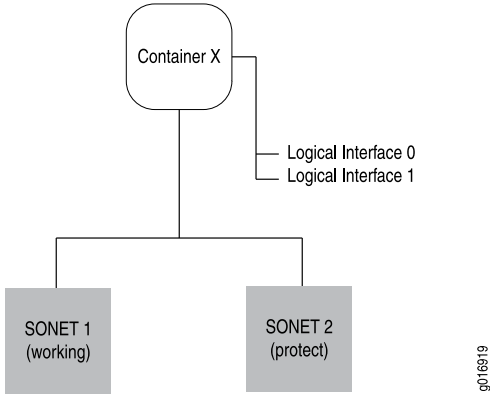


Traditional APS uses routing protocols that run on each individual SONET interface (since circuit is an abstract construct, instead of being an actual interface). When the working link goes down, the APS infrastructure brings up the protect link and its underlying logical interfaces, and brings down the working link and its underlying logical interfaces, causing the routing protocols to reconverge. This consumes time and leads to traffic loss even though the APS infrastructure has performed the switch quickly.

Container Interfaces Concept

To solve this problem, the JUNOS software provides a soft interface construct called a container interface (see Figure 2 on page 33).

Figure 2: Container Interface



The container interface allows routing protocols to run on the logical interfaces associated with a virtual *container interface* instead of on the physical SONET interfaces. When APS switches the underlying physical link based on a fault condition, the container interface remains up, and the logical interface on the container interface does not flap. The routing protocols remain unaware of the APS switching.

APS Support for Container-Based Interfaces

With the container interface, APS is configured on the container interface itself. Individual member SONET links are either marked as primary (corresponding to the working circuit) or standby (corresponding to the protect circuit) in the configuration. No circuit or group name is specified in the container interface model; physical SONET links are put in an APS group by linking them to a single container interface. APS parameters are specified at the container interface level, and are propagated to the individual SONET links by the APS daemon.

Autocopy of APS Parameters

Typical applications require copying APS parameters from the working circuit to the protect circuit, since most of the parameters must be the same for both circuits. This is automatically done in the container interface. APS parameters are specified only once under the container physical interface configuration, and are internally copied over to the individual physical SONET links.

For more information, see “Configuring Container Interfaces” on page 697.

Interface Encapsulations

Table 7 on page 35 lists encapsulation support by interface type.

Table 7: Encapsulation Support by Interface Type

Interface Type	Physical Interface Encapsulation	Logical Interface Encapsulation
ae—Aggregated Ethernet interface	ethernet-ccc—Ethernet cross-connect	dix—Ethernet DIXv2 (RFC 894)
	extended-vlan-ccc—Nonstandard TPID tagging for a cross-connect	vlan-ccc—802.1Q tagging for a cross-connect
	extended-vlan-vpls—Extended VLAN virtual private LAN service	
	vlan-ccc—802.1Q tagging for a cross-connect	
	ethernet-vpls—Ethernet virtual private LAN service	
	vlan-vpls—VLAN virtual private LAN service	
as—Aggregated SONET/SDH interface	cisco-hdlc—Cisco-compatible HDLC framing	NA
	ppp—Serial PPP device	
at—ATM1 interface	atm-ccc-cell-relay—ATM cell relay encapsulation for a cross-connect	atm-ccc-cell-relay—ATM cell relay for CCC
	atm-pvc—ATM permanent virtual circuits	atm-ccc-vc-mux—ATM VC for CCC
	ethernet-over-atm—Ethernet over ATM encapsulation	atm-cisco-nlpid—Cisco-compatible ATM NLPID encapsulation
		atm-nlpid—ATM NLPID encapsulation
		atm-snap—ATM LLC/SNAP encapsulation
		atm-tcc-snap—ATM LLC/SNAP for a translational cross-connect
		atm-tcc-vc-mux—ATM VC for a translational cross-connect
		atm-vc-mux—ATM VC multiplexing
		ether-over-atm-llc—Ethernet over ATM (LLC/SNAP) encapsulation

Table 7: Encapsulation Support by Interface Type *(continued)*

Interface Type	Physical Interface Encapsulation	Logical Interface Encapsulation
at—ATM2 intelligent queuing (IQ) interface	atm-ccc-cell-relay—ATM cell relay encapsulation for a cross-connect	atm-ccc-cell-relay—ATM cell relay for CCC
		atm-ccc-vc-mux—ATM VC for CCC
	atm-pvc—ATM permanent virtual circuits	
	ethernet-over-atm—Ethernet over ATM encapsulation	atm-cisco-nlpid—Cisco-compatible ATM NLPID encapsulation
		atm-mlppp-llc—ATM MLPPP over AAL5/LLC
		atm-nlpid—ATM NLPID encapsulation
		atm-ppp-llc—ATM PPP over AAL5/LLC
		atm-ppp-vc-mux—ATM PPP over raw AAL5
		atm-snap—ATM LLC/SNAP encapsulation
		atm-tcc-snap—ATM LLC/SNAP for a translational cross-connect
br—Integrated Services Digital Network (ISDN) interface	NA	atm-tcc-vc-mux—ATM VC for a translational cross-connect
		atm-vc-mux—ATM VC multiplexing
		ether-over-atm-llc—Ethernet over ATM (LLC/SNAP) encapsulation
ci—Container Interface		ether-vpls-over-atm-llc—Ethernet VPLS over ATM (bridging) encapsulation
	cisco-hdlc—Cisco-compatible HDLC framing	
	ppp—Serial PPP device	aps—SONET interface required for APS configuration.

Table 7: Encapsulation Support by Interface Type *(continued)*

Interface Type	Physical Interface Encapsulation	Logical Interface Encapsulation
ds—DS0 interface	cisco-hdlc—Cisco-compatible HDLC framing	frame-relay-ccc—Frame Relay DLCI for CCC
	cisco-hdlc-ccc—Cisco-compatible HDLC framing for a cross-connect	frame-relay-ppp—PPP over Frame Relay
	cisco-hdlc-tcc—Cisco-compatible HDLC framing for a translational cross-connect	frame-relay-tcc—Frame Relay DLCI for a translational cross-connect
	extended-frame-relay-ccc—Any Frame Relay DLCI for cross-connect	
	extended-frame-relay-tcc—Any Frame Relay DLCI for translational cross-connect	
	flexible-frame-relay—Multiple Frame Relay encapsulations	
	frame-relay—Frame Relay encapsulation	
	frame-relay-ccc—Frame Relay for a cross-connect	
	frame-relay-port-ccc—Frame Relay port encapsulation for a cross-connect	
	frame-relay-tcc—Frame Relay for a translational cross-connect	
	multilink-frame-relay-uni-nni—Multilink Frame Relay UNI NNI (FRF.16) encapsulation	
	ppp—Serial PPP device	
	ppp-ccc—Serial PPP device for a cross-connect	
	ppp-tcc—Serial PPP device for a translational cross-connect	
dsc—Discard interface	NA	NA

Table 7: Encapsulation Support by Interface Type (*continued*)

Interface Type	Physical Interface Encapsulation	Logical Interface Encapsulation
e1—E1 interface (including channelized STM1-to-E1 interfaces)	cisco-hdlc—Cisco-compatible HDLC framing	frame-relay-ccc—Frame Relay DLCI for CCC
	cisco-hdlc-ccc—Cisco-compatible HDLC framing for a cross-connect	frame-relay-ppp—PPP over Frame Relay
	cisco-hdlc-tcc—Cisco-compatible HDLC framing for a translational cross-connect	frame-relay-tcc—Frame Relay DLCI for a translational cross-connect
	extended-frame-relay-ccc—Any Frame Relay DLCI for a cross-connect	
	extended-frame-relay-tcc—Any Frame Relay DLCI for a translational cross-connect	
	flexible-frame-relay—Multiple Frame Relay encapsulations	
	frame-relay—Frame Relay encapsulation	
	frame-relay-ccc—Frame Relay for a cross-connect	
	frame-relay-port-ccc—Frame Relay port encapsulation for a cross-connect	
	frame-relay-tcc—Frame Relay for a translational cross-connect	
	multilink-frame-relay-uni-nni—Multilink Frame Relay UNI NNI (FRF.16) encapsulation	
	ppp—Serial PPP device	
	ppp-ccc—Serial PPP device for a cross-connect	
	ppp-tcc—Serial PPP device for a translational cross-connect	

Table 7: Encapsulation Support by Interface Type *(continued)*

Interface Type	Physical Interface Encapsulation	Logical Interface Encapsulation
e3—E3 interface (including E3 IQ and IQE interfaces)	cisco-hdlc—Cisco-compatible HDLC framing	frame-relay-ccc—Frame Relay DLCI for CCC
	cisco-hdlc-ccc—Cisco-compatible HDLC framing for a cross-connect	frame-relay-ppp—PPP over Frame Relay
	cisco-hdlc-tcc—Cisco-compatible HDLC framing for a translational cross-connect	frame-relay-tcc—Frame Relay DLCI for a translational cross-connect
	extended-frame-relay-ccc—Any Frame Relay DLCI for a cross-connect	
	extended-frame-relay-tcc—Any Frame Relay DLCI for a translational cross-connect	
	flexible-frame-relay—Multiple Frame Relay encapsulations	
	frame-relay—Frame Relay encapsulation	
	frame-relay-ccc—Frame Relay for a cross-connect	
	frame-relay-port-ccc—Frame Relay port encapsulation for a cross-connect	
	frame-relay-tcc—Frame Relay for a translational cross-connect	
	ppp—Serial PPP device	
	ppp-ccc—Serial PPP device for a cross-connect	
	ppp-tcc—Serial PPP device for a translational cross-connect	

Table 7: Encapsulation Support by Interface Type *(continued)*

Interface Type	Physical Interface Encapsulation	Logical Interface Encapsulation
fe—Fast Ethernet interface	ethernet-ccc—Ethernet cross-connect	dix—Ethernet DIXv2 (RFC 894)
	ethernet-tcc—Ethernet translational cross-connect	vlan-ccc—802.1Q tagging for a cross-connect
	ethernet-vpls—Ethernet virtual private LAN service	vlan-vpls—VLAN virtual private LAN service
	extended-vlan-ccc—Nonstandard TPID tagging for a cross-connect	
	extended-vlan-tcc—802.1Q tagging for a translational cross-connect	
	extended-vlan-vpls—Extended VLAN virtual private LAN service	
	vlan-ccc—802.1Q tagging for a cross-connect	
	vlan-vpls—VLAN virtual private LAN service	
fxp—Management and internal Ethernet interfaces	NA	NA
ge—Gigabit Ethernet interface (including Gigabit Ethernet IQ interfaces)	ethernet-ccc—Ethernet cross-connect	dix—Ethernet DIXv2 (RFC 894)
	ethernet-tcc—Ethernet translational cross-connect	vlan-ccc—802.1Q tagging for a cross-connect
	ethernet-vpls—Ethernet virtual private LAN service	vlan-tcc—802.1Q tagging for a translational cross-connect
	extended-vlan-ccc—Nonstandard TPID tagging for a cross-connect	vlan-vpls—VLAN virtual private LAN service
	extended-vlan-tcc—802.1Q tagging for a translational cross-connect	
	extended-vlan-vpls—Extended VLAN virtual private LAN service	
	flexible-ethernet-services—Allows per-unit Ethernet encapsulation configuration	
	vlan-ccc—802.1Q tagging for a cross-connect	
	vlan-vpls—VLAN virtual private LAN service	
lo—Loopback interface; the JUNOS software automatically configures one loopback interface (lo0)	NA	NA

Table 7: Encapsulation Support by Interface Type (*continued*)

Interface Type	Physical Interface Encapsulation	Logical Interface Encapsulation
ls—Link services interface	multilink-frame-relay-uni-nni—Multilink Frame Relay UNI NNI (FRF.16) encapsulation	multilink-frame-relay-end-to-end—Multilink Frame Relay end-to-end (FRF.15) multilink-ppp—Multilink PPP
lsq—Link services IQ interface	multilink-frame-relay-uni-nni—Multilink Frame Relay UNI NNI (FRF.16) encapsulation	multilink-frame-relay-end-to-end—Multilink Frame Relay end-to-end (FRF.15) multilink-ppp—Multilink PPP
lt—Logical tunnel interface	NA	ethernet—Ethernet service ethernet-vpls—Ethernet virtual private LAN service ethernet-ccc—Ethernet cross-connect frame-relay—Frame Relay encapsulation frame-relay-ccc—Frame Relay for a cross-connect vlan—VLAN service vlan-ccc—802.1Q tagging for a cross-connect vlan-vpls—VLAN virtual private LAN service
ml—Multilink interface (including Multilink Frame Relay and MLPPP)	NA	multilink-frame-relay-end-to-end—Multilink Frame Relay end-to-end (FRF.15) multilink-ppp—Multilink PPP

Table 7: Encapsulation Support by Interface Type *(continued)*

Interface Type	Physical Interface Encapsulation	Logical Interface Encapsulation
se—Serial interface (including EIA-530, V.35, and X.21 interfaces)	cisco-hdlc—Cisco-compatible HDLC framing	frame-relay-ccc—Frame Relay DLCI for CCC
	cisco-hdlc-ccc—Cisco-compatible HDLC framing for a cross-connect	frame-relay-ppp—PPP over Frame Relay
	cisco-hdlc-tcc—Cisco-compatible HDLC framing for a translational cross-connect	frame-relay-tcc—Frame Relay DLCI for a translational cross-connect
	frame-relay—Frame Relay encapsulation	
	frame-relay-ccc—Frame Relay for a cross-connect	
	frame-relay-port-ccc—Frame Relay port encapsulation for a cross-connect	
	frame-relay-tcc—Frame Relay for a translational cross-connect	
	ppp—Serial PPP device	
	ppp-ccc—Serial PPP device for a cross-connect	
	ppp-tcc—Serial PPP device for a translational cross-connect	

Table 7: Encapsulation Support by Interface Type (*continued*)

Interface Type	Physical Interface Encapsulation	Logical Interface Encapsulation
so—SONET/SDH interface	cisco-hdlc—Cisco-compatible HDLC framing	frame-relay-ccc—Frame Relay DLCI for CCC
	cisco-hdlc-ccc—Cisco-compatible HDLC framing for a cross-connect	frame-relay-ppp—PPP over Frame Relay
	cisco-hdlc-tcc—Cisco-compatible HDLC framing for a translational cross-connect	frame-relay-tcc—Frame Relay DLCI for a translational cross-connect
	extended-frame-relay-ccc—Any Frame Relay DLCI for a cross-connect	
	extended-frame-relay-tcc—Any Frame Relay DLCI for a translational cross-connect	
	flexible-frame-relay—Multiple Frame Relay encapsulations	
	frame-relay—Frame Relay encapsulation	
	frame-relay-ccc—Frame Relay for a cross-connect	
	frame-relay-port-ccc—Frame Relay port encapsulation for a cross-connect	
	frame-relay-tcc—Frame Relay for a translational cross-connect	
	ppp—Serial PPP device	
	ppp-ccc—Serial PPP device for a cross-connect	
	ppp-tcc—Serial PPP device for a translational cross-connect	

Table 7: Encapsulation Support by Interface Type (*continued*)

Interface Type	Physical Interface Encapsulation	Logical Interface Encapsulation
t1—T1 interface (including channelized DS3-to-DS1 interfaces)	cisco-hdlc—Cisco-compatible HDLC framing	frame-relay-ccc—Frame Relay DLCI for CCC
	cisco-hdlc-ccc—Cisco-compatible HDLC framing for a cross-connect	frame-relay-ppp—PPP over Frame Relay
	cisco-hdlc-tcc—Cisco-compatible HDLC framing for a translational cross-connect	frame-relay-tcc—Frame Relay DLCI for a translational cross-connect
	extended-frame-relay-ccc—Any Frame Relay DLCI for a cross-connect	
	extended-frame-relay-tcc—Any Frame Relay DLCI for a translational cross-connect	
	flexible-frame-relay—Multiple Frame Relay encapsulations	
	frame-relay—Frame Relay encapsulation	
	frame-relay-ccc—Frame Relay for a cross-connect	
	frame-relay-port-ccc—Frame Relay port encapsulation for a cross-connect	
	frame-relay-tcc—Frame Relay for a translational cross-connect	
	multilink-frame-relay-uni-nni—Multilink Frame Relay UNI NNI (FRF.16) encapsulation	
	ppp—Serial PPP device	
	ppp-ccc—Serial PPP device for a cross-connect	
	ppp-tcc—Serial PPP device for a translational cross-connect	

Table 7: Encapsulation Support by Interface Type (*continued*)

Interface Type	Physical Interface Encapsulation	Logical Interface Encapsulation
t3—T3 interface (including channelized OC12-to-DS3 interfaces)	cisco-hdlc—Cisco-compatible HDLC framing	frame-relay-ccc—Frame Relay DLCI for CCC
	cisco-hdlc-ccc—Cisco-compatible HDLC framing for a cross-connect	frame-relay-ppp—PPP over Frame Relay
	cisco-hdlc-tcc—Cisco-compatible HDLC framing for a translational cross-connect	frame-relay-tcc—Frame Relay DLCI for a translational cross-connect
	extended-frame-relay-ccc—Any Frame Relay DLCI for a cross-connect	
	extended-frame-relay-tcc—Any Frame Relay DLCI for a translational cross-connect	
	flexible-frame-relay—Multiple Frame Relay encapsulations	
	frame-relay—Frame Relay encapsulation	
	frame-relay-ccc—Frame Relay for a cross-connect	
	frame-relay-port-ccc—Frame Relay port encapsulation for a cross-connect	
	frame-relay-tcc—Frame Relay for a translational cross-connect	
	ppp—Serial PPP device	
	ppp-ccc—Serial PPP device for a cross-connect	
	ppp-tcc—Serial PPP device for a translational cross-connect	
Controller-level channelized IQ interfaces (cau4, coc1, coc3, coc12, cstm1, ct1, ct3, ce1)	NA	NA
Services interfaces (cp, gr, ip, mo, vt, es, mo, rsp, sp)	NA	NA
Unconfigurable, internally generated interfaces (gre, ipip, learning-chip (lc), lsi, tap, mt, mtun, pd, pe, pimd, pime)	NA	NA

Interface Descriptors

When you configure an interface, you are effectively specifying the properties for a physical interface descriptor. In most cases, the physical interface descriptor corresponds to a single physical device and consists of the following parts:

- The interface name, which defines the media type
- The slot in which the FPC or DPC is located
- The location on the FPC in which the PIC is installed
- The PIC or DPC port
- The interface's channel and logical unit numbers (optional)

Each physical interface descriptor can contain one or more logical interface descriptors. These allow you to map one or more logical (or virtual) interfaces to a single physical device. Creating multiple logical interfaces is useful for ATM, Frame Relay, and Gigabit Ethernet networks, in which you can associate multiple virtual circuits, data-link connections, or virtual LANs (VLANs) with a single interface device.

Each logical interface descriptor can have one or more family descriptors to define the protocol family that is associated with and allowed to run over the logical interface.

The following protocol families are supported:

- Internet Protocol version 4 (IPv4) suite (inet)
- Internet Protocol version 6 (IPv6) suite (inet6)
- Circuit cross-connect (CCC)
- Translational cross-connect (TCC)
- International Organization for Standardization (ISO)
- Multilink Frame Relay end-to-end (MLFR end-to-end)
- Multilink Frame Relay user-to-network interface network-to-network interface (MLFR UNI NNI)
- Multilink Point-to-Point Protocol (MLPPP)
- Multiprotocol Label Switching (MPLS)
- Trivial Network Protocol (TNP)
- (M-series, T-series, and MX-series routing platforms only) Virtual private LAN service (VPLS)

Finally, each family descriptor can have one or more address entries, which associate a network address with a logical interface and hence with the physical interface.

You configure the various interface descriptors as follows:

- You configure the physical interface descriptor by including the **interfaces** *interface-name* statement.
- You configure the logical interface descriptor by including the **unit** statement within the **interfaces** *interface-name* statement or by including the *.logical*

descriptor at the end of the interface name, as in **t3-0/0/0.1**, where the logical unit number is 1, as shown in the following examples:

```
[edit]
user@host# set interfaces t3-0/0/0 unit 1
[edit]
user@host# edit interfaces t3-0/0/0.1
[edit interfaces t3-0/0/0]
user@host# set unit 1
```

- You configure the family descriptor by including the **family** statement within the **unit** statement.
- You configure address entries by including the **address** statement within the **family** statement.
- You configure tunnels by including the **tunnel** statement within the **unit** statement.

Interface Naming

Each interface has an interface name, which specifies the media type, the slot in which the FPC or DPC is located, the location on the FPC where the PIC is installed, and the PIC or DPC port. The interface name uniquely identifies an individual network connector in the system. You use the interface name when configuring interfaces and when enabling various functions and properties, such as routing protocols, on individual interfaces. The system uses the interface name when displaying information about the interface, for example, in the **show interfaces** command.

The interface name is represented by a physical part, a channel part, and a logical part in the following format:

physical<:channel>.logical

The channel part of the name is optional for all interfaces except channelized DS3, E1, OC12, and STM1 interfaces.

The following sections provide interface naming configuration guidelines:

- Physical Part of an Interface Name on page 47
- Logical Part of an Interface Name on page 51
- Separators in an Interface Name on page 51
- Channel Part of an Interface Name on page 51
- Interface Naming for a Routing Matrix on page 52
- Chassis Interface Naming on page 54
- Examples: Interface Naming on page 55

Physical Part of an Interface Name

The physical part of an interface name identifies the physical device, which corresponds to a single physical network connector. This part of the interface name has the following format:

type-fpc/pic/port

type is the media type, which identifies the network device. It can be one of the following:

- **ae**—Aggregated Ethernet interface. This is a virtual aggregated link and has a different naming format from most PICs; for more information, see “Configuring Aggregated Ethernet Interfaces” on page 535.
- **as**—Aggregated SONET/SDH interface. This is a virtual aggregated link and has a different naming format from most PICs; for more information, see “Configuring Aggregated SONET/SDH Interfaces” on page 716.
- **at**—ATM1 or ATM2 intelligent queuing (IQ) interface.
- **br**—Integrated Services Digital Network (ISDN) interface (configured on a 1-port or 4-port Basic Rate Interface (BRI) card). This interface has a different naming format from most PICs: **br-pim/0/port**. The second number is always 0. For more information, see “Configuring ISDN Physical Interface Properties” on page 659.
- **cau4**—Channelized AU-4 IQ interface (configured on the Channelized STM1 IQ or IQE PIC or Channelized OC12 IQ and IQE PICs).
- **ce1**—Channelized E1 IQ interface (configured on the Channelized E1 IQ PIC or Channelized STM1 IQ or IQE PIC).
- **ci**—Container interface
- **coc1**—Channelized OC1 IQ interface (configured on the Channelized OC12 IQ and IQE or Channelized OC3 IQ and IQE PICs).
- **coc3**—Channelized OC3 IQ interface (configured on the Channelized OC3 IQ and IQE PICs).
- **coc12**—Channelized OC12 IQ interface (configured on the Channelized OC12 IQ and IQE PICs).
- **cp**—Collector interface (configured on the Monitoring Services II PIC).
- **cstm1**—Channelized STM1 IQ interface (configured on the Channelized STM1 IQ or IQE PIC).
- **cstm4**—Channelized STM4 IQ interface (configured on the Channelized OC12 IQ and IQE PICs).
- **ct1**—Channelized T1 IQ interface (configured on the Channelized DS3 IQ and IQE PICs, Channelized OC3 IQ and IQE PICs, Channelized OC12 IQ and IQE PICs, or Channelized T1 IQ PIC).
- **ct3**—Channelized T3 IQ interface (configured on the Channelized DS3 IQ and IQE PICs, Channelized OC3 IQ and IQE PICs, or Channelized OC12 IQ and IQE PICs).
- **demux**—Interface that supports logical IP interfaces that use the IP source or destination address to demultiplex received packets. Only one demux interface (**demux0**) exists per chassis. All demux logical interfaces must be associated with an underlying logical interface.
- **dfc**—Interface that supports dynamic flow capture processing on T-series or M320 routing platform containing one or more Monitoring Services III PICs. Dynamic flow capture enables you to capture packet flows on the basis of

dynamic filtering criteria. Specifically, you can use this feature to forward passively monitored packet flows that match a particular filter list to one or more destinations using an on-demand control protocol.

- **ds**—DS0 interface (configured on the Multichannel DS3 PIC, Channelized E1 PIC, Channelized OC3 IQ and IQE PICs, Channelized OC12 IQ and IQE PICs, Channelized DS3 IQ and IQE PICs, Channelized E1 IQ PIC, Channelized STM1 IQ or IQE PIC, or Channelized T1 IQ).
- **dsc**—Discard interface.
- **e1**—E1 interface (including channelized STM1-to-E1 interfaces).
- **e3**—E3 interface (including E3 IQ interfaces).
- **es**—Encryption interface.
- **fe**—Fast Ethernet interface.
- **fxp**—Management and internal Ethernet interfaces. The JUNOS software automatically configures the routing platform's management Ethernet interface, **fxp0**, which is an out-of-band management interface, and the internal Ethernet interface, **fxp1**, which connects the Routing Engine with the routing platform's packet forwarding components. If the routing platform has redundant Routing Engines, another internal Ethernet interface, **fxp2**, is created on each Routing Engine (**re0** and **re1**) in order to support fault tolerance. Two physical links between **re0** and **re1** connect the independent control planes. If one of the links fails, both Routing Engines can use the other link for IP communication.
- **ge**—Gigabit Ethernet interface. Some older 10-Gigabit Ethernet interfaces use the **ge** media type to identify the physical part of the network device, but newer 10-Gigabit Ethernet interfaces use the **xe** media type.
- **gr**—Generic routing encapsulation (GRE) tunnel interface.
- **gre**—Internally generated interface that is configurable only as the control channel for Generalized MPLS (GMPLS). For more information about GMPLS, see the *JUNOS MPLS Applications Configuration Guide* and the *JUNOS Feature Guide*.
- **ip**—IP-over-IP encapsulation tunnel interface.
- **ipip**—Internally generated interface that is not configurable.
- **lc**—Internally generated interface that is not configurable.
- **lo**—Loopback interface. The JUNOS software automatically configures one loopback interface (**lo0**). The logical interface **lo0.16383** is a nonconfigurable interface for routing platform control traffic.
- **ls**—Link services interface.
- **lsi**—Internally generated interface that is not configurable.
- **ml**—Multilink interface (including Multilink Frame Relay and MLPPP).
- **mo**—Monitoring services interface (including monitoring services and monitoring services II). The logical interface **mo-fpc/pic/port.16383** is an internally generated, nonconfigurable interface for routing platform control traffic.
- **mt**—Multicast tunnel interface (internal routing platform interface for VPNs). If your routing platform has a Tunnel PIC, the JUNOS software automatically configures one multicast tunnel interface (**mt**) for each virtual private network

(VPN) you configure. Although it is not necessary to configure multicast interfaces, you can use the **multicast-only** statement to configure the unit and family so that the tunnel can transmit and receive multicast traffic only. For more information, see **multicast-only**.

- **mtun**—Internally generated interface that is not configurable.
- **oc3**—OC3 IQ interface (configured on the Channelized OC12 IQ and IQE PICw or Channelized OC3 IQ and IQE PICs).
- **pd**—Interface on the rendezvous point (RP) that de-encapsulates packets.
- **pe**—Interface on the first-hop RP that encapsulates packets destined for the RP routing platform.
- **pimd**—Internally generated interface that is not configurable.
- **pime**—Internally generated interface that is not configurable.
- **rsp**—Redundant interface for the adaptive services interface.
- **se**—Serial interface (including EIA-530, V.35, and X.21 interfaces).
- **so**—SONET/SDH interface.
- **sp**—Adaptive services interface. The logical interface **sp-fpc/pic/port.16383** is an internally generated, nonconfigurable interface for routing platform control traffic.
- **t1**—T1 interface (including channelized DS3-to-DS1 interfaces).
- **t3**—T3 interface (including channelized OC12-to-DS3 interfaces).
- **tap**—Internally generated interface that is not configurable.
- **umd**—USB modem interface.
- **vsp**—Voice services interface.
- **vc4**—Virtually concatenated interface.
- **vt**—Virtual loopback tunnel interface.
- **xe**—10-Gigabit Ethernet interface. Some older 10-Gigabit Ethernet interfaces use the **ge** media type (rather than **xe**) to identify the physical part of the network device.

fpc identifies the number of the FPC or DPC card on which the physical interface is located. Specifically, it is the number of the slot in which the card is installed.

M40, M40e, M160, M320, M120, T320, and T640 platforms each have eight FPC slots that are numbered 0 through 7, from left to right as you are facing the front of the chassis.

The M20 routing platform has four FPC slots that are numbered 0 through 3, from top to bottom as you are facing the front of the chassis. The slot number is printed adjacent to each slot. The MX-series routing platforms do not use FPCs. The DPC combines the functions of four FPCs and the PICs.

The MX960 router has 12 DPC slots. The MX480 router has seven DPC slots. The MX240 router has four DPC slots. Each DPC has either 40 Gigabit Ethernet ports or

4 10-Gigabit Ethernet ports. M5, M7i, M10, and M10i routing platforms do not use FPCs; you install the PICs individually.

The M5 and M7i routing platforms have space for up to four PICs. The M7i routing platform also comes with an integrated Tunnel PIC or an optional integrated AS PIC.

The M10 and M10i routing platforms have space for up to eight PICs.

A routing matrix can have up to 32 FPCs (numbered 0 through 31).

For more information about interface naming for a routing matrix, see “Interface Naming for a Routing Matrix” on page 52.

pic identifies the number of the PIC on which the physical interface is located. Specifically, it is the number of the PIC location on the FPC. The four PIC slots are numbered 0 through 3. The PIC location is printed on the FPC carrier board. For PICs that occupy more than one PIC location, use the lower location number.

port identifies a specific port on a PIC or DPC. The number of ports varies depending on the PIC. The port slot numbers are printed on the PIC.

Logical Part of an Interface Name

The logical unit part of the interface name corresponds to the logical unit number, which can be a number from 0 through 16384.

Separators in an Interface Name

There is a separator between each element of an interface name.

In the physical part of the name, a hyphen (-) separates the media type from the FPC number, and a slash (/) separates the FPC, PIC, and port numbers.

In the virtual part of the name, a period (.) separates the channel and logical unit numbers.

A colon (:) separates the physical and virtual parts of the interface name.

Channel Part of an Interface Name

The channel identifier part of the interface name is required only on channelized interfaces. For channelized interfaces, channel 0 identifies the first channelized interface. For channelized IQ and channelized IQE interfaces, channel 1 identifies the first channelized interface. A nonconcatenated (that is, channelized) SONET/SDH OC48 interface has four OC12 channels, numbered 0 through 3.

To determine which types of channelized PICs are currently installed in the routing platform, use the **show chassis hardware** command from the top level of the command-line interface (CLI). Channelized IQ and IQE PICs are listed in the output with “intelligent queuing IQ” or “enhanced intelligent queuing IQE” in the description. For more information, see “Configuring Channelized Interfaces” on page 361.

For ISDN interfaces, you specify the B-channel in the form `bc-pim/0/port:n`. *n* is the B-channel ID and can be 1 or 2. You specify the D-channel in the form `dc-pim/0/port:0`.



NOTE: For ISDN, the B- and D-channel interfaces do not have any configurable parameters. However, when interface statistics are displayed, B- and D-channel interfaces have statistical values.



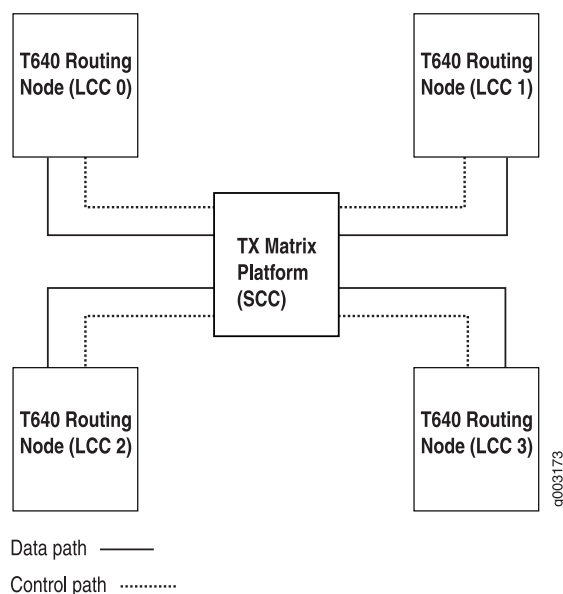
NOTE: In the JUNOS software implementation, the term *logical interfaces* generally refers to interfaces you configure by including the `unit` statement at the `[edit interfaces interface-name]` hierarchy level. Logical interfaces have the *.logical* descriptor at the end of the interface name, as in `ge-0/0/0.1` or `t1-0/0/0.0.1`, where the logical unit number is 1.

Although channelized interfaces are generally thought of as logical or virtual, the JUNOS software sees T3, T1, and NxDS0 interfaces within a channelized IQ or IQE PIC as physical interfaces. For example, both `t3-0/0/0` and `t3-0/0/0.1` are treated as physical interfaces by the JUNOS software. In contrast, `t3-0/0/0.2` and `t3-0/0/0.1.2` are considered logical interfaces because they have the *.2* at the end of the interface names.

Interface Naming for a Routing Matrix

A routing matrix is a multichassis architecture composed of one TX Matrix platform, to which you can connect from one to four T640 routing nodes, as shown in Figure 3 on page 52.

Figure 3: Routing Matrix



A TX Matrix platform is also referred to as a *switch-card chassis* (SCC). The CLI uses **scc** to refer to the TX Matrix platform. A T640 routing node in a routing matrix is also referred to as a *line-card chassis* (LCC). The CLI uses **lcc** as a prefix to refer to a specific T640 routing node.

LCCs are assigned numbers, 0 through 3, depending on the hardware setup and connectivity to the TX Matrix platform. For more information, see the *TX Matrix Platform Hardware Guide*. A routing matrix can have up to four T640 routing nodes, and each T640 routing node has up to eight FPCs. Therefore, the routing matrix as a whole can have up to 32 FPCs (0 through 31).

In the JUNOS CLI, an interface name has the following format:

type-fpc/pic/port

When you specify the **fpc** number, the JUNOS software determines which T640 routing node contains the specified FPC based on the following assignment:

- On LCC 0, FPC hardware slots 0 through 7 are configured as 0 through 7.
- On LCC 1, FPC hardware slots 0 through 7 are configured as 8 through 15.
- On LCC 2, FPC hardware slots 0 through 7 are configured as 16 through 23.
- On LCC 3, FPC hardware slots 0 through 7 are configured as 24 through 31.

For example, the **1** in **se-1/0/0** refers to FPC hardware slot 1 on the T640 routing node labeled **lcc0**. The **11** in **t1-11/2/0** refers to FPC hardware slot 3 on the T640 routing node labeled **lcc1**. The **20** in **so-20/0/1** refers to FPC hardware slot 4 on the T640 routing node labeled **lcc2**. The **31** in **t3-31/1/0** refers to FPC hardware slot 7 on the T640 routing node labeled **lcc3**.

Table 8 on page 53 summarizes the FPC numbering for a routing matrix.

Table 8: FPC Numbering for T640 Routing Nodes in a Routing Matrix

LCC Numbers Assigned to the T640 Routing Nodes	Configuration Numbers
0	0 through 7
1	8 through 15
2	16 through 23
3	24 through 31

Table 9 on page 54 lists each FPC hardware slot and the corresponding configuration numbers for LCCs 0 through 3.

Table 9: One-to-One FPC Numbering for T640 Routing Nodes in a Routing Matrix

FPC Numbering	T640 Routing Nodes							
LCC 0								
Hardware Slots	0	1	2	3	4	5	6	7
Configuration Numbers	0	1	2	3	4	5	6	7
LCC 1								
Hardware Slots	0	1	2	3	4	5	6	7
Configuration Numbers	8	9	10	11	12	13	14	15
LCC 2								
Hardware Slots	0	1	2	3	4	5	6	7
Configuration Numbers	16	17	18	19	20	21	22	23
LCC 3								
Hardware Slots	0	1	2	3	4	5	6	7
Configuration Numbers	24	25	26	27	28	29	30	31

Chassis Interface Naming

You configure some PIC properties, such as framing, at the `[edit chassis]` hierarchy level. Chassis interface naming varies depending on the routing hardware. For standalone routing platforms, you must specify the FPC and PIC numbers.

For routing matrixes, you must specify the LCC, FPC, and PIC numbers, as follows:

- Standalone routing platform interface naming:

```
[edit chassis]
fpc slot-number {
  pic pic-number {
    ...
  }
}
```

- Routing matrix interface naming:

```
[edit chassis]
lcc lcc-number {
  fpc slot-number { # Use the hardware FPC slot number
    pic pic-number {
      ...
    }
  }
}
```

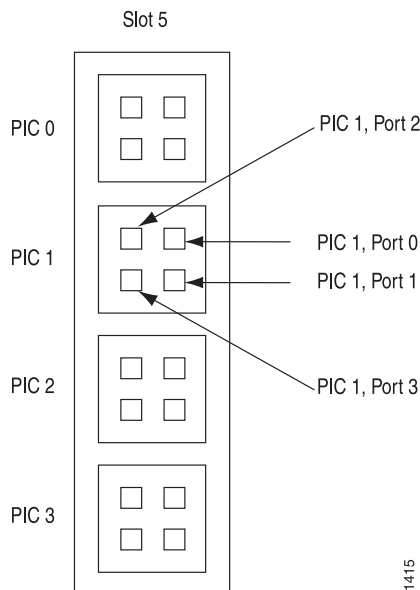

For the FPC slot number, specify the actual hardware slot number, as labeled on the T640 routing node chassis. Do not use the corresponding software FPC number shown in Table 9 on page 54.

For more information about the [edit chassis] hierarchy, see the *JUNOS System Basics Configuration Guide*.

Examples: Interface Naming

This section provides examples of naming interfaces. For an illustration of where slots, PICs, and ports are located, see Figure 4 on page 55.

Figure 4: Interface Slot, PIC, and Port Locations



For an FPC in slot 1 with two OC3 SONET/SDH PICs in PIC positions 0 and 1, each PIC with two ports uses the following names:

```
so-1/0/0.0
so-1/0/1.0
so-1/1/0.0
so-1/1/1.0
```

An OC48 SONET/SDH FPC in slot 1 and in concatenated mode appears as a single FPC with a single PIC, which has a single port. If this interface has a single logical unit, it has the following name:

```
so-1/0/0.0
```

An OC48 SONET/SDH FPC in slot 1 and in channelized mode has a number for each channel. For example:

```
so-1/0/0:0
so-1/0/0:1
```

For an FPC in slot 1 with a Channelized OC12 PIC in PIC position 2, the DS3 channels have the following names:

```
t3-1/2/0:0
t3-1/2/0:1
t3-1/2/0:2
...
t3-1/2/0:11
```

For an FPC in slot 1 with four OC12 ATM PICs (the FPC is fully populated), the four PICs, each with a single port and a single logical unit, have the following names:

```
at-1/0/0.0
at-1/1/0.0
at-1/2/0.0
at-1/3/0.0
```

In a routing matrix on the T640 routing node labeled `lcc1`, for an FPC in slot 5 with four SONET OC192 PICs, the four PICs, each with a single port and a single logical unit, have the following names:

```
so-13/0/0.0
so-13/1/0.0
so-13/2/0.0
so-13/3/0.0
```

For an FPC in slot 1 with one 4-port BRI interface card, port 4 has the following name:

```
br-1/0/4
```

The first B channel, the second B channel, and the control channel have the following names:

```
bc-1/0/4:1
bc-1/0/4:2
dc-1/0/4:0
```

Displaying Interface Configurations

To display a configuration, use either the **show** command in configuration mode or the **show configuration** top-level command. Interfaces are listed in numerical order, from lowest to highest slot number, then from lowest to highest PIC number, and finally from lowest to highest port number.

Interface and Router Clock Sources

When configuring the routing platform, you can configure the *transmit clock* on each interface; the transmit clock aligns each outgoing packet transmitted over the routing platform's interfaces. For both the routing platform and interfaces, the clock source can be the routing platform's internal Stratum 3 clock, which resides on the control board, or an external clock that is received from the interface you are configuring. For example, interface A can transmit on interface A's received clock (external, loop

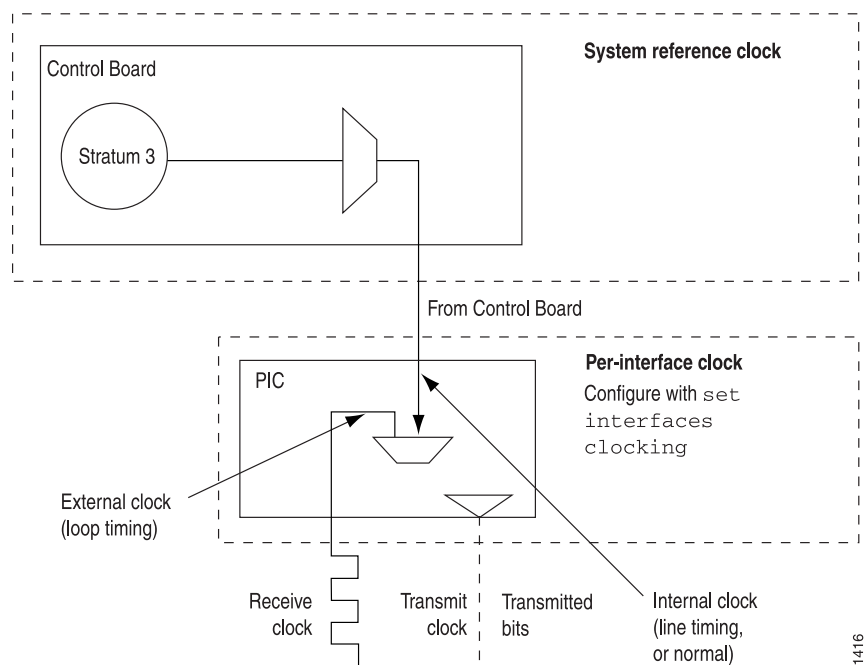
timing) or the Stratum 3 clock (internal, line timing). Interface A cannot use a clock from any other source.

By default, each interface uses the routing platform's internal Stratum 3 clock. To configure the clock source of each interface, include the **clocking** statement at the **[edit interfaces *interface-name*]** hierarchy level:

```
[edit interfaces interface-name]  
  clocking (internal | external);
```

Figure 5 on page 57 illustrates the different clock sources.

Figure 5: Clock Sources



Configuring an External Synchronization Interface

The M-series 320 routing platform supports an external synchronization interface that can be configured to synchronize the internal Stratum 3 clock to an external source, and then synchronize the chassis interface clock to the external source.

This feature can be configured for external primary and secondary interfaces that use Building Integrated Timing System (BITS) or SDH Equipment Timing Source (SETS) timing sources. When internal timing is set for SONET/SDH, Plesiochronous Digital Hierarchy (PDH), and digital hierarchy (DS1) interfaces on the Physical Interface Cards (PICs), the transmit clock of the interface is synchronized to BITS/SETS timing and traceable to timing within the network.

To configure external synchronization on the M-series 320 router, include the **synchronization** statement at the **[edit chassis]** hierarchy level.

For more information about the external synchronization interface, see the *JUNOS System Basics Configuration Guide*.

Chapter 3

Configuring Physical Interface Properties

The software driver for each network media type sets reasonable default values for general interface properties, such as the interface's maximum transmission unit (MTU) size, receive and transmit leaky bucket properties, link operational mode, and clock source.

This chapter discusses configuration of the following physical interface properties:

- Physical Interface Configuration Statements on page 60
- Physical Interfaces Properties Statements List on page 69
- Specifying an Aggregated Interface on page 84
- Specifying a USB Modem Interface on J-series Routers on page 85
- Specifying OC768-over-OC192 Mode on page 87
- Adding an Interface Description to the Configuration on page 88
- Configuring the Link Characteristics on page 89
- Configuring the Media MTU on page 89
- Configuring Interface Encapsulation on page 98
- Configuring the PPP Challenge Handshake Authentication Protocol on page 103
- Configuring the PPP Password Authentication Protocol on page 106
- Monitoring a PPP Session on page 110
- Tracing Operations of the pppd Process on page 110
- Configuring PPP Address and Control Field Compression on page 111
- Configuring the PPP Protocol Field Compression on page 113
- Configuring the Interface Speed on page 114
- Configuring Keepalives on page 118
- Configuring the Clock Source on page 119
- Configuring the Router as a DCE on page 120
- Configuring Receive and Transmit Leaky Bucket Properties on page 120
- Configuring Accounting for the Physical Interface on page 121
- Interface Diagnostics on page 122
- Tracing Operations of an Individual Router Interface on page 128
- Damping Interface Transitions on page 128

- Configuring Multiservice Physical Interface Properties on page 129
- Enabling or Disabling SNMP Notifications on Physical Interfaces on page 129
- Enabling Unidirectional Traffic Flow on Physical Interfaces on page 129
- Disabling a Physical Interface on page 130

Physical Interface Configuration Statements

M-series, MX-series, T-series, and J-series routers are factory configured according to the specific router, its features, and its physical interfaces. This section includes a default configuration example showing the statements used to configure the physical interfaces properties. Additional statements are used to set properties for specific interface types and are described in “Physical Interfaces Properties Statements List” on page 69.

To modify any of the default general interface properties, include the appropriate statements at the [edit interfaces interface-name] hierarchy level:

```

interfaces {
  traceoptions {
    file filename <files number> <size size> <world-readable | no-world-readable>
      <match regex>;
    flag flag <disable>;
  }
  interface-name {
    accounting-profile name;
    aggregated-ether-options {
      (flow-control | no-flow-control);
      lACP {
        (active | passive);
        link-protection {
          disable;
        }
        (revertive | non-revertive);
        periodic interval;
        system-priority priority;
      }
      link-protection;
      link-speed speed;
      (loopback | no-loopback);
      minimum-links number;
      source-address-filter {
        mac-address
      }
      (source-filtering | no-source-filtering);
    }
    aggregated-sonet-options {
      link-speed speed | mixed;
      minimum-links number;
    }
    atm-options {
      cell-bundle-size cells;
      ilmi;
      linear-red-profiles profile-name {
        high-plp-max-threshold percent;
      }
    }
  }
}

```

```

    low-plp-max-threshold percent;
    queue-depth cells high-plp-threshold percent low-plp-threshold percent;
}
mpls {
    pop-all-labels {
        required-depth number;
    }
}
pic-type (atm1 | atm2);
plp-to-clp;
promiscuous-mode {
    vpi vpi-identifier;
}
scheduler-maps map-name {
    forwarding-class class-name {
        epd-threshold cells plp1 cells;
        linear-red-profile profile-name;
        priority (high | low);
        transmit-weight (cells number | percent number);
    }
    vc-cos-mode (alternate | strict);
}
vpi vpi-identifier {
    maximum-vcs maximum-vcs;
    oam-liveness {
        up-count cells;
        down-count cells;
    }
    oam-period (seconds | disable);
    shaping {
        (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate
        sustained rate burst length);
        queue-length number;
    }
}
}
clocking clock-source;
data-input (system | interface interface-name);
dce;
serial-options {
    clock-rate rate;
    clocking-mode (dce | dte | loop);
    control-polarity (negative | positive);
    cts-polarity (negative | positive);
    dcd-polarity (negative | positive);
    dce-options {
        control-signal (assert | de-assert | normal);
        cts (ignore | normal | require);
        dcd (ignore | normal | require);
        dsr (ignore | normal | require);
        dtr signal-handling-option;
        ignore-all;
        indication (ignore | normal | require);
        rts (assert | de-assert | normal);
        tm (ignore | normal | require);
    }
}

```

```

dsr-polarity (negative | positive);
dte-options {
    control-signal (assert | de-assert | normal);
    cts (ignore | normal | require);
    dcd (ignore | normal | require);
    dsr (ignore | normal | require);
    dtr signal-handling-option;
    ignore-all;
    indication (ignore | normal | require);
    rts (assert | de-assert | normal);
    tm (ignore | normal | require);
}
dtr-circuit (balanced | unbalanced);
dtr-polarity (negative | positive);
encoding (nrz | nrzi);
indication-polarity (negative | positive);
line-protocol protocol;
loopback mode;
rts-polarity (negative | positive);
tm-polarity (negative | positive);
transmit-clock invert;
}
description text;
dialer-options {
    pool pool-name <priority priority>;
}
disable;
ds0-options {
    bert-algorithm algorithm;
    bert-error-rate rate;
    bert-period seconds;
    byte-encoding (nx56 | nx64);
    fcs (16 | 32);
    idle-cycle-flag (flags | ones);
    invert-data;
    loopback payload;
    start-end-flag (filler | shared);
}
e1-options {
    bert-error-rate rate;
    bert-period seconds;
    fcs (16 | 32);
    framing (g704 | g704-no-crc4 | unframed);
    idle-cycle-flag (flags | ones);
    invert-data;
    loopback (local | remote);
    start-end-flag (filler | shared);
    timeslots time-slot-range;
}
e3-options {
    atm-encapsulation (direct | plcp);
    bert-algorithm algorithm;
    bert-error-rate rate;
    bert-period seconds;
    buildout feet;
    compatibility-mode (digital-link | kentrox | larscom) <subrate value>;

```



```

fcs (16 | 32);
framing (g.751 | g.832);
idle-cycle-flag (filler | shared);
invert-data;
loopback (local | remote);
(payload-scrambler | no-payload-scrambler);
start-end-flag (filler | shared);
(unframed | no-unframed);
}
encapsulation type;
es-options {
    backup-interface es-fpc/pic/port;
}
fastether-options {
    802.3ad aex;
    (flow-control | no-flow-control);
    ignore-l3-incompletes;
    ingress-rate-limit rate;
    (loopback | no-loopback);
    mpls {
        pop-all-labels {
            required-depth number;
        }
    }
    source-address-filter {
        mac-address;
    }
    (source-filtering | no-source-filtering);
}
flexible-vlan-tagging;
gigether-options {
    802.3ad aex;
    (asynchronous-notification | no-asynchronous-notification);
    (auto-negotiation | no-auto-negotiation) remote-fault <local-interface-online |
        local-interface-offline>;
    auto-reconnect seconds;
    (flow-control | no-flow-control);
    ignore-l3-incompletes;
    (loopback | no-loopback);
    mpls {
        pop-all-labels {
            required-depth number;
        }
    }
    source-address-filter {
        mac-address;
    }
    (source-filtering | no-source-filtering);
    ethernet-switch-profile {
        (mac-learn-enable | no-mac-learn-enable);
        tag-protocol-id [ tpids ];
        ethernet-policer-profile {
            input-priority-map {
                ieee802.1p premium [ values ];
            }
            output-priority-map {

```

```

        classifier {
            premium {
                forwarding-class class-name {
                    loss-priority (high | low);
                }
            }
        }
    }
    policer cos-policer-name {
        aggregate {
            bandwidth-limit bps;
            burst-size-limit bytes;
        }
        premium {
            bandwidth-limit bps;
            burst-size-limit bytes;
        }
    }
}
(gratuitous-arp-reply | no-gratuitous-arp-reply);
hold-time up milliseconds down milliseconds;
interface-set interface-set-name {
    interface ethernet-interface-name {
        (unit unit-number | vlan-tags-outer vlan-tag);
    }
}
}
isdn-options {
    bchannel-allocation (ascending | descending);
    calling-number number;
    pool pool-name <priority priority>;
    spid1 spid-string;
    spid2 spid-string;
    static-tei-val value;
    switch-type (att5e | etsi | ni1 | ntdms100 | ntt);
    t310 seconds;
    tei-option (first-call | power-up);
}
keepalives <down-count number> <interval seconds> <up-count number>;
link-mode mode;
lmi {
    lmi-type (ansi | itu);
    n391dte number;
    n392dce number;
    n392dte number;
    n393dce number;
    n393dte number;
    t391dte seconds;
    t392dce seconds;
}
lsq-failure-options {
    no-termination-request;
    [ trigger-link-failure interface-name ];
}
}
mac mac-address;

```

```

mlfr-uni-nni-bundle-options {
    acknowledge-retries number;
    acknowledge-timer milliseconds;
    action-red-differential-delay (disable-tx | remove-link);
    cisco-interoperability send-lip-remove-link-for-link-reject;
    drop-timeout milliseconds;
    fragment-threshold bytes;
    hello-timer milliseconds;
    link-layer-overhead percent;
    lmi-type (ansi | itu);
    minimum-links number;
    mrru bytes;
    n391 number;
    n392 number;
    n393 number;
    red-differential-delay milliseconds;
    t391 seconds;
    t392 seconds;
    yellow-differential-delay milliseconds;
    encapsulation type;
}
modem-options {
    dialin (console | routable);
    init-command-string initialization-command-string;
}
mtu bytes;
multiservice-options {
    (core-dump | no-core-dump);
    (syslog | no-syslog);
}
native-vlan-id number;
no-gratuitous-arp-request;
no-keepalives;
no-partition {
    interface-type type;
}
optics-options {
    wavelength nm;
}
partition partition-number oc-slice oc-slice-range interface-type type;
timeslots time-slot-range;
passive-monitor-mode;
per-unit-scheduler;
ppp-options {
    chap {
        access-profile name;
        default-chap-secret name;
        local-name name;
        passive;
    }
    compression {
        acfc;
        pfc;
    }
    no-termination-request;
    pap {

```

```

        access-profile name;
        local-name name;
        local-password password;
        passive;
    }
}
receive-bucket {
    overflow (discard | tag);
    rate percentage;
    threshold bytes;
}
redundancy-options {
    primary sp-fpc/pic/port;
    secondary sp-fpc/pic/port;
}
schedulers number;
serial-options {
    clock-rate rate;
    clocking-mode (dce | dte | loop);
    control-polarity (negative | positive);
    cts-polarity (negative | positive);
    dcd-polarity (negative | positive);
    dce-options {
        control-signal (assert | de-assert | normal);
        cts (ignore | normal | require);
        dcd (ignore | normal | require);
        dsr (ignore | normal | require);
        dtr signal-handling-option;
        ignore-all;
        indication (ignore | normal | require);
        rts (assert | de-assert | normal);
        tm (ignore | normal | require);
    }
    dsr-polarity (negative | positive);
    dte-options {
        control-signal (assert | de-assert | normal);
        cts (ignore | normal | require);
        dcd (ignore | normal | require);
        dsr (ignore | normal | require);
        dtr signal-handling-option;
        ignore-all;
        indication (ignore | normal | require);
        rts (assert | de-assert | normal);
        tm (ignore | normal | require);
    }
}
dtr-circuit (balanced | unbalanced);
dtr-polarity (negative | positive);
encoding (nrz | nrzi);
indication-polarity (negative | positive);
line-protocol protocol;
loopback mode;
rts-polarity (negative | positive);
tm-polarity (negative | positive);
transmit-clock invert;
}
services-options {

```

```

inactivity-timeout seconds;
open-timeout seconds;
syslog {
    host hostname {
        facility-override facility-name;
        log-prefix prefix-number;
        services priority-level;
    }
}
}
shdsl-options {
    annex (annex-a | annex-b);
    line-rate line-rate;
    loopback (local | remote);
    snr-margin {
        current margin;
        snext margin;
    }
}
sonet-options {
    aggregate asx;
    aps {
        advertise-interval milliseconds;
        authentication-key key;
        force;
        hold-time milliseconds;
        lockout;
        neighbor address;
        paired-group group-name;
        preserve-interface;
        protect-circuit group-name;
        request;
        revert-time seconds;
        switching-mode (bidirectional | unidirectional);
        working-circuit group-name;
    }
    bytes {
        c2 value;
        e1-quiet value;
        f1 value;
        f2 value;
        s1 value;
        z3 value;
        z4 value;
    }
    fcs (16 | 32);
    loopback (local | remote);
    mpls {
        pop-all-labels {
            required-depth number;
        }
    }
    path-trace trace-string;
    (payload-scrambler | no-payload-scrambler);
    rfc-2615;
    trigger {

```

```

        defect ignore;
        hold-time up milliseconds down milliseconds;
    }
    vtmapping (itu-t | klm);
    (zO-increment | no-zO-increment);
}
speed (10m | 100m | 1g | oc3 | oc12 | oc48);
stacked-vlan-tagging;
switch-options {
    switch-port port-number {
        (auto-negotiation | no-auto-negotiation);
        speed (10m | 100m | 1g);
        link-mode (full-duplex | half-duplex);
    }
}
t1-options {
    bert-algorithm algorithm;
    bert-error-rate rate;
    bert-period seconds;
    buildout value;
    byte-encoding (nx56 | nx64);
    crc-major-alarm-threshold (1e-3 | 5e-4 | 1e-4 | 5e-5 | 1e-5);
    crc-minor-alarm-threshold (1e-3 | 5e-4 | 1e-4 | 5e-5 | 1e-5 | 5e-6 | 1e-6);
    fcs (16 | 32);
    framing (esf | sf);
    idle-cycle-flag (flags | ones);
    invert-data;
    line-encoding (ami | b8zs);
    loopback (local | payload | remote);
    remote-loopback-respond;
    start-end-flag (filler | shared);
    timeslots time-slot-range;
}
t3-options {
    atm-encapsulation (direct | plcp);
    bert-algorithm algorithm;
    bert-error-rate rate;
    bert-period seconds;
    buildout feet;
    (cbit-parity | no-cbit-parity);
    compatibility-mode (adtran | digital-link | kentrox | larscom | verilink) <subrate
        value>;
    fcs (16 | 32);
    (feac-loop-respond | no-feac-loop-respond);
    idle-cycle-flag value;
    (long-buildout | no-long-buildout);
    (loop-timing | no-loop-timing);
    loopback (local | payload | remote);
    (mac | no-mac);
    (payload-scrambler | no-payload-scrambler);
    start-end-flag (filler | shared);
}
traceoptions {
    flag flag <flag-modifier> <disable>;
}
transmit-bucket {

```

```

        overflow discard;
        rate percentage;
        threshold bytes;
    }
    (traps | no-traps);
    unidirectional;
    vlan-tagging;
    vlan-vci-tagging;
    unit logical-unit-number {
        logical-interface-statements;
    }
}

```

For information about interface-specific physical properties, see “Physical Interfaces Properties Statements List” on page 69.

Physical Interfaces Properties Statements List

Table 10 on page 69 lists statements that you can use to configure physical interfaces.

Table 10: Statements for Physical Interface Properties

Statement	Interface Types	Usage Guidelines
802.3ad aex	Aggregated Ethernet interfaces	“Configuring Ethernet Link Aggregation” on page 537 or “Configuring Aggregated Ethernet Interfaces” on page 535
access-profile <i>name</i>	Interfaces with Point-to-Point Protocol (PPP) encapsulation	“Configuring the PPP Challenge Handshake Authentication Protocol” on page 103
accounting-profile <i>name</i>	All	“Configuring Accounting for the Physical Interface” on page 121
acfc	Interfaces with PPP encapsulation	“Identifying the Access Concentrator” on page 644
acknowledge-retries <i>number</i>	Link services and voice services interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
acknowledge-timer <i>milliseconds</i>	Link services and voice services interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
action-red-differential-delay (disable-tx remove-link)	Link services and voice services interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
advertise-interval <i>milliseconds</i>	SONET/SDH interfaces	“Configuring APS and MSP” on page 694

Table 10: Statements for Physical Interface Properties (*continued*)

Statement	Interface Types	Usage Guidelines
<code>aggregate</code>	Gigabit Ethernet intelligent queuing (IQ) interfaces and Gigabit Ethernet interfaces with small form-factor pluggable transceivers (SFPs) (except the 10-port Gigabit Ethernet PIC and the built-in Gigabit Ethernet port on the M7i platform)	“Configuring Gigabit Ethernet Policers” on page 609
<code>aggregate asx</code>	Aggregated SONET/SDH interfaces	“Configuring Aggregated SONET/SDH Interfaces” on page 716
<code>aggregated-ether-options</code>	Aggregated Ethernet interfaces	“Configuring Aggregated Ethernet Interfaces” on page 535
<code>aggregate-ports</code>	SONET/SDH interfaces	“Specifying OC768-over-OC192 Mode” on page 87
<code>aggregated-sonet-options</code>	Aggregated SONET/SDH interfaces	“Configuring Aggregated SONET/SDH Interfaces” on page 716
<code>annex (annex-a annex-b)</code>	ATM interfaces on J-series Services Routers	“Configuring SHDSL Operating Mode on an ATM Physical Interface” on page 340
<code>aps</code>	SONET/SDH interfaces	“Configuring APS and MSP” on page 694
<code>atm-encapsulation (direct plcp)</code>	E3 and T3 traffic over Asynchronous Transfer Mode (ATM) interfaces	“Configuring E3 and T3 Parameters on ATM Interfaces” on page 313
<code>atm-options</code>	ATM1 and ATM2 IQ interfaces	“Configuring ATM Interfaces” on page 255
<code>authentication-key key</code>	SONET/SDH interfaces	“Configuring APS and MSP” on page 694
<code>backup-interface</code>	E1, E3, T1, T3 and Fast Ethernet	“Configuring an ISDN Dialer Interface as a Backup Interface” on page 664
<code>bandwidth-limit bps</code>	Gigabit Ethernet IQ and Gigabit Ethernet PICs with SFPs (except the 10-port Gigabit Ethernet PIC and the built-in Gigabit Ethernet port on the M7i platform)	“Configuring Gigabit Ethernet Policers” on page 609
<code>bchannel-allocation (ascending descending)</code>	J-series Services Routers equipped with a Dual-Port Channelized T1/E1 PIM; for Integrated Services Digital Network Primary Rate Interfaces (ISDN PRI)	“Allocating B-Channels for Dialout” on page 389
<code>bert-algorithm <i>algorithm</i></code>	E3, T1, T3, multichannel DS3, channelized interfaces (DS3, OC12, and STM1), and channelized IQ and IQE interfaces (E1 and DS3)	“Interface Diagnostics” on page 125
<code>bert-error-rate <i>rate</i></code>	E1, E3, T1, T3, and channelized interfaces (DS3, OC3, OC12, and STM1)	“Interface Diagnostics” on page 125
<code>bert-period <i>seconds</i></code>	E1, E3, T1, T3, and channelized interfaces (DS3, OC12, and STM1)	“Interface Diagnostics” on page 125

Table 10: Statements for Physical Interface Properties (continued)

Statement	Interface Types	Usage Guidelines
buildout <i>value</i>	T1 interfaces	“Configuring the T1 Buildout” on page 487
buildout <i>feet</i>	E3 and T3 traffic over ATM interfaces	“Configuring E3 and T3 Parameters on ATM Interfaces” on page 313
burst-size-limit <i>bytes</i>	Gigabit Ethernet IQ and Gigabit Ethernet PICs with SFPs (except the 10-port Gigabit Ethernet PIC and the built-in Gigabit Ethernet port on the M7i platform)	“Configuring Gigabit Ethernet Policers” on page 609
byte-encoding (nx56 nx64)	DS0 and T1 interfaces	“Configuring T1 Byte Encoding” on page 487
bytes [<i>values</i>	SONET/SDH interfaces	“Configuring SONET/SDH Header Byte Values” on page 685
cbit-parity no-cbit-parity	T3 interfaces	“Disabling T3 C-Bit Parity Mode” on page 497
cbr <i>rate</i>	ATM interfaces	“Defining the ATM Traffic-Shaping Profile” on page 295
cell-bundle-size <i>cells</i>	ATM2 IQ interfaces using ATM Layer 2 circuit cell-relay transport mode	“Configuring the Layer 2 Circuit Cell-Relay Cell Maximum” on page 289
chap	Interfaces with PPP encapsulation	“Configuring the PPP Challenge Handshake Authentication Protocol” on page 103
cisco-interoperability send-lip-remove-link-for-link-reject	link services IQ (lsq) interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
classifier	Gigabit Ethernet IQ interfaces	“Specifying an Output Priority Map” on page 610
clocking <i>clock-source</i>	ATM, DS0, E1, E3, SONET/SDH, T1, and T3 interfaces	“Configuring the Clock Source” on page 119
clocking-mode (dce dte loop)	Serial interfaces (EIA-530 and V.35)	“Configuring the Serial Clocking Mode” on page 244
clock-rate <i>rate</i>	Serial interfaces (EIA-530 and V.35)	“Configuring the DTE Clock Rate” on page 246
compatibility-mode <i>mode</i>	E3 and T3 interfaces	“Configuring the E3 CSU Compatibility Mode” on page 479 and “Configuring the T3 CSU Compatibility Mode” on page 498
compression	Interfaces with PPP encapsulation	“Configuring the PPP Protocol Field Compression” on page 113
control-polarity (negative positive)	Serial interfaces (X.21)	“Configuring Serial Signal Polarities” on page 250

Table 10: Statements for Physical Interface Properties (*continued*)

Statement	Interface Types	Usage Guidelines
control-signal (assert de-assert normal)	Serial interfaces (X.21)	“Configuring the Serial Signal Handling” on page 247
core-dump no-core-dump)	Adaptive services, monitoring services, and collector interfaces	“Configuring Multiservice Physical Interface Properties” on page 129
cts (ignore normal require)	Serial interfaces (EIA-530 and V.35)	“Configuring the Serial Signal Handling” on page 247
cts-polarity (negative positive)	Serial interfaces (EIA-530 and V.35)	“Configuring Serial Signal Polarities” on page 250
current <i>margin</i>	ATM interfaces on J-series Services Routers	“Configuring SHDSL Operating Mode on an ATM Physical Interface” on page 340
dcd (ignore normal require)	Serial interfaces (EIA-530 and V.35)	“Configuring the Serial Signal Handling” on page 247
dcd-polarity (negative positive)	Serial interfaces (EIA-530 and V.35)	“Configuring Serial Signal Polarities” on page 250
dce	Interfaces with Frame Relay encapsulation	“Configuring the Router as a DCE” on page 120
dce-options	Serial interfaces (EIA-530, V.35, and X.21) on J-series Services Routers	“Configuring the Serial Signal Handling” on page 247
default-chap-secret <i>name</i>	Interfaces with Point-to-Point Protocol (PPP) encapsulation	“Configuring a Default CHAP Secret” on page 105
description <i>text</i>	All	“Adding an Interface Description to the Configuration” on page 88
dialer-options	ISDN interfaces	“Configuring ISDN Physical Interface Properties” on page 659
disable	All	“Disabling a Physical Interface” on page 130, “Tracing Operations of an Individual Router Interface” on page 221, and “Tracing Operations of an Individual Router Interface” on page 128
dot1x	802.1x Port-Based Network Access Control	“Configuring IEEE 802.1x Port-Based Network Access Control” on page 591
down-count	ATM interfaces	“Configuring the ATM OAM F5 Loopback Cell Threshold” on page 305
drop-timeout <i>milliseconds</i>	Multilink, link services, and voice services interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
ds0-options	DS0 interfaces	“Configuring Channelized Interfaces” on page 361

Table 10: Statements for Physical Interface Properties (continued)

Statement	Interface Types	Usage Guidelines
<code>dsr (ignore normal require)</code>	Serial interfaces (EIA-530 and V.35)	“Configuring the Serial Signal Handling” on page 247
<code>dsr-polarity (negative positive)</code>	Serial interfaces (EIA-530 and V.35)	“Configuring Serial Signal Polarities” on page 250
<code>dte-options</code>	Serial interfaces (EIA-530, V.35, and X.21) on M-series and T-series routing platforms	“Configuring the Serial Signal Handling” on page 247
<code>dtr signal-handling-option</code>	Serial interfaces (EIA-530 and V.35)	“Configuring the Serial Signal Handling” on page 247
<code>dtr-circuit (balanced unbalanced)</code>	Serial interfaces (EIA-530 and V.35)	“Configuring the Serial DTR Circuit” on page 250
<code>dtr-polarity (negative positive)</code>	Serial interfaces (EIA-530 and V.35)	“Configuring Serial Signal Polarities” on page 250
<code>e1-options</code>	E1 interfaces	“Configuring E1 Interfaces” on page 469
<code>e3-options</code>	E3 interfaces	“Configuring E3 Interfaces” on page 477
<code>encapsulation type</code>	All interfaces, except loopback and multicast tunnel	“Configuring Interface Encapsulation” on page 98
<code>encoding (nrz nrzi)</code>	Serial interfaces (EIA-530, V.35, and X.21)	“Configuring Serial Line Encoding” on page 253
<code>epd-threshold cells</code>	ATM2 interfaces	“Configuring ATM2 IQ VC Tunnel CoS Components” on page 315
<code>es-options</code>	ES interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
<code>ethernet-policer-profile</code>	Gigabit Ethernet IQ and Gigabit Ethernet PICs with SFPs (except the 10-port Gigabit Ethernet PIC, and the built-in Gigabit Ethernet port on the M7i platform)	“Configuring Gigabit Ethernet Policers” on page 609
<code>ethernet-switch-profile</code>	Gigabit Ethernet IQ and Gigabit Ethernet PICs with SFPs (except the 10-port Gigabit Ethernet PIC, Aggregated Ethernet with Gigabit Ethernet IQ interfaces, and the built-in Gigabit Ethernet port on the M7i platform)	“Configuring Gigabit Ethernet Policers” on page 609, “Configuring MAC Address Filtering” on page 613, and “Configuring the Management Ethernet Interface” on page 627
<code>facility-override facility-name</code>	Adaptive services interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
<code>fastether-options</code>	Fast Ethernet interfaces	“Configuring Ethernet Interfaces” on page 511

Table 10: Statements for Physical Interface Properties (continued)

Statement	Interface Types	Usage Guidelines
fcs (16 32)	E1/E3, SONET/SDH, and T1/T3 interfaces	“Configuring the E1 Frame Checksum” on page 471, “Configuring the E3 Frame Checksum” on page 480, “Configuring the SONET/SDH Frame Checksum” on page 687, “Configuring the T1 Frame Checksum” on page 489, and “Configuring the T3 Frame Checksum” on page 500
feac-loop-respond no-feac-loop-respond)	T3 interfaces	“Configuring the T3 FEAC Response” on page 500
flow-control no-flow-control)	Aggregated Ethernet, Fast Ethernet, and Gigabit Ethernet interfaces	“Configuring Flow Control” on page 520
force	SONET/SDH interfaces	“Configuring APS and MSP” on page 694
forwarding-class <i>class-name</i>	Gigabit Ethernet IQ and ATM2 interfaces	“Configuring ATM2 IQ VC Tunnel CoS Components” on page 315 and “Specifying an Output Priority Map” on page 610
fragment-threshold <i>bytes</i>	Multilink, link services, and voice services interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
framing <i>framing-type</i>	10-Gigabit Ethernet, SONET, E1, E3, and T1 interfaces	“Configuring E3 and T3 Parameters on ATM Interfaces” on page 313, “Configuring E1 Framing” on page 471, and “Configuring T1 Framing” on page 490, “Configuring 10-Gigabit Ethernet Framing” on page 633, and “Configuring SONET Options for 10-Gigabit Ethernet Interfaces” on page 707
gether-options	Gigabit Ethernet and Tri-Rate Ethernet copper interfaces	“Configuring Ethernet Interfaces” on page 511
(gratuitous-arp-reply no-gratuitous-arp-reply)	Ethernet interfaces	“Configuring Gratuitous ARP” on page 521
hello-timer <i>milliseconds</i>	Link services and voice services interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
high-plp-max-threshold	ATM2 interfaces	“Configuring Linear RED Profiles” on page 316
high-plp-threshold <i>percent</i>	ATM2 interfaces	= “Configuring ATM2 IQ VC Tunnel CoS Components” on page 315
hold-time <i>milliseconds</i>	SONET/SDH interfaces	“Configuring APS and MSP” on page 694
hold-time up <i>milliseconds</i> down <i>milliseconds</i>	All interfaces, except aggregated SONET/SDH, generalized routing encapsulation (GRE) tunnel, and IP tunnel	“Damping Interface Transitions” on page 128 and “Configuring SONET/SDH Defect Triggers to Be Ignored” on page 691

Table 10: Statements for Physical Interface Properties (continued)

Statement	Interface Types	Usage Guidelines
host <i>hostname</i>	Adaptive services interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
ieee802.1p premium [<i>values</i>]	Gigabit Ethernet IQ interfaces	“Specifying an Input Priority Map” on page 610
idle-cycle-flag <i>value</i>	E1, E3, T1, and T3 interfaces	“Configuring the E1 Idle Cycle Flag” on page 472, “Configuring the E3 Idle Cycle Flag” on page 481, “Configuring the T1 Idle Cycle Flag” on page 492, and “Configuring the T3 Idle Cycle Flag” on page 501
ignore-all	Serial interfaces (EIA-530, V.35, and X.21)	“Configuring the Serial Signal Handling” on page 247
ilmi	ATM interfaces	“Configuring Communication with Directly Attached ATM Switches and Routers” on page 267
inactivity-timeout <i>seconds</i>	Adaptive services interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
indication (ignore normal require)	Serial interfaces (X.21)	“Configuring the Serial Signal Handling” on page 247
indication-polarity (negative positive)	Serial interfaces (X.21)	“Configuring Serial Signal Polarities” on page 250
ingress-rate-limit <i>rate</i>	8-port, 12-port, and 48-port Fast Ethernet interfaces	“Configuring the Ingress Rate Limit” on page 523
init-command-string <i>initialization-command-string</i> ;	For USB ports (umd0) on J4350 and J6350 Services Routers	“Specifying a USB Modem Interface on J-series Routers” on page 85
input-priority-map	Gigabit Ethernet IQ interfaces	“Specifying an Input Priority Map” on page 610
interface-type <i>type</i>	Channelized IQ interfaces, ISDN interfaces	“Configuring Channelized Interfaces” on page 361 and “Configuring ISDN Physical Interface Properties” on page 659
invert-data	DS0, E1, E3, and T1 interfaces	“Configuring E1 Data Inversion” on page 472, “Configuring E3 Data Inversion” on page 481, and “Configuring T1 Data Inversion” on page 489
isdn-options	ISDN interfaces	“Configuring ISDN Logical Interface Properties” on page 661
keepalives <down-count <i>number</i> <interval <i>seconds</i> > <up-count <i>number</i> >	Aggregated SONET/SDH, DS0, E1, E3, SONET/SDH, T1, and T3 interfaces	“Configuring Keepalives” on page 118

Table 10: Statements for Physical Interface Properties (continued)

Statement	Interface Types	Usage Guidelines
<code>lacp mode</code>	Aggregated Ethernet interfaces	“Configuring Aggregated Ethernet LACP” on page 539
<code>line-encoding (ami b8zs)</code>	T1 interfaces	“Configuring T1 Line Encoding” on page 490
<code>line-protocol protocol</code>	Serial interfaces (EIA-530, V.35, and X.21)	“Configuring the Serial Line Protocol” on page 241
<code>line-rate line-rate</code>	ATM interfaces on J-series Services Routers	“Configuring SHDSL Operating Mode on an ATM Physical Interface” on page 340
<code>linear-red-profile profile-name</code>	ATM2 interfaces	“Configuring ATM2 IQ VC Tunnel CoS Components” on page 315
<code>linear-red-profiles profile-name</code>	ATM2 interfaces	“Configuring ATM2 IQ VC Tunnel CoS Components” on page 315
<code>link-layer-overhead percent</code>	AS PIC link services IQ interfaces (lsq)	<i>JUNOS Services Interfaces Configuration Guide</i>
<code>link-mode mode</code>	Management Ethernet (fxp0) and Fast Ethernet interfaces	“Configuring the Link Characteristics” on page 89
<code>link-speed speed</code>	Aggregated Ethernet and aggregated SONET/SDH interfaces	“Configuring Aggregated Ethernet Link Speed” on page 546 and “Configuring Aggregated SONET/SDH Link Speed” on page 718
<code>lmi lmi-options</code>	Interfaces with Frame Relay encapsulation	“Configuring Tunable Keepalives for Frame Relay LMI” on page 354 and <i>JUNOS Services Interfaces Configuration Guide</i>
<code>lmi-type (ansi itu)</code>	Link services interfaces and interfaces with Frame Relay encapsulation	“Configuring Frame Relay Keepalives” on page 353
<code>local-name name</code>	Interfaces with PPP encapsulation	“Configuring the PPP Challenge Handshake Authentication Protocol” on page 103
<code>lockout</code>	SONET/SDH interfaces	“Configuring APS and MSP” on page 694
<code>log-prefix prefix-number</code>	Adaptive services interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
<code>(long-buildout no-long-buildout)</code>	T3 interfaces	“Configuring the T3 Line Buildout” on page 501
<code>(loop-timing no-loop-timing)</code>	Channelized IQ interfaces	“Configuring the Channelized T3 Loop Timing” on page 502

Table 10: Statements for Physical Interface Properties (continued)

Statement	Interface Types	Usage Guidelines
<code>loopback mode</code>	DS0, E1, E3, T1, T3, Ethernet, SONET/SDH, ATM interfaces on J-series Services Routers, serial interfaces (EIA-530, V.35, and X.21), and 10-Gigabit Ethernet interfaces in WAN PHY mode	“Configuring E1 Loopback Capability” on page 472, “Configuring E3 Loopback Capability” on page 481, “Configuring Ethernet Loopback Capability” on page 519, “Configuring Serial Loopback Capability” on page 251, “Configuring Channelized IQ and IQE SONET/SDH Loop Timing” on page 687, “Configuring T1 Loopback Capability” on page 490, “Configuring T3 Loopback Capability” on page 502, “Configuring SHDSL Operating Mode on an ATM Physical Interface” on page 340, and “Configuring SONET Options for 10-Gigabit Ethernet Interfaces” on page 707
<code>(loopback no-loopback)</code>	Aggregated Ethernet, Fast Ethernet, and Gigabit Ethernet interfaces	“Configuring Ethernet Loopback Capability” on page 519
<code>loss-priority (high low)</code>	Gigabit Ethernet IQ interfaces	“Specifying an Output Priority Map” on page 610
<code>low-plp-max-threshold percent</code>	ATM2 interfaces	“Configuring ATM2 IQ VC Tunnel CoS Components” on page 315
<code>low-plp-threshold percent</code>	ATM2 interfaces	“Configuring ATM2 IQ VC Tunnel CoS Components” on page 315
<code>lsq-failure-options</code>	Link services IQ (lsq) interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
<code>mac mac-address</code>	Management Ethernet interface (fxp0)	“Configuring the MAC Address on the Management Ethernet Interface” on page 628
<code>(mac-learn-enable no-mac-learn-enable)</code>	Gigabit Ethernet IQ, Tri-Rate Ethernet copper, and Gigabit Ethernet PICs with SFPs (except the 10-port Gigabit Ethernet PIC and the built-in Gigabit Ethernet port on the M7i platform)	“Configuring MAC Address Filtering” on page 613
<code>maximum-vcs maximum-vcs</code>	ATM interfaces	“Configuring the Maximum Number of ATM1 VCs on a VP” on page 276
<code>minimum-links number</code>	Multilink, link services, and voice services interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
<code>mlfr-uni-nni-bundle-options bundle-options</code>	Link services and voice services interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
<code>modem-options</code>	For USB ports (umd0) on J4350 and J6350 Services Routers	“Specifying a USB Modem Interface on J-series Routers” on page 85

Table 10: Statements for Physical Interface Properties (continued)

Statement	Interface Types	Usage Guidelines
<code>mpls</code>	10-Gigabit Ethernet interfaces in WAN PHY mode and ATM and SONET/SDH interfaces in passive monitoring mode	“Removing MPLS Labels from Incoming Packets” on page 270 and “Removing MPLS Labels from Incoming Packets” on page 709 and “Configuring SONET Options for 10-Gigabit Ethernet Interfaces” on page 707
<code>mrru bytes</code>	Link services and voice services interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
<code>mtu bytes</code>	All interfaces, except management Ethernet (<code>fxp0</code>), loopback, multilink, and multicast tunnel	“Configuring the Media MTU” on page 89
<code>multiservice-options</code>	Adaptive services, monitoring services, and collector interfaces	“Configuring Multiservice Physical Interface Properties” on page 129
<code>n391 number</code>	Link services and voice services interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
<code>n392 number</code>	Link services and voice services interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
<code>n393 number</code>	Link services and voice services interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
<code>neighbor address</code>	SONET/SDH interfaces	“Configuring APS and MSP” on page 694
<code>no-gratuitous-arp-request</code>	Ethernet interfaces	“Configuring Gratuitous ARP” on page 521
<code>no-keepalives</code>	Interfaces with PPP, Frame Relay, or Cisco High-level Data Link Control (HDLC) encapsulation	“Configuring Keepalives” on page 118
<code>no-partition</code>	Channelized IQ interfaces	“Configuring Channelized Interfaces” on page 361
<code>no-termination-request</code>	link services IQ (lsq) interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
<code>oam-liveness</code>	ATM interfaces	“Configuring the OAM F4 Cell Flows” on page 291
<code>oam-period (seconds disable)</code>	ATM interfaces	“Defining the ATM OAM F5 Loopback Cell Period” on page 305
<code>oc-slice oc-slice-range</code>	Channelized OC12 IQ interfaces	“Configuring Channelized OC12 Interfaces” on page 401
<code>open-timeout seconds</code>	Adaptive services interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
<code>optics-options</code>	Gigabit Ethernet dense wavelength-division multiplexing (DWDM) interfaces	“Configuring the 10-Gigabit Ethernet DWDM Interface Wavelength” on page 631

Table 10: Statements for Physical Interface Properties (continued)

Statement	Interface Types	Usage Guidelines
output-priority-map	Gigabit Ethernet IQ interfaces	“Specifying an Output Priority Map” on page 610
overflow (discard tag)	All interfaces, except ATM, channelized E1, E1, Fast Ethernet, Gigabit Ethernet, and channelized IQ	“Configuring Receive and Transmit Leaky Bucket Properties” on page 120 and “Configuring Receive and Transmit Leaky Bucket Properties” on page 711
paired-group <i>group-name</i>	SONET/SDH interfaces	“Configuring APS and MSP” on page 694
partition <i>partition-number</i>	Channelized IQ interfaces	“Configuring Channelized Interfaces” on page 361
passive	Interfaces with PPP encapsulation	“Configuring the PPP Challenge Handshake Authentication Protocol” on page 103
passive-monitor-mode	SONET/SDH interfaces	“Enabling Passive Monitoring on SONET/SDH Interfaces” on page 709
path-trace <i>trace-string</i>	10-Gigabit Ethernet interfaces in WAN PHY mode and SONET/SDH interfaces	“Configuring the SONET/SDH Path Trace Identifier” on page 689 and “Configuring SONET Options for 10-Gigabit Ethernet Interfaces” on page 707
(payload-scrambler no-payload-scrambler)	E3, SONET/SDH, and T3 interfaces	“Configuring E3 and T3 Parameters on ATM Interfaces” on page 313, “Configuring E3 HDLC Payload Scrambling” on page 483, “Configuring SONET/SDH HDLC Payload Scrambling” on page 689, “Configuring T3 HDLC Payload Scrambling” on page 504, and “Examples: Configuring T3 Interfaces” on page 505
periodic <i>interval</i>	Aggregated Ethernet interfaces	“Configuring Aggregated Ethernet LACP” on page 539
per-unit-scheduler	IQ interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
pfc	Interfaces with PPP encapsulation	“Configuring the PPP Protocol Field Compression” on page 113
pic-type (atm1 atm2)	ATM2 IQ interfaces	“Configuring the ATM PIC Type” on page 271
plp1 <i>cells</i>	ATM2 interfaces	“Configuring ATM2 IQ VC Tunnel CoS Components” on page 315
plp-to-clp	ATM2 IQ interfaces	“Enabling the PLP Setting to Be Copied to the CLP Bit” on page 324

Table 10: Statements for Physical Interface Properties (continued)

Statement	Interface Types	Usage Guidelines
<code>policer cos-policer-name</code>	Gigabit Ethernet IQ and Gigabit Ethernet PICs with SFPs (except the 10-port Gigabit Ethernet PIC and the built-in Gigabit Ethernet port on the M7i platform)	“Configuring Gigabit Ethernet Policers” on page 609
<code>pop-all-labels</code>	ATM and SONET/SDH interfaces in passive monitoring mode	“Removing MPLS Labels from Incoming Packets” on page 270 and “Removing MPLS Labels from Incoming Packets” on page 709
<code>ppp-options</code>	Interfaces with PPP encapsulation	“Configuring the PPP Challenge Handshake Authentication Protocol” on page 103
<code>premium</code>	Gigabit Ethernet IQ interfaces	“Configuring Gigabit Ethernet Policers” on page 609 and “Specifying an Output Priority Map” on page 610
<code>primary sp-fpcpicport</code>	Redundant interfaces for adaptive services interfaces (rsp -)	<i>JUNOS Services Interfaces Configuration Guide</i>
<code>priority (high low)</code>	ATM2 IQ interfaces	“Configuring ATM2 IQ VC Tunnel CoS Components” on page 315
<code>priority number</code>	ISDN interfaces	“Configuring an ISDN Dialer Interface as a Backup Interface” on page 664
<code>promiscuous-mode</code>	ATM2 IQ interfaces	“Configuring ATM Cell-Relay Promiscuous Mode” on page 272
<code>protect-circuit group-name</code>	SONET/SDH interfaces	“Configuring APS and MSP” on page 694
<code>queue-depth cells</code>	ATM2 interfaces	“Configuring ATM2 IQ VC Tunnel CoS Components” on page 315
<code>queue-length number</code>	ATM1 interfaces	“Configuring the ATM1 Queue Length” on page 301
<code>rate percentage</code>	All interfaces, except ATM, channelized E1, E1, Fast Ethernet, Gigabit Ethernet, and channelized IQ	“Configuring Receive and Transmit Leaky Bucket Properties” on page 120 and “Configuring Receive and Transmit Leaky Bucket Properties” on page 711
<code>receive-bucket</code>	All interfaces, except ATM, Fast Ethernet, and Gigabit Ethernet	“Configuring Receive and Transmit Leaky Bucket Properties” on page 120
<code>red-differential-delay milliseconds</code>	Link services and voice services interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
<code>redundancy-options</code>	Redundant interfaces for adaptive services interfaces (rsp -)	<i>JUNOS Services Interfaces Configuration Guide</i>
<code>remote-loopback-respond</code>	T1 interfaces	“Configuring the T1 Remote Loopback Response” on page 489

Table 10: Statements for Physical Interface Properties (continued)

Statement	Interface Types	Usage Guidelines
<code>request</code>	SONET/SDH interfaces	“Configuring APS and MSP” on page 694
<code>required-depth number</code>	ATM and SONET/SDH interfaces in passive monitoring mode	“Removing MPLS Labels from Incoming Packets” on page 270 and “Removing MPLS Labels from Incoming Packets” on page 709
<code>revert-time seconds</code>	SONET/SDH interfaces	“Configuring APS and MSP” on page 694
<code>rfc-2615</code>	SONET/SDH interfaces	“Configuring SONET/SDH RFC 2615 Support” on page 690
<code>rts (assert de-assert normal)</code>	Serial interfaces (EIA-530 and V.35)	“Configuring the Serial Signal Handling” on page 247
<code>rts-polarity (negative positive)</code>	Serial interfaces (EIA-530 and V.35)	“Configuring Serial Signal Polarities” on page 250
<code>rtvbr peak rate sustained rate burst length</code>	ATM interfaces	“Configuring ATM2 IQ Real-Time VBR” on page 296
<code>scheduler-maps map-name</code>	ATM2 interfaces	“Configuring ATM2 IQ VC Tunnel CoS Components” on page 315
<code>schedulers number</code>	Ethernet IQ2 PIC port interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
<code>secondary sp-fpcpicport</code>	Redundant interfaces for adaptive services interfaces (rsp-)	<i>JUNOS Services Interfaces Configuration Guide</i>
<code>services-options</code>	Services interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
<code>serial-options</code>	Serial interfaces (EIA-530, V.35, and X.21)	“Configuring Serial Interfaces” on page 239
<code>services priority-level</code>	Adaptive services interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
<code>shdsl-options</code>	ATM interfaces on J-series Services Routers	“Configuring SHDSL Operating Mode on an ATM Physical Interface” on page 340
<code>size</code>	All	“Tracing Operations of the Interface Process” on page 222
<code>shaping</code>	ATM interfaces	“Defining the ATM Traffic-Shaping Profile” on page 295
<code>snext margin</code>	ATM interfaces on J-series Services Routers	“Configuring SHDSL Operating Mode on an ATM Physical Interface” on page 340
<code>snr-margin</code>	ATM interfaces on J-series Services Routers	“Configuring SHDSL Operating Mode on an ATM Physical Interface” on page 340

Table 10: Statements for Physical Interface Properties (continued)

Statement	Interface Types	Usage Guidelines
sonet-options	SONET/SDH interfaces	“Configuring SONET/SDH Physical Interface Properties” on page 680
source-address-filter <i>mac-address</i>	Aggregated Ethernet, Fast Ethernet, Tri-Rate Ethernet copper, and Gigabit Ethernet interfaces	“Enabling Ethernet MAC Address Filtering” on page 517
(source-filtering no-source-filtering)	Aggregated Ethernet, Fast Ethernet, Tri-Rate Ethernet copper, Gigabit Ethernet, Gigabit Ethernet IQ, and Gigabit Ethernet interfaces with SFPs (except the 10-port Gigabit Ethernet PIC and the built-in Gigabit Ethernet port on the M7i platform)	“Enabling Ethernet MAC Address Filtering” on page 517
speed (10m 100m 1g oc3 oc12 oc48)	Management Ethernet interface (fxp0), Tri-Rate Ethernet copper interfaces, and 12-port and 48-port Fast Ethernet interfaces SONET/SDH PIC with SFP	“Configuring the Interface Speed” on page 114 and “SONET/SDH Interface” on page 116
spid1spid2	ISDN interfaces	“Configuring ISDN Physical Interface Properties” on page 659 and “Configuring an ISDN Dialer Interface as a Backup Interface” on page 664
stacked-vlan-tagging	Gigabit Ethernet IQ interfaces	“Configuring the Management Ethernet Interface” on page 627
start-end-flag (filler shared)	DS0, E1, E3, T1, and T3 interfaces	“Configuring E1 Start and End Flags” on page 474, “Configuring the E3 Start and End Flags” on page 483, “Configuring T1 Start and End Flags” on page 492, and “Configuring T3 Start and End Flags” on page 505
switching-mode (bidirectional unidirectional)	Unchannelized OC3, OC12, and OC48 SONET/SDH interfaces on T-series platforms	“Configuring Switching Between the Working and Protect Circuits” on page 700
syslog	Adaptive services interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
(syslog no-syslog)	Adaptive services, monitoring services, and collector interfaces	“Configuring Multiservice Physical Interface Properties” on page 129
t1-options	T1 interfaces	“Configuring T1 Interfaces” on page 485
t3-options	T3 interfaces	“Configuring T3 Interfaces” on page 495
t310	ISDN interfaces	“Configuring ISDN Physical Interface Properties” on page 659

Table 10: Statements for Physical Interface Properties (continued)

Statement	Interface Types	Usage Guidelines
t391 seconds	Link services and voice services interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
t392 number	Link services and voice services interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
tag-protocol-id (first-call power-up)	ISDN interfaces	“Configuring ISDN Physical Interface Properties” on page 659
threshold bytes	All interfaces, except ATM, channelized E1, E1, Fast Ethernet, Gigabit Ethernet, and channelized IQ	“Configuring Receive and Transmit Leaky Bucket Properties” on page 120 and “Configuring Receive and Transmit Leaky Bucket Properties” on page 711
timeslots time-slot-range	Channelized T1 IQ and channelized E1 IQ interfaces	“Configuring Channelized Interfaces” on page 361
tm (ignore normal require)	Serial interfaces (EIA-530)	“Configuring the Serial Signal Handling” on page 247
tm-polarity (negative positive)	Serial interfaces (EIA-530)	“Configuring Serial Signal Polarities” on page 250
traceoptions	All	“Tracing Operations of an Individual Router Interface” on page 128 and “Tracing Operations of the Interface Process” on page 222
transmit-bucket	All interfaces, except ATM, Fast Ethernet, Tri-Rate Ethernet copper, and Gigabit Ethernet	“Configuring Receive and Transmit Leaky Bucket Properties” on page 120
transmit-clock invert	Serial interfaces (EIA-530, V.35, and X.21)	“Configuring the Serial Clocking Mode” on page 244
transmit-weight (cells number percent number)	ATM2 IQ interfaces	“Configuring ATM2 IQ VC Tunnel CoS Components” on page 315
(traps no-traps)	All	“Enabling or Disabling SNMP Notifications on Physical Interfaces” on page 129
trigger defect ignore defect hold-time up milliseconds down milliseconds;	10-Gigabit Ethernet interfaces in WAN PHY mode and ATM over SONET/SDH and SONET/SDH interfaces	“Configuring SONET/SDH Defect Triggers to Be Ignored” on page 691 and “Configuring SONET Options for 10-Gigabit Ethernet Interfaces” on page 707
(unframed no-unframed)	E3 IQ interfaces	“Configuring E3 IQ and IQE Unframed Mode” on page 484
unidirectional	10-Gigabit Ethernet interfaces on MX960 4x10 GE DPC	“Enabling Unidirectional Traffic Flow on Physical Interfaces” on page 129
vbr peak rate sustained rate burst length	ATM interfaces	“Defining the ATM Traffic-Shaping Profile” on page 295

Table 10: Statements for Physical Interface Properties (*continued*)

Statement	Interface Types	Usage Guidelines
<code>vc-cos-mode</code> (alternate strict)	ATM2 interfaces	“Configuring ATM2 IQ VC Tunnel CoS Components” on page 315
<code>vlan-tagging</code>	Fast Ethernet, Tri-Rate Ethernet copper, and Gigabit Ethernet interfaces	“Configuring 802.1Q VLANs” on page 525
<code>vlan-vci-tagging</code>	Fast Ethernet, Tri-Rate Ethernet copper, Gigabit Ethernet, 10-Gigabit Ethernet, and aggregated Ethernet interfaces	“Configuring ATM-to-Ethernet Interworking” on page 210
<code>vpi vpi-identifier</code>	ATM interfaces	“Configuring ATM Cell-Relay Promiscuous Mode” on page 272 and “Configuring the Maximum Number of ATM1 VCs on a VP” on page 276
<code>vtmapping</code>	Channelized STM1 interfaces	“Configuring Virtual Tributary Mapping of Channelized STM1 Interfaces” on page 430
<code>wavelength nm</code>	Gigabit Ethernet dense wavelength-division multiplexing (DWDM) interfaces	“Configuring the 10-Gigabit Ethernet DWDM Interface Wavelength” on page 631
<code>working-circuit group-name</code>	SONET/SDH interfaces	“Configuring APS and MSP” on page 694
<code>yellow-differential-delay milliseconds</code>	Link services and voice services interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
(z0-increment no-z0-increment)	SONET/SDH interfaces	“Configuring an Incrementing STM ID” on page 686

Specifying an Aggregated Interface

The M-series, MX-series, and T-series routing platforms support aggregated interfaces.

You specify aggregated interfaces by assigning a number for the aggregated interface. For aggregated Ethernet interfaces, configure **ae** as in the following example:

```
[edit interfaces]
ae0 {
  ...
}
```

For aggregated SONET/SDH interfaces, configure **as** as in the following example:

```
[edit interfaces]
as0 {
  ...
}
```

The maximum number of aggregated Ethernet interfaces is 128, and the assigned number can be from 0 through 127. The maximum number of aggregated SONET

interfaces is 16, and the assigned number can be from 0 through 15. You should not mix SONET and SDH modes on the same aggregated interface.



NOTE: SONET/SDH aggregation is proprietary to the JUNOS software and might not work with other software.

If you are configuring VLANs for aggregated Ethernet interfaces, you must include the `vlan-tagging` statement at the `[edit interfaces aex]` hierarchy level to complete the association.

For more information, see “Configuring Aggregated Ethernet Interfaces” on page 535 and “Configuring Aggregated SONET/SDH Interfaces” on page 716.

Specifying a USB Modem Interface on J-series Routers

The J-series Services Routers contain two USB ports controlled by a single USB controller. One USB port can support USB devices, while the other one can act as a USB modem.

The USB modem provides a dial-in remote management interface, and supports dialer interface features by sharing the same dial pool as a dialer interface. The dial pool allows the logical dialer interface (`dln`) and the physical interface (`umd0`) to be bound together dynamically on a per-call basis.

The following dialer interface features are supported by the USB modem interface:

- Encapsulation PPP
- CoS
- NAT
- Interface statistics
- Packet capture
- GRE tunnel
- Stateful firewall
- Traffic sampling

To configure a USB modem interface, include the following statements at the `[edit interfaces]` hierarchy level:

```
[edit interfaces]
umd0 {
  dialer-options {
    pool pool-name <priority priority>;
  }
  modem-options {
    dialin (console | routable);
    init-command-string initialization-command-string;
  }
}
```

```
}
```

The pool name specified at the `[edit interfaces umd0 dialer-options pool]` hierarchy level must be the same as the pool name specified at the `[edit interfaces dln unit logical-unit-number dialer-options pool]` hierarchy level.

Configure the USB modem to operate as a dial-in WAN backup interface by including the `dialin` statement and specifying the `routable` option. If the USB modem is to be used as a dial-in console, specify the `console` option in the `dialin` statement.

When the Services Router applies the modem AT commands configured in the `init-command-string` statement or the default sequence of initialization commands to the modem, it compares them to the initialization commands already configured on the modem and makes the following changes:

- If the commands are the same, the router overrides the existing modem values that do not match. For example, if the initialization commands on the modem include `S0 = 0` and the router's `init-command-string` configuration includes `S0 = 2`, the Services Router applies `S0 = 2`.
- If the initialization commands on the modem do not include a command in the router's `init-command-string` statement configuration, the router adds it. For example, if the `init-command-string` statement includes the command `L2`, but the modem commands do not include it, the router adds `L2` to the initialization commands configured on the modem.

Include the following statements at the `[edit interfaces dln]` hierarchy level to support a minimum configuration for a dialer interface connected to a USB modem:

```
[edit interfaces dln]
encapsulation ppp;
unit logical-unit-number;
dialer-options {
    dial-string dial-string-numbers;
    pool pool-name <priority priority>;
}
ppp-options {
    chap;
    access-profile name;
    local-name name;
    passive;
}
family inet {
    mtu bytes;
    address address {
        destination address;
    }
}
```

For more information about configuring dial-in, see “Configuring Dial-In and Callback” on page 670.

Specifying OC768-over-OC192 Mode

The T-series routing platforms support OC768-over-OC192 mode on the 4-port OC192c PIC. In OC768-over-OC192 mode, four OC192 links are aggregated into one OC768 link with one logical interface. This single interface achieves data rates of approximately 40 Gbps. OC768 optics are expensive, and most long-distance networks currently use fiber optics and regenerators that cannot carry OC768 SONET. When you create an OC768 pipe as a large data pipe running over existing infrastructures, you transfer network traffic without link bonding or load sharing over parallel links. Load sharing is automatically accomplished in the JUNOS software using a proprietary method, and does not need to be manually configured.

The following limitations apply to OC768-over-OC192 mode:

- The maximum difference in delay between all links in the bundle is 8 μ (microseconds), equivalent to approximately 1.5 km maximum difference in length between the longest and shortest fiber pairs.
- If a single link in the bundle fails, the whole bundle fails. If link redundancy is required, implement an aggregated SONET/SDH bundle instead.
- Only routers that contain 4-port OC192 PICs can operate in OC768-over-OC192 mode.

To configure the 4-port OC192 PIC to operate in OC768-over-OC192 mode on a TX Matrix platform, include the **aggregate-ports** statement at the [edit chassis lcc lcc-number fpc slot-number pic pic-number] hierarchy level:

```
[edit chassis]
lcc lcc-number {
  fpc slot-number {
    pic pic-number {
      aggregate-ports;
    }
  }
}
...
```

To configure the 4-port OC192 PIC to operate in OC768-over-OC192 mode on a T640 routing node, include the **aggregate-ports** statement at the [edit chassis fpc slot-number pic pic-number] hierarchy level:

```
[edit chassis]
fpc slot-number {
  pic pic-number {
    aggregate-ports;
  }
}
...
```

When you configure the 4-port OC192 PIC for OC768-over-OC192 mode, only port 0 (the first port) needs be configured as the OC768 port.

To display logical and physical interface information, use the operational mode command **show interfaces so-fpc/pic/port extensive**. When this command is used for

the 4-port OC192 PIC configured for OC768-over-OC192 mode, only port 0 (*so-fpc/pic/0*) is displayed. This port is displayed as OC768.

Adding an Interface Description to the Configuration

You can include a text description of each physical interface in the configuration file. Any descriptive text you include is displayed in the output of the **show interfaces** commands, and is also exposed in the *ifAlias* Management Information Base (MIB) object. It has no impact on the interface's configuration. To add a text description, include the **description** statement at the **[edit interfaces *interface-name*]** hierarchy level:

```
[edit interfaces interface-name]
description text;
```

The description can be a single line of text. If the text contains spaces, enclose it in quotation marks.

For information about describing logical units, see “Adding a Logical Unit Description to the Configuration” on page 146.

Example: Adding an Interface Description to the Configuration

Add a description to a Fast Ethernet interface:

```
[edit interfaces]
user@host#
set fe-0/0/1 description "Backbone connection to PHL01"
[edit interfaces]
user@host#
show
fe-0/0/1 {
  description "Backbone connection to PHL01";
  unit 0 {
    family inet {
      address 192.168.0.1/30;
    }
  }
}
```

To display the description from the router CLI, use the **show interfaces** command:

```
user@host>
show interfaces fe-0/0/1
Physical interface: fe-0/0/1, Enabled, Physical link is Up
  Interface index: 129, SNMP ifIndex: 23
  Description: Backbone connection to PHL01
  ...
```

To display the interface description from the interfaces MIB, use the **snmpwalk** command from a server. To isolate information for a specific interface, search for the interface index shown in the **SNMP ifIndex** field of the **show interfaces** command output. The *ifAlias* object is in *ifXTable*.

```

user-server>snmpwalk host-fxp0.mylab public ifXTable | grep -e '\.23'
snmpwalk host-fxp0.mylab public ifXTable | grep -e '\.23'
ifMIB.ifMIBObjects.ifXTable.ifXEntry.ifName.23 = fe-0/0/1
ifMIB.ifMIBObjects.ifXTable.ifXEntry.ifInMulticastPkts.23 = Counter32: 0
ifMIB.ifMIBObjects.ifXTable.ifXEntry.ifInBroadcastPkts.23 = Counter32: 0
ifMIB.ifMIBObjects.ifXTable.ifXEntry.ifOutMulticastPkts.23 = Counter32: 0
ifMIB.ifMIBObjects.ifXTable.ifXEntry.ifOutBroadcastPkts.23 = Counter32: 0
ifMIB.ifMIBObjects.ifXTable.ifXEntry.ifHCInOctets.23 = Counter64: 0
ifMIB.ifMIBObjects.ifXTable.ifXEntry.ifHCInUcastPkts.23 = Counter64: 0
ifMIB.ifMIBObjects.ifXTable.ifXEntry.ifHCInMulticastPkts.23 = Counter64: 0
ifMIB.ifMIBObjects.ifXTable.ifXEntry.ifHCInBroadcastPkts.23 = Counter64: 0
ifMIB.ifMIBObjects.ifXTable.ifXEntry.ifHCOutOctets.23 = Counter64: 42
ifMIB.ifMIBObjects.ifXTable.ifXEntry.ifHCOutUcastPkts.23 = Counter64: 0
ifMIB.ifMIBObjects.ifXTable.ifXEntry.ifHCOutMulticastPkts.23 = Counter64: 0
ifMIB.ifMIBObjects.ifXTable.ifXEntry.ifHCOutBroadcastPkts.23 = Counter64: 0
ifMIB.ifMIBObjects.ifXTable.ifXEntry.ifLinkUpDownTrapEnable.23 = enabled(1)
ifMIB.ifMIBObjects.ifXTable.ifXEntry.ifHighSpeed.23 = Gauge32: 100
ifMIB.ifMIBObjects.ifXTable.ifXEntry.ifPromiscuousMode.23 = false(2)
ifMIB.ifMIBObjects.ifXTable.ifXEntry.ifConnectorPresent.23 = true(1)
ifMIB.ifMIBObjects.ifXTable.ifXEntry.ifAlias.23 = Backbone connection to PHL01
ifMIB.ifMIBObjects.ifXTable.ifXEntry.ifCounterDiscontinuityTime.23 = Timeticks:
(0) 0:00:00.00

```

Configuring the Link Characteristics

By default, the routing platform's management Ethernet interface, **fxp0**, autonegotiates whether to operate in full-duplex or half-duplex mode. Fast Ethernet and J-series Services Router Gigabit Ethernet interfaces can operate in either full-duplex or half-duplex mode, and all other interfaces can operate only in full-duplex mode. For Gigabit Ethernet, the link partner must also be set to full duplex.



NOTE: When you configure the Tri-Rate Ethernet copper interface to operate at 1 Gbps, autonegotiation must be enabled.



NOTE: When you manually configure Fast Ethernet interfaces on the M-series and T-series routers, link mode and speed must both be configured. If both these values are not configured, the router uses autonegotiation for the link and ignores the user-configured settings.

To explicitly configure an Ethernet interface to operate in either full-duplex or half-duplex mode, include the `link-mode` statement at the `[edit interfaces interface-name]` hierarchy level:

```

[edit interfaces interface-name]
link-mode (full-duplex | half-duplex);

```

Configuring the Media MTU

The default media MTU size used on a physical interface depends on the encapsulation used on that interface. In some cases, the default IP Protocol MTU depends on whether

the protocol used is IP version 4 (IPv4) or International Organization for Standardization (ISO). Table 11 on page 90 through Table 17 on page 93 list the media and protocol MTU sizes by interface type, and Table 20 on page 95 lists the encapsulation overhead by encapsulation type.

Table 11: Media MTU Sizes by Interface Type for M5, M7i, M10, M10i, M20, and M40 Routers

Interface Type	Default Media MTU (Bytes)	Maximum MTU (Bytes)	Default IP Protocol MTU (Bytes)
Adaptive Services (MTU size not configurable)	9192	N/A	N/A
ATM	4482	9192	4470
E1/T1	1504	9192	1500
E3/T3	4474	9192	4470
Fast Ethernet	1514	9192 (4-port) 1532 (8-port) 1532 (12-port)	1500 (IPv4) 1497 (ISO)
Gigabit Ethernet	1514	9192	1500 (IPv4) 1497 (ISO)
Serial	1504	9192	1500 (IPv4) 1497 (ISO)
SONET/SDH	4474	9192	4470

Table 12: Media MTU Sizes by Interface Type for M40e Routers

Interface Type	Default Media MTU (Bytes)	Maximum MTU (Bytes)	Default IP Protocol MTU (Bytes)
Adaptive Services (MTU size not configurable)	9192	N/A	N/A
ATM	4482	9192	4470
E1/T1	1504	4500	1500
E3/T3	4474	4500 9192 (4-port)	4470
E3/DS3 IQ	4474	9192	4470
Fast Ethernet	1514	4500	1500 (IPv4) 1497 (ISO)

Table 12: Media MTU Sizes by Interface Type for M40e Routers *(continued)*

Interface Type	Default Media MTU (Bytes)	Maximum MTU (Bytes)	Default IP Protocol MTU (Bytes)
Gigabit Ethernet	1514	9192 (1- or 2-port) 9192 (4-port)	1500 (IPv4) 1497 (ISO)
Serial	1504	9192	1500 (IPv4) 1497 (ISO)
SONET/SDH	4474	4500 (1-port nonconcatenated) 9192 (4-port OC3) 9192 (4-port OC3c) 4500 (1-port OC12) 4500 (4-port OC12) 4500 (4-port OC12c) 4500 (1-port OC48) 9192 (2-port OC3) 9192 (2-port OC3c) 9192 (1-port OC12c) 9192 (1-port OC48c) 4500 (1-port OC192) 9192 (1-port OC192c)	4470

Table 13: Media MTU Sizes by Interface Type for M160 Routers

Interface Type	Default Media MTU (Bytes)	Maximum MTU (Bytes)	Default IP Protocol MTU (Bytes)
Adaptive Services (MTU size not configurable)	9192	N/A	N/A
ATM	4482	9192	4470
E1/T1	1504	4500	1500
E3/T3	4474	4500	4470
E3/DS3 IQ	4474	9192	4470
Fast Ethernet	1514	4500	1500 (IPv4) 1497 (ISO)

Table 13: Media MTU Sizes by Interface Type for M160 Routers *(continued)*

Interface Type	Default Media MTU (Bytes)	Maximum MTU (Bytes)	Default IP Protocol MTU (Bytes)
Gigabit Ethernet	1514	9192 (1- or 2-port) 4500 (4-port)	1500 (IPv4) 1497 (ISO)
Serial	1504	9192	1500 (IPv4) 1497 (ISO)
SONET/SDH	4474	4500 (1-port nonconcatenated) 9192 (1- or 2-port) 4500 (4-port)	4470

Table 14: Media MTU Sizes by Interface Type for M320 and M120 Platforms

Interface Type	Default Media MTU (Bytes)	Maximum MTU (Bytes)	Default IP Protocol MTU (Bytes)
ATM2 IQ	4482	9192	4470
Channelized DS3 IQ	4471	4500	4470
Channelized E1 IQ	1504	4500	1500
Channelized OC12 IQ	4474	9192	4470
Channelized STM1 IQ	4474	9192	4470
DS3	4471	4500	4470
E1	1504	4500	1500
E3 IQ	4471	4500	4470
Fast Ethernet	1514	9192 (4-port) 1532 (8-, 12- and 48-port)	1500 (IPv4) 1497 (ISO)
Gigabit Ethernet	1514	9192	1500 (IPv4) 1497 (ISO)
SONET/SDH	4474	9192	4470
T1	1504	4500	1500

Table 15: Media MTU Sizes by Interface Type for T320 Platforms

Interface Type	Default Media MTU (Bytes)	Maximum MTU (Bytes)	Default IP Protocol MTU (Bytes)
ATM	4482	9192	4470
ATM2 IQ	4482	9192	4470
Channelized OC12 IQ	4474	9192	4470
Channelized STM1 IQ	4474	9192	4470
DS3	4471	4500	4470
Fast Ethernet	1514	4500 (4-port) 1532 (12- and 48-port)	1500 (IPv4) 1497 (ISO)
Gigabit Ethernet	1514	9192	1500 (IPv4) 1497 (ISO)
SONET/SDH	4474	9192	4470

Table 16: Media MTU Sizes by Interface Type for T640 Platforms

Interface Type	Default Media MTU (Bytes)	Maximum MTU (Bytes)	Default IP Protocol MTU (Bytes)
ATM2 IQ	4482	9192	4470
48-port Fast Ethernet	1514	1532	1500 (IPv4) 1497 (ISO)
Gigabit Ethernet	1514	9192	1500 (IPv4) 1497 (ISO)
SONET/SDH	4474	9192	4470

Table 17: Media MTU Sizes by Interface Type for J2300 Platforms

Interface Type	Default Media MTU (Bytes)	Maximum MTU (Bytes)	Default IP Protocol MTU (Bytes)
Fast Ethernet (10/100)	1514	9192	1500
G.SHDSL	4482	9150	4470
ISDN BRI	1504	4092	1500
Serial	1504	9150	1500
T1 or E1	1504	9150	1500

Table 18: Media MTU Sizes by Interface Type for J4300 and J6300 Platforms

Interface Type	Default Media MTU (Bytes)	Maximum MTU (Bytes)	Default IP Protocol MTU (Bytes)
ADSL2 + PIM	4482	9150	4470
Dual-Port Fast Ethernet (10/100) PIM	1514	9192	1500
Dual-Port Serial PIM	1504	9150	1500
Dual-Port T1 or E1 PIM	1504	9150	1500
Dual-Port Channelized T1/E1 PIM (channelized to DS0s)	1504	4500	1500
Dual-Port Channelized T1/E1 PIM (clear channel T1 or E1)	1504	9150	1500
Fast Ethernet (10/100) built-in interface	1514	9192	1500
G.SHDSL PIM	4482	9150	4470
4-Port ISDN BRI PIM	1504	4092	1500
T3 (DS3) or E3 PIM	4474	9192	4470

Table 19: Media MTU Sizes by Interface Type for J4350 and J6350 Platforms

Interface Type	Default Media MTU (Bytes)	Maximum MTU (Bytes)	Default IP Protocol MTU (Bytes)
4-Port ISDN BRI PIM	1504	4092	1500
ADSL2 + PIM	4482	9150	4470
Dual-Port Fast Ethernet (10/100) PIM	1514	9192	1500
Dual-Port Serial PIM	1504	9150	1500
Dual-Port T1 or E1 PIM	1504	9150	1500
Dual-Port Channelized T1/E1 PIM (channelized to DS0s)	1504	4500	1500
Dual-Port Channelized T1/E1 PIM (clear channel T1 or E1)	1504	9150	1500

Table 19: Media MTU Sizes by Interface Type for J4350 and J6350 Platforms *(continued)*

Interface Type	Default Media MTU (Bytes)	Maximum MTU (Bytes)	Default IP Protocol MTU (Bytes)
4-Port Fast Ethernet (10/100) ePIM	1518	1518	1500
Gigabit Ethernet (10/100/1000) built-in interface	1514	9018	1500
Gigabit Ethernet (10/100/1000) Enhanced Physical Interface Module (ePIM)	1514	9018	1500
Gigabit Ethernet (10/100/1000) SFP ePIM	1514	9018	1500
G.SHDSL PIM	4482	9150	4470
T3 (DS3) or E3 PIM	4474	9192	4470



NOTE: On Gigabit Ethernet ePIMs in J4350 and J6350 Services Routers, you can configure a maximum transmission unit (MTU) size of only 9018 bytes even though the CLI indicates that you can configure an MTU of up to 9192 bytes. If you configure an MTU greater than 9018 bytes, the router does not accept the configuration and generates a system log error message similar to the following:

```
/kernel: ge-0/0/0: Illegal media change. MTU invalid: 9192. Max MTU supported on this PIC: 9018
```

On 4-port Fast Ethernet ePIMs in J4350 and J6350 Services Routers, you can configure a maximum transmission unit (MTU) size of only 1518 bytes even though the CLI indicates that you can configure an MTU of up to 9192 bytes. If you configure an MTU greater than 1518 bytes, the router does not accept the configuration and generates a system log error message similar to the following:

```
/kernel: fe-3/0/1: Illegal media change. MTU invalid: 9192. Max MTU supported on this PIC: 1518
```

Table 20: Encapsulation Overhead by Encapsulation Type

Interface Encapsulation	Encapsulation Overhead (Bytes)
802.1Q/Ethernet 802.3	21
802.1Q/Ethernet Subnetwork Access Protocol (SNAP)	26

Table 20: Encapsulation Overhead by Encapsulation Type *(continued)*

Interface Encapsulation	Encapsulation Overhead (Bytes)
802.1Q/Ethernet version 2	18
ATM Cell Relay	4
ATM permanent virtual connection (PVC)	12
Cisco HDLC	4
Ethernet 802.3	17
Ethernet circuit cross-connect (CCC) and virtual private LAN service (VPLS)	4
Ethernet over ATM	32
Ethernet SNAP	22
Ethernet translational cross-connect (TCC)	18
Ethernet version 2	14
Extended virtual local area network (VLAN) CCC and VPLS	4
Extended VLAN TCC	22
Frame Relay	4
PPP	4
VLAN CCC	4
VLAN VPLS	4
VLAN TCC	22

The default media MTU is calculated as follows:

$$\text{Default media MTU} = \text{Default IP MTU} + \text{encapsulation overhead}$$

When you are configuring point-to-point connections, the MTU sizes on both sides of the connections must be the same. Also, when you are configuring point-to-multipoint connections, all interfaces in the subnet must use the same MTU size.



NOTE: The actual frames transmitted also contain cyclic redundancy check (CRC) bits, which are not part of the media MTU. For example, the media MTU for a Gigabit Ethernet Version 2 interface is specified as 1514 bytes, but the largest possible frame size is actually 1518 bytes; you need to consider the extra bits in calculations of MTUs for interoperability.

The physical MTU for Ethernet interfaces does not include the 4-byte frame check sequence (FCS) field of the Ethernet frame.

A SONET/SDH interface operating in concatenated mode has a “c” added to the rate descriptor. For example, a concatenated OC48 interface is referred to as OC48c.

If you do not configure an MPLS MTU, the JUNOS software derives the MPLS MTU from the physical interface MTU. From this value, the software subtracts the encapsulation-specific overhead and space for the maximum number of labels that might be pushed in the Packet Forwarding Engine. Currently, the software provides for three labels of four bytes each, for a total of 12 bytes.

In other words, the formula used to determine the MPLS MTU is the following:

$$\text{MPLS MTU} = \text{physical interface MTU} - \text{encapsulation overhead} - 12$$

If you configure an MTU value by including the `mtu` statement at the `[edit interfaces interface-name unit logical-unit-number family mpls]` hierarchy level, the configured value is used.

For information about configuring the encapsulation on an interface, see “Configuring Interface Encapsulation” on page 98.

To modify the default media MTU size for a physical interface, include the `mtu` statement at the `[edit interfaces interface-name]` hierarchy level:

```
[edit interfaces interface-name]
mtu bytes;
```

If you change the size of the media MTU, you must ensure that the size is equal to or greater than the sum of the protocol MTU and the encapsulation overhead.



NOTE: Changing the media MTU or protocol MTU causes an interface to be deleted and added again.

You configure the protocol MTU by including the `mtu` statement at the following hierarchy levels:

- `[edit interfaces interface-name unit logical-unit-number family family]`
- `[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number family family]`

Because tunnel services interfaces are considered logical interfaces, you cannot configure the MTU setting for the physical interface. This means you cannot include the `mtu` statement at the `[edit interfaces interface-name]` hierarchy level for the following interface types: generic routing encapsulation (`gr-`), IP-IP (`ip-`), loopback (`lo-`), link services (`ls-`), multilink services (`ml-`), and multicast (`pe-`, `pd-`). You can, however, configure the protocol MTU on tunnel interfaces, as described in “Setting the Protocol MTU” on page 177.

Configuring Interface Encapsulation

Point-to-Point Protocol (PPP) encapsulation is the default encapsulation type for physical interfaces. You need not configure encapsulation for any physical interfaces that support PPP encapsulation. If you do not configure encapsulation, PPP is used by default. For physical interfaces that do not support PPP encapsulation, you must configure an encapsulation to use for packets transmitted on the interface.

You can optionally configure an encapsulation on a logical interface, which is the encapsulation used within certain packet types. For more information about logical interface encapsulation, see “Configuring the Encapsulation on a Logical Interface” on page 150.

This section contains the following topics:

- Configuring the Encapsulation on a Physical Interface on page 98
- Encapsulation Capabilities on page 102

Configuring the Encapsulation on a Physical Interface

By default, PPP is the encapsulation type for physical interfaces. To configure the encapsulation on a physical interface, include the `encapsulation` statement at the `[edit interfaces interface-name]` hierarchy level:

```
[edit interfaces interface-name]
encapsulation (atm-ccc-cell-relay | atm-pvc | cisco-hdlc | cisco-hdlc-ccc | cisco-hdlc-tcc
| ethernet-ccc | ethernet-over-atm | ethernet-tcc | ethernet-vpls |
extended-frame-relay-ccc | extended-frame-relay-ether-type-tcc |
extended-frame-relay-tcc | extended-vlan-ccc | extended-vlan-tcc | extended-vlan-vpls
| flexible-ethernet-services | flexible-frame-relay | frame-relay | frame-relay-ccc |
frame-relay-ether-type | frame-relay-ether-type-tcc | frame-relay-port-ccc | frame-relay-tcc
| multilink-frame-relay-uni-nni | ppp | ppp-ccc | ppp-tcc | vlan-ccc | vlan-vpls);
```

The physical interface encapsulation can be one of the following:

- ATM CCC cell relay—Connects two remote virtual circuits or ATM physical interfaces with a label-switched path (LSP). Traffic on the circuit is ATM cells.

You can configure an ATM1 Physical Interface Card (PIC) to use cell-relay accumulation mode (CAM). In this mode, the incoming cells (1 to 8 cells) are packaged into a single packet and forwarded to the LSP. Cell-relay accumulation mode is not supported on ATM2 PICs. You configure CAM as shown in the following example:

```
[edit chassis]
```

```
fpc 1 {
  pic 0 {
    atm-cell-relay-accumulation;
  }
}
```

For more information, see the *JUNOS System Basics Configuration Guide*.

- **ATM PVC**—Defined in RFC 2684, *Multiprotocol Encapsulation over ATM Adaptation Layer 5*. When you configure physical ATM interfaces with ATM PVC encapsulation, an RFC 2684-compliant ATM Adaptation Layer 5 (AAL5) tunnel is set up to route the ATM cells over a Multiprotocol Label Switching (MPLS) path that is typically established between two MPLS-capable routing platforms using the Label Distribution Protocol (LDP).
- **Cisco HDLC**—E1, E3, SONET/SDH, T1, and T3 interfaces can use Cisco HDLC encapsulation. Two related versions are supported:
 - **CCC version (cisco-hdlc-ccc)**—The logical interface does not require an encapsulation statement. When you use this encapsulation type, you can configure the **ccc** family only.
 - **TCC version (cisco-hdlc-tcc)**—Similar to CCC and has the same configuration restrictions, but used for circuits with different media on either side of the connection.
- **Ethernet over ATM**—As defined in RFC 1483, *Multiprotocol Encapsulation over ATM Adaptation Layer 5*, this encapsulation type allows ATM interfaces to connect to devices that support only bridged-mode protocol data units (BPDUs). The JUNOS software does not completely support bridging, but accepts BPDU packets as a default gateway. If you use the router as an edge device, then the router acts as a default gateway. It accepts Ethernet logical link control (LLC)/SNAP frames with IP or Address Resolution Protocol (ARP) in the payload, and drops the rest. For packets destined to the Ethernet local area network (LAN), a route lookup is done using the destination IP address. If the route lookup yields a full address match, the packet is encapsulated with an LLC/SNAP and media access control (MAC) header, and the packet is forwarded to the ATM interface.
- **Ethernet cross-connect**—Ethernet interfaces without VLAN tagging can use Ethernet CCC encapsulation. Two related versions are supported:
 - **CCC version (ethernet-ccc)**—Ethernet interfaces with standard Tag Protocol ID (TPID) tagging can use Ethernet CCC encapsulation. When you use this encapsulation type, you can configure the **ccc** family only.
 - **TCC version (ethernet-tcc)**—Similar to CCC, but used for circuits with different media on either side of the connection.

For 8-port, 12-port, and 48-port Fast Ethernet PICs, TCC is not supported.

- **VLAN CCC (vlan-ccc)**—Ethernet interfaces with VLAN tagging enabled can use VLAN CCC encapsulation. VLAN CCC encapsulation supports TPID 0x8100 only. When you use this encapsulation type, you can configure the **ccc** family only.
- **Extended VLAN cross-connect**—Gigabit Ethernet interfaces with VLAN 802.1Q tagging enabled can use extended VLAN cross-connect encapsulation. (Ethernet

interfaces with standard TPID tagging can use VLAN CCC encapsulation.) Two related versions of extended VLAN cross-connect are supported:

- CCC version (**extended-vlan-ccc**)—Extended VLAN CCC encapsulation supports TPIDs 0x8100, 0x9100, and 0x9901. When you use this encapsulation type, you can configure the **ccc** family only.
- TCC version (**extended-vlan-tcc**)—Similar to CCC, but used for circuits with different media on either side of the connection.

For 8-port, 12-port, and 48-port Fast Ethernet PICs, extended VLAN CCC is not supported. For 4-port Gigabit Ethernet PICs, extended VLAN CCC and extended VLAN TCC are not supported.

- Ethernet VPLS (**ethernet-vpls**)—Ethernet interfaces with VPLS enabled can use Ethernet VPLS encapsulation. For more information about VPLS, see the *JUNOS VPNs Configuration Guide* and the *JUNOS Feature Guide*.
- Ethernet VLAN VPLS (**vlan-vpls**)—Ethernet interfaces with VLAN tagging and VPLS enabled can use Ethernet VLAN VPLS encapsulation. For more information about VPLS, see the *JUNOS VPNs Configuration Guide* and the *JUNOS Feature Guide*.
- Extended VLAN VPLS (**extended-vlan-vpls**)—Ethernet interfaces with VLAN 802.1Q tagging and VPLS enabled can use Ethernet Extended VLAN VPLS encapsulation. (Ethernet interfaces with standard TPID tagging can use Ethernet VLAN VPLS encapsulation.) Extended Ethernet VLAN VPLS encapsulation supports TPIDs 0x8100, 0x9100, and 0x9901. For more information about VPLS, see the *JUNOS VPNs Configuration Guide* and the *JUNOS Feature Guide*.
- Flexible Ethernet services (**flexible-ethernet-services**)—Gigabit Ethernet IQ and Gigabit Ethernet PICs with SFPs (except the 10-port Gigabit Ethernet PIC and the built-in Gigabit Ethernet port on the M7i platform) can use flexible Ethernet services encapsulation. Aggregated Ethernet bundles cannot use this encapsulation type. You use this encapsulation type when you want to configure multiple per-unit Ethernet encapsulations. This encapsulation type allows you to configure any combination of route, TCC, CCC, Layer 2 virtual private networks (VPNs), and VPLS encapsulations on a single physical port. If you configure flexible Ethernet services encapsulation on the physical interface, VLAN IDs from 1 through 511 are no longer reserved for normal VLANs.
- Flexible Frame Relay (**flexible-frame-relay**)—IQ interfaces can use flexible Frame Relay encapsulation. You use flexible Frame Relay encapsulation when you want to configure multiple per-unit Frame Relay encapsulations. This encapsulation type allows you to configure any combination of TCC, CCC, and standard Frame Relay encapsulations on a single physical port. Also, each logical interface can have any data-link connection identifier (DLCI) value from 1 through 1022.
- Frame Relay (**frame-relay**)—Defined in RFC 1490, *Multiprotocol Interconnect over Frame Relay*. E1, E3, link services, SONET/SDH, T1, T3, and voice services interfaces can use Frame Relay encapsulation. Five related versions are supported:

- CCC version (**frame-relay-ccc**)—The same as standard Frame Relay for DLCIs 0 through 511. DLCIs 512 through 1022 are dedicated to CCC. The logical interface must also have **frame-relay-ccc** encapsulation. When you use this encapsulation type, you can configure the **ccc** family only.
- TCC version (**frame-relay-tcc**)—Similar to Frame Relay CCC and has the same configuration restrictions, but used for circuits with different media on either side of the connection.
- Extended CCC version (**extended-frame-relay-ccc**)—This encapsulation type allows you to dedicate DLCIs 1 through 1022 to CCC. The logical interface must have **frame-relay-ccc** encapsulation. When you use this encapsulation type, you can configure the **ccc** family only.
- Extended TCC version (**extended-frame-relay-tcc**)—Similar to extended Frame Relay CCC, this encapsulation type allows you to dedicate DLCIs 1 through 1022 to TCC, which is used for circuits with different media on either side of the connection.
- Port CCC version (**frame-relay-port-ccc**)—Defined in the IETF document *Frame Relay Encapsulation over Pseudo-Wires* (expired December 2002). This encapsulation type allows you to transparently carry all the DLCIs between two customer edge (CE) routers without explicitly configuring each DLCI on the two provider edge (PE) routers with Frame Relay transport. The connection between the two CE routers can be either user-to-network interface (UNI) or network-to-network interface (NNI); this is completely transparent to the PE routers. The logical interface does not require an encapsulation statement. When you use this encapsulation type, you can configure the **ccc** family only.
- Frame Relay Ether Type (**frame-relay-ether-type**)—Physical interfaces can use Frame Relay ether type encapsulation for compatibility with Cisco Frame Relay. IETF frame relay encapsulation identifies the payload format using NLPID and SNAP formats. Cisco-compatible Frame Relay encapsulation uses the Ethernet type to identify the type of payload. Two related versions are supported:
 - TCC version (**frame-relay-ether-type-tcc**)—Cisco-compatible Frame Relay for DLCIs 0 through 511. DLCIs 512 through 1022 are dedicated to TCC. This numbering restriction does not apply to IQ interfaces. This encapsulation is used for circuits with different media on either side of the connection.
 - Extended TCC version (**extended-frame-relay-ether-type-tcc**)—This encapsulation allows you to dedicate Cisco-compatible Frame Relay TCC for DLCIs 1 through 1022. This encapsulation is used for circuits with different media on either side of the connection.
- Multilink Frame Relay (MLFR) UNI and NNI (**multilink-frame-relay-uni-nni**)—Link services and voice services interfaces functioning as FRF.16 bundles can use multilink Frame Relay UNI NNI encapsulation. This encapsulation is also used on link services and voice services interfaces' constituent T1, E1, or NxDS0 interfaces.
- PPP—Defined in RFC 1661, *The Point-to-Point Protocol (PPP) for the Transmission of Multiprotocol Datagrams over Point-to-Point Links*. PPP is the default encapsulation type for physical interfaces. E1, E3, SONET/SDH, T1, and T3 interfaces can use PPP encapsulation. Two related versions are supported:

- Circuit cross-connect (CCC) version (**ppp-ccc**)—The logical interface does not require an encapsulation statement. When you use this encapsulation type, you can configure the **ccc** family only.
- Translational cross-connect (TCC) version (**ppp-tcc**)—Similar to CCC and has the same configuration restrictions, but used for circuits with different media on either side of the connection.



NOTE: When the encapsulation type is set to Cisco-compatible Frame Relay encapsulation, ensure that the LMI type is set to ANSI or Q933-A.

Encapsulation Capabilities

When you configure a point-to-point encapsulation (such as PPP or Cisco HDLC) on a physical interface, the physical interface can have only one logical interface (that is, only one **unit** statement) associated with it. When you configure a multipoint encapsulation (such as Frame Relay), the physical interface can have multiple logical units, and the units can be either point-to-point or multipoint.

Ethernet CCC encapsulation for Ethernet interfaces with standard TPID tagging requires that the physical interface have only a single logical interface. Ethernet interfaces in VLAN mode can have multiple logical interfaces.

For Ethernet interfaces in VLAN mode, VLAN IDs are applicable as follows:

- VLAN ID 0 is reserved for tagging the priority of frames.
- For encapsulation type **vlan-ccc**, VLAN IDs 1 through 511 are reserved for normal VLANs. VLAN IDs 512 and above are reserved for VLAN CCCs.
- For encapsulation type **vlan-vpls**, VLAN IDs 1 through 511 are reserved for normal VLANs, and VLAN IDs 512 through 4094 are reserved for VPLS VLANs. For 4-port Fast Ethernet interfaces, you can use VLAN IDs 512 through 1024 for VPLS VLANs.
- For Gigabit Ethernet IQ interfaces and Gigabit Ethernet PICs with SFPs (except the 10-port Gigabit Ethernet PIC and the built-in Gigabit Ethernet port on the M7i platform), you can configure flexible Ethernet services encapsulation on the physical interface. For interfaces with **flexible-ethernet-services** encapsulation, all VLAN IDs are valid. VLAN IDs from 1 through 511 are not reserved.
- For encapsulation types **extended-vlan-ccc** and **extended-vlan-vpls**, all VLAN IDs are valid.

The upper limits for configurable VLAN IDs vary by interface type. For more information, see “Configuring 802.1Q VLANs” on page 525.

When you configure a TCC encapsulation, some modifications are needed to handle VPN connections over unlike Layer 2 and Layer 2.5 links and terminate the Layer 2 and Layer 2.5 protocol locally.

The routing platform performs the following media-specific changes:

- PPP TCC—Both Link Control Protocol (LCP) and Network Control Protocol (NCP) are terminated on the routing platform. Internet Protocol Control Protocol (IPCP) IP address negotiation is not supported. The JUNOS software strips all PPP encapsulation data from incoming frames before forwarding them. For output, the next hop is changed to PPP encapsulation.
- Cisco HDLC TCC—Keepalive processing is terminated on the routing platform. The JUNOS software strips all Cisco HDLC encapsulation data from incoming frames before forwarding them. For output, the next hop is changed to Cisco HDLC encapsulation.
- Frame Relay TCC—All Local Management Interface (LMI) processing is terminated on the routing platform. The JUNOS software strips all Frame Relay encapsulation data from incoming frames before forwarding them. For output, the next hop is changed to Frame Relay encapsulation.
- ATM—Operation, Administration, and Maintenance (OAM) and Interim Local Management Interface (ILMI) processing is terminated at the routing platform. Cell relay is not supported. The JUNOS software strips all ATM encapsulation data from incoming frames before forwarding them. For output, the next hop is changed to ATM encapsulation.

Example: Configuring the Encapsulation on a Physical Interface

Configure PPP encapsulation on a SONET/SDH interface. The second and third family statements allow Intermediate System-to-Intermediate System (IS-IS) and MPLS to run on the interface.

```
[edit interfaces]
so-7/0/0 {
  encapsulation ppp;
  unit 0 {
    point-to-point;
    family inet {
      address 192.168.1.113/32 {
        destination 192.168.1.114;
      }
    }
    family iso;
    family mpls;
  }
}
```

Configuring the PPP Challenge Handshake Authentication Protocol

For interfaces with PPP encapsulation, you can configure interfaces to support the PPP Challenge Handshake Authentication Protocol (CHAP), as defined in RFC 1994, *PPP Challenge Handshake Authentication Protocol (CHAP)*. When you enable CHAP on an interface, the interface can authenticate its peer and can be authenticated by its peer.

By default, PPP CHAP is disabled. If CHAP is not explicitly enabled, the interface makes no CHAP challenges and denies all incoming CHAP challenges. To enable CHAP, you must create an access profile, and you must configure the interfaces to use CHAP.

To configure a CHAP access profile, include the **profile** statement and specify a profile name at the [edit access] hierarchy level:

```
[edit access]
profile profile-name {
  client name chap-secret data;
}
```

For more information about configuring access profiles, see the *JUNOS System Basics Configuration Guide*.

When you configure an interface to use CHAP, you must assign an access profile to the interface. When an interface receives CHAP challenges and responses, the access profile in the packet is used to look up the shared secret, as defined in RFC 1994.

If no matching access profile is found for the CHAP challenge that was received by the interface, the optionally configured default CHAP secret is used. The default CHAP secret is useful if the CHAP name of the peer is unknown, or if the CHAP name changes during PPP link negotiation.

To configure PPP CHAP on an interface with PPP encapsulation, include the **chap** statement at the [edit interfaces *interface-name* ppp-options] hierarchy level:

```
[edit interfaces interface-name ppp-options]
chap {
  access-profile name;
  default-chap-secret name;
  local-name name;
  passive;
}
```

On each interface with PPP encapsulation, you can configure the following PPP CHAP properties:

- Assigning an Access Profile to an Interface on page 105
- Configuring a Default CHAP Secret on page 105
- Configuring the Local Name on page 105
- Configuring Passive Mode on page 105
- Example: Configuring the PPP Challenge Handshake Authentication Protocol on page 106

When you configure PPP over ATM or Multilink PPP over ATM encapsulation, you can enable CHAP on the logical interface. For more information, see “Configuring PPP over ATM2 Encapsulation” on page 310.

Assigning an Access Profile to an Interface

To assign an access profile to an interface, include the `access-profile` statement at the `[edit interfaces interface-name ppp-options chap]` hierarchy level:

```
[edit interfaces interface-name ppp-options chap]
access-profile name;
```

You must include the `access-profile` statement when you configure the CHAP authentication method. If an interface receives a CHAP challenge or response from a peer that is not in the applied access profile, the link is immediately dropped unless a default CHAP secret has been configured. For information about configuring the default CHAP secret, see “Configuring a Default CHAP Secret” on page 105.

Configuring a Default CHAP Secret

To configure a default CHAP secret for an interface, include the `default-chap-secret` statement at the `[edit interfaces interface-name ppp-options chap]` hierarchy level:

```
[edit interfaces interface-name ppp-options chap]
default-chap-secret name;
```

The default CHAP secret is used when no matching CHAP access profile exists, or if the CHAP name changes during PPP link negotiation.

Configuring the Local Name

By default, when CHAP is enabled on an interface, the interface uses the routing platform’s system hostname as the name sent in CHAP challenge and response packets.

To configure the name the interface uses in CHAP challenge and response packets, include the `local-name` statement at the `[edit interfaces interface-name ppp-options chap]` hierarchy level:

```
[edit interfaces interface-name ppp-options chap]
local-name name;
```

The local name is any string from 1 to 250 characters in length, starting with an alphanumeric or underscore character, and including only the following characters:

`a-z A-Z 0-9 % @ # / \ . _ -`

Configuring Passive Mode

By default, when CHAP is enabled on an interface, the interface always challenges its peer and responds to challenges from its peer.

You can configure the interface not to challenge its peer, and only respond when challenged. To configure the interface not to challenge its peer, include the `passive` statement at the `[edit interfaces interface-name ppp-options chap]` hierarchy level:

```
[edit interfaces interface-name ppp-options chap]
passive;
```

Example: Configuring the PPP Challenge Handshake Authentication Protocol

Configure CHAP:

```
[edit access]
profile pe-A-ppp-clients;
client cpe-1 chap-secret "$1$dQYsZ$B5ojUeUjDsUo.yKwcCZ0";
      # SECRET-DATA
client cpe-2 chap-secret "$1$kdAsfaDAfkdjDsASxfafdKdFKJ";
      # SECRET-DATA
[edit interfaces so-1/2/0]
encapsulation ppp;
ppp-options {
  chap {
    access-profile pe-A-ppp-clients;
    default-chap-secret "$9$mPafafhdsaiufhyrv1Rxd";
    local-name "pe-A-so-1/1/1";
  }
}
[edit interfaces so-1/1/2]
encapsulation ppp;
ppp-options {
  chap {
    access-profile pe-A-ppp-clients;
    default-chap-secret "$9$mPafafhdsaiufhyrv1Rxd";
    local-name "pe-A-so-1/1/2";
  }
}
```

Configuring the PPP Password Authentication Protocol

For interfaces with PPP encapsulation, you can configure interfaces to support the Password Authentication Protocol (PAP), as defined in RFC 1334, *PAP Authentication Protocols*. If authentication is configured, the PPP link negotiates using CHAP or PAP protocol for authentication during the Link Control Protocol (LCP) negotiation phase. PAP is only performed after the link establishment phase (LCP up) portion of the authentication phase.

During authentication, the PPP link sends a PAP authentication-request packet to the peer with an ID and password. The authentication-request packet is sent every 2 seconds, similar to the CHAP challenge, until a response is received (acknowledgment packet, nonacknowledgment packet). If an acknowledgment packet is received, the PPP link transitions to the next state, the network phase. If a nonacknowledgment packet is received, an LCP terminate request is sent, and the PPP link goes back to the link establishment phase. If no response is received, and an optional retry counter is set to **true**, a new request acknowledgment packet is resent. If the retry counter expires, the PPP link transitions to the LCP negotiate phrase.

You can configure the PPP link with PAP in passive mode. By default, when PAP is enabled on an interface, the interface always sends authenticate-request packets to the peer, and requires that the peer acknowledge the authenticate-request packets. In passive mode, the router with the PPP link configured for PAP authenticates any incoming connections, but will not require the peer to authenticate its connection.

Both CHAP and PAP authentication can be configured on a PPP interface. If both are configured, CHAP is negotiated first. If CHAP authentication fails, PAP authentication is negotiated.

To enable PAP, you must create an access profile, and you must configure the interfaces to use PAP.

To configure a PAP access profile, include the **profile** statement and specify a profile name at the **[edit access]** hierarchy level:

```
[edit access]
profile profile-name {
  client name;
  pap-password password;
}
```

For more information about configuring access profiles, see the *JUNOS System Basics Configuration Guide*.

When you configure an interface to use PAP, you must assign an access profile to the interface. When an interface receives PAP authentication requests, the access profile in the packet is used to look up the password.

If no matching access profile is found for the PAP authentication request that was received by the interface, the optionally configured default PAP password is used. For information about configuring the default PAP password, see “Configuring PPP PAP Authentication” on page 152.

To configure PPP PAP on a physical interface with PPP encapsulation, include the **pap** statement at the **[edit interfaces interface-name ppp-options]** hierarchy level:

```
[edit interfaces interface-name ppp-options]
pap {
  access-profile name;
  local-name name;
  local-password password;
  passive;
}
```

To configure PPP PAP on a logical interface with PPP encapsulation, include the **pap** statement with options:

```
pap {
  default-pap-password password;
  local-name name;
  local-password password;
  passive;
}
```

You can include these statements at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

For more information about configuring PAP for logical interfaces, see “Configuring PPP PAP Authentication” on page 152. For information about configuring tracing operations for PPP, see “Tracing Operations of the pppd Process” on page 110.

On each physical interface with PPP encapsulation, you can perform one of the following tasks:

- Configuring the Local Name on page 108
- Configuring the Local Password on page 108
- Configuring Passive Mode on page 108
- Example: Configuring PAP Authentication Protocol on page 109

Configuring the Local Name

By default, when PAP is enabled on an interface, the interface uses the routing platform’s system hostname as the name sent in PAP request and response packets.

To configure the name the interface uses in PAP request and response packets, include the `local-name` statement at the [edit interfaces *interface-name* ppp-options pap] hierarchy level:

```
[edit interfaces interface-name ppp-options pap]
local-name name;
```

Configuring the Local Password

You need to configure the password to be used for authentication. To configure the host password for sending PAP requests, include the `local-password` statement at the [edit interfaces *interface-name* ppp-options pap] hierarchy level:

```
local-password password;
```

Configuring Passive Mode

By default, when PAP is enabled on an interface, the interface always sends authenticate-request packets to the peer, and requires that the peer acknowledge the authenticate-request packets. However, some peer routers may not support bidirectional authentication. In these cases, you can instead configure PAP to operate in passive mode. In passive mode, the router with the PPP link configured for PAP authenticates any incoming connections, but will not require the peer to authenticate its connection.

To configure the interface to authenticate with PAP in passive mode, include the `passive` statement at the [edit interfaces *interface-name* ppp-options pap] hierarchy level:

```
[edit interfaces interface-name ppp-options pap]
passive;
```

Example: Configuring PAP Authentication Protocol

Configure a PAP access profile, the physical and logical interfaces, and tracing operations for PPP.

For PAP authentication, a username and password for the peer is configured in the access profile, along with a PAP password. Each user can have either a PAP password or a CHAP secret.

```
[edit access]
profile userlist1;
client {
  papuser {
    pap-password "%^***"; # SECRET-DATA;
  }
  chapuser {
    chap-secret "%^***"; # SECRET-DATA;
  }
}
```

To configure the same name for the PAP password and the CHAP secret, configure the client with two different access profiles:

```
[edit access]
profile chap-profile;
client {
  sjcrouter {
    chap-secret "%^***"; # SECRET-DATA;
  }
  boston {
    chap-secret "%^***"; # SECRET-DATA;
  }
}
profile pap-profile;
client {
  sjcrouter {
    pap-password "%^***"; # SECRET-DATA;
  }
  boston {
    pap-password "%^***"; # SECRET-DATA;
  }
}
```

Configure the physical interface, including the access profile name to be used for PPP authentication:

```
[edit interfaces so-0/0/0]
ppp-options {
  pap {
    access-profile "pap-profile";
    local-name "rtrnum1";
    local-password "XXXXXXX"; #SECRET-DATA
```

```

        passive;
    }
}

```

Configure the logical interface, including the default PAP password to be used, should the access profile not be located during authentication:

```

[edit interfaces so-0/0/0]
encapsulation frame-relay;
unit 0 {
    dlci 100;
    encapsulation frame-relay-ppp;
    ppp-options {
        pap {
            local-name "rtrnum1";
            local-password "XXXXXXX"; #SECRET-DATA
            default-pap-password "XXXXX"; #SECRET-DATA
            passive;
        }
    }
}

```

Include the `pap` statement to trace PPP protocol operations:

```

[edit protocols]
ppp {
    traceoptions {
        flag {
            pap;
        }
    }
}

```

Monitoring a PPP Session

You can monitor PPP packet exchanges. When monitoring is enabled, packets exchanged during a session are logged by default to `/var/log/pppd`, or to the file specified in the `traceoptions` statement.

To configure PPP packet monitoring, include the `monitor-session` statement at the `[edit protocols ppp]` hierarchy level:

```

[edit protocols ppp]
monitor-session (interface-name | all);

```

When monitoring is configured, the operational mode commands `show ppp summary` and `show ppp interface` display a **Monitored** flag in the **Session flags** column or line.

Tracing Operations of the pppd Process

To trace the operations of the routing platform's `pppd` process, include the `traceoptions` statement at the `[edit protocols ppp]` hierarchy level:


```
[edit protocols ppp]
traceoptions {
  flag flag <disable>;
  file filename <files number> <size size>
  <world-readable | no-world-readable> <match regex>;
  level detail-level;
}
```

To specify more than one tracing operation, include multiple **flag** statements.

You can specify the following flags in the **traceoptions** statement:

- **access**—Access code
- **address-pool**—Address pool code
- **all**—All areas of code
- **auth**—Authentication code
- **chap**—Challenge Handshake Authentication Protocol (CHAP) code
- **config**—Configuration code
- **ifdb**—Interface database code
- **lcp**—LCP state machine code
- **memory**—Memory management code
- **message**—Message processing code
- **ncp**—NCP state machine code
- **pap**—Password Authentication Protocol (PAP) code
- **ppp**—PPP protocol processing code
- **radius**—RADIUS processing code
- **rtsock**—Routing socket code
- **session**—Session management code
- **signal**—Signal handling code
- **timer**—Timer code
- **ui**—User interface code

For general information about tracing, see the tracing and logging information in the *JUNOS System Basics Configuration Guide*.

Configuring PPP Address and Control Field Compression

For interfaces with PPP, PPP CCC, or PPP TCC encapsulation, you can configure compression of the Data Link Layer address and control fields, as defined in RFC 1661, *The Point-to-Point Protocol (PPP)*. By default, the address and control fields are not compressed. This means PPP-encapsulated packets are transmitted with two 1-byte fields (0xff and 0x03). If you configure address and control field compression (ACFC) and ACFC is successfully negotiated with the local router's peer, the local router

transmits packets without these 2 bytes. ACFC allows you to conserve bandwidth by transmitting less data.

On M320, M120, and T-series routing platforms, ACFC is not supported for any ISO family protocols. Do not include the `acfc` statement at the `[edit interfaces interface-name ppp-options compression]` hierarchy level when you include the `family iso` statement at the `[edit interfaces interface-name unit logical-unit-number]` hierarchy level.



NOTE: The address and control fields cannot be compressed in Link Control Protocol (LCP) packets.

The PPP session restarts when you configure or modify compression options.

To configure ACFC, include the `compression` statement at the `[edit interfaces interface-name ppp-options]` hierarchy level, and specify `acfc`:

```
[edit interfaces interface-name ppp-options]
compression acfc;
```

This configuration causes the local router to try to negotiate ACFC with its peer. If ACFC is successfully negotiated, the local router sends packets with compressed address and control fields. When you include the `compression acfc` statement in the configuration, the PPP session restarts, and the local router sends the ACFC option in the LCP Configure-Request packet. The ACFC option informs the local router's peer that the local router can receive packets with compression. If the peer indicates that it, too, can receive packets with compression, then ACFC is negotiated. If ACFC is successfully negotiated, the local router can receive packets with or without the address and control bytes included.

To monitor the configuration, issue the `show interfaces interface-name` command. Configured options are displayed in the `link flags` field for the physical interface. Successfully negotiated options are displayed in the `flags` field for the logical interface. In this example, both ACFC and PFC are configured, but neither compression feature has been successfully negotiated.

```
user@router# run show interfaces so-0/1/1
Physical interface: so-0/1/1, Enabled, Physical link is Up
  Interface index: 133, SNMP ifIndex: 27
  Link-level type: PPP, MTU: 4474, Clocking: Internal, SONET mode, Speed: OC3,
  Loopback: None, FCS: 16
  Payload scrambler: Enabled
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps 16384
  Link flags     : No-Keepalives ACFC PFC
  LCP state: Opened
  NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mpls:
  Not-configured
  CHAP state: Not-configured
  CoS queues   : 4 supported
  Last flapped : 2004-12-29 10:49:32 PST (00:18:35 ago)
  Input rate    : 0 bps (0 pps)
  Output rate   : 0 bps (0 pps)
  SONET alarms  : None
```

```

SONET defects : None
Logical interface so-0/1/1.0 (Index 68) (SNMP ifIndex 169)
Flags: Point-To-Point SNMP-Traps ACFC Encapsulation: PPP
Protocol inet, MTU: 4470
Flags: None
Addresses, Flags: Is-Preferred Is-Primary
Destination: 3.3.3/24, Local: 3.3.3.2, Broadcast: 3.3.3.255

```

Configuring the PPP Protocol Field Compression

For interfaces with PPP, PPP CCC, or PPP TCC encapsulation, you can configure protocol field compression. By default, the protocol field is not compressed. This means PPP-encapsulated packets are transmitted with a two-byte protocol field. For example, IPv4 packets are transmitted with the protocol field set to 0x0021, and MPLS packets are transmitted with the protocol field set to 0x0281.

For all protocols with identifiers in the range 0x0000 through 0x00ff, you can configure the router to compress the protocol field to one byte, as defined in RFC 1661, *The Point-to-Point Protocol (PPP)*. Protocol field compression (PFC) allows you to conserve bandwidth by transmitting less data.



NOTE: The protocol field cannot be compressed in Link Control Protocol (LCP) packets.

The PPP session restarts when you configure or modify compression options.

To configure PFC, include the **compression** statement at the [edit interfaces *interface-name* ppp-options] hierarchy level, and specify **pfc**:

```

[edit interfaces interface-name ppp-options]
compression pfc;

```

This configuration causes the local router to try to negotiate PFC with its peer. If PFC is successfully negotiated, the local router sends packets with compressed protocol fields. When you include the **compression pfc** statement in the configuration, the PPP session restarts, and the local router sends the PFC option in the LCP Configure-Request packet. The PFC option informs the local router's peer that the local router can receive packets with compression. If the peer indicates that it, too, can receive packets with compression, then PFC is negotiated. If PFC is successfully negotiated, the local router can receive packets with either 2-byte (uncompressed) or 1-byte (compressed) protocol fields.

To monitor the configuration, issue the **show interfaces *interface-name*** command. Configured options are displayed in the **link flags** field for the physical interface. Successfully negotiated options are displayed in the **flags** field for the logical interface. In this example, both ACFC and PFC are configured, but neither compression feature has been successfully negotiated.

```

user@router# run show interfaces so-0/1/1
Physical interface: so-0/1/1, Enabled, Physical link is Up
Interface index: 133, SNMP ifIndex: 27

```

```

Link-level type: PPP, MTU: 4474, Clocking: Internal, SONET mode, Speed: OC3,
Loopback: None, FCS: 16,
Payload scrambler: Enabled
Device flags   : Present Running
Interface flags: Point-To-Point SNMP-Traps 16384
Link flags     : No-Keepalives ACFC PFC
LCP state: Opened
NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mpls:
Not-configured
CHAP state: Not-configured
CoS queues   : 4 supported
Last flapped : 2004-12-29 10:49:32 PST (00:18:35 ago)
Input rate    : 0 bps (0 pps)
Output rate   : 0 bps (0 pps)
SONET alarms  : None
SONET defects : None
Logical interface so-0/1/1.0 (Index 68) (SNMP ifIndex 169)
Flags: Point-To-Point SNMP-Traps ACFC Encapsulation: PPP
Protocol inet, MTU: 4470
Flags: None
Addresses, Flags: Is-Preferred Is-Primary
Destination: 3.3.3/24, Local: 3.3.3.2, Broadcast: 3.3.3.255

```

Configuring the Interface Speed

You can configure the interface speed on the following interfaces:

- Management Ethernet Interface on M-series and T-series Routing Platforms on page 114
- Gigabit Ethernet Interfaces on J-series Services Routers on page 115
- Fast Ethernet Interface on page 115
- Tri-Rate Ethernet Copper Interface on page 116
- SONET/SDH Interface on page 116

Management Ethernet Interface on M-series and T-series Routing Platforms

By default, the M-series and T-series routing platforms management Ethernet interface, `fxp0`, autonegotiates whether to operate at 10 megabits per second (Mbps) or 100 Mbps. All other interfaces automatically choose the correct speed based on the PIC type and whether the PIC is configured to operate in multiplexed mode (using the `no-concatenate` statement in the `[edit chassis]` configuration hierarchy, as described in the *JUNOS System Basics Configuration Guide*).

To configure the management Ethernet interface to operate at 10 Mbps or 100 Mbps, include the `speed` statement at the `[edit interfaces fxp0]` hierarchy level:

```

[edit interfaces fxp0]
speed (10m | 100m);

```

For information about configuring the link mode, see “Configuring the Link Characteristics” on page 520.



NOTE: The fxp0 interface does not support CoS.

Gigabit Ethernet Interfaces on J-series Services Routers

By default, Gigabit Ethernet interfaces (both built-in and PIMs) for J-series Services Routers autonegotiate whether to operate at 10 megabits per second (Mbps), 100 Mbps, or 1000 Mbps.

To configure a J-series Gigabit Ethernet interface to operate at 10 Mbps, 100 Mbps, or 1000 Mbps, include the **speed** statement at the [edit interfaces *ge-pim/O/port*] hierarchy level:

```
[edit interfaces ge-pim/O/port]
speed (10m | 100m | 1g);
```

For information about configuring the link mode, see “Configuring the Link Characteristics” on page 520.

Fast Ethernet Interface

By default, both of the built-in Fast Ethernet ports on the M7i router FIC autonegotiate whether to operate at 10 Mbps or 100 Mbps. All other interfaces automatically choose the correct speed based on the PIC type and whether the PIC is configured to operate in multiplexed mode (using the **no-concatenate** statement at the [edit chassis] hierarchy level, as described in the *JUNOS System Basics Configuration Guide*).

If the link partner does not support autonegotiation, configure either Fast Ethernet port manually to match its link partner's speed and link mode. When the link mode is configured, autonegotiation is disabled.



NOTE: When you manually configure Fast Ethernet interfaces on the M-series and T-series routers, link mode and speed must both be configured. If both these values are not configured, the router uses autonegotiation for the link and ignores the user-configured settings.

To configure a Fast Ethernet port on the FIC to operate at 10 Mbps or 100 Mbps, include the **speed** statement at the [edit interfaces *fe-fpc/pic/port*] hierarchy level:

```
[edit interfaces fe-fpc/pic/port]
speed (10m | 100m);
```

For information about configuring the link mode, see “Configuring the Link Characteristics” on page 520.

Tri-Rate Ethernet Copper Interface

By default, the Tri-Rate Ethernet copper interfaces on MX-series routers operate at 1 Gbps. Tri-Rate Ethernet copper interfaces can also be configured to operate at 10 Mbps, 100 Mbps, or 1 Gbps.



NOTE: When you configure the Tri-Rate Ethernet copper interface to operate at 1 Gbps, autonegotiation must be enabled.

To configure a Tri-Rate Ethernet copper interface to operate at 10 Mbps, 100 Mbps, or 1 Gbps, include the **speed** statement at the `[edit interfaces ge-fpc/pic/port]` hierarchy level:

```
[edit interfaces ge-fpc/pic/port]
speed (10m | 100m | 1g);
```

For information about configuring the link mode, see “Configuring the Link Characteristics” on page 520.

SONET/SDH Interface

You can configure the speed of SONET/SDH interfaces on next-generation SONET/SDH Type 1 and Type 2 PICs with SFP. The speed you select is dependent upon whether the PIC is in concatenated or nonconcatenated mode. In concatenated mode, the bandwidth of the interface is in a single channel. In nonconcatenated mode, the PIC operates in channelized (multiplexed) mode.

Table 21 on page 116 shows the mode combinations for the next-generation SONET/SDH Type 1 PICs with SFP.

Table 21: Type 1 PIC Mode Combinations

PIC	Mode	Speed Configuration	Default Mode
2-port OC3	2xOC3 concatenated	<code>fpc/pic/0 speed oc3</code>	concatenated
4-port OC3	1xOC12 concatenated	<code>fpc/pic/0 speed oc12</code>	—
	1xOC12 nonconcatenated	<code>fpc/pic/0:0 speed oc3</code>	nonconcatenated
	4xOC3 concatenated	<code>fpc/pic/port speed oc3</code>	concatenated
1-port OC12	1xOC12 concatenated	<code>fpc/pic/0 speed oc12</code>	concatenated
	1xOC12 nonconcatenated	<code>fpc/pic/0:0 speed oc3</code>	nonconcatenated
	1xOC3 concatenated	<code>fpc/pic/0 speed oc3</code>	—

Table 22 on page 117 shows the mode combinations for the next-generation SONET/SDH Type 2 PICs with SFP.

Table 22: Type 2 PIC Mode Combinations

PIC	Mode	Speed Configuration	Default Mode
1-port OC48	1xOC48 concatenated	<i>fpc/pic/0 speed oc48</i>	concatenated
	1xOC48 nonconcatenated	<i>fpc/pic/0:0 speed oc12</i>	nonconcatenated
	1xOC12 concatenated	<i>fpc/pic/0 speed oc12</i>	—
	1xOC12 nonconcatenated	<i>fpc/pic/0 0 speed oc3</i>	—
	1xOC3 concatenated	<i>fpc/pic/0 speed oc3</i>	—
4-port OC12	1xOC48 concatenated	<i>fpc/pic/0 speed oc48</i>	—
	1xOC48 nonconcatenated	<i>fpc/pic/0:0 speed oc12</i>	nonconcatenated
	1xOC12 nonconcatenated	<i>fpc/pic/0 speed oc3</i>	—
	4xOC12 concatenated	<i>fpc/pic/port speed oc3 oc12</i>	concatenated
4-port OC3	1xOC12 concatenated	<i>fpc/pic/0 speed oc12</i>	—
	1xOC12 nonconcatenated	<i>fpc/pic/0:0 speed oc3</i>	nonconcatenated
	4xOC3 concatenated	<i>fpc/pic/port speed oc3</i>	concatenated

By default, SONET/SDH PICs operate in concatenated mode. To specify interface speed in concatenated mode, include the **speed** statement with options at the [edit interfaces *so-fpc/pic/port*] hierarchy level:

```
[edit interfaces so-fpc/pic/port]
speed (oc3 | oc12 | oc48);
```

For example, each port of the 4-port OC12 PIC can be configured to be in OC3 or OC12 speed independently when this PIC is in 4xOC12 concatenated mode.

To specify interface speed in nonconcatenated mode, include the **speed** statement at the [edit interfaces *so-fpc/pic/port.channel*] hierarchy level:

```
[edit interfaces so-fpc/pic/port.channel]
speed (oc3 | oc12);
```

To configure the PIC to operate in channelized (multiplexed) mode, include the `no-concatenate` statement at the `[edit chassis fpc slot-number pic pic-number]` hierarchy level.

For more information about using the `no-concatenate` statement, see the *JUNOS System Basics Configuration Guide*.

Configuring Keepalives

By default, physical interfaces configured with Cisco HDLC or PPP encapsulation send keepalive packets at 10-second intervals. The Frame Relay term for keepalives is LMI packets; the JUNOS software supports both ANSI T1.617 Annex D LMIs and ITU Q933 Annex A LMIs. On ATM networks, OAM cells perform the same function. You configure OAM cells at the logical interface level; for more information, see “Defining the ATM OAM F5 Loopback Cell Period” on page 305.

To disable the sending of keepalives on a physical interface, include the `no-keepalives` statement at the `[edit interfaces interface-name]` hierarchy level:

```
[edit interfaces interface-name]
no-keepalives;
```

To disable the sending of keepalives on a physical interface configured with Cisco HDLC encapsulation for a translational cross-connection, include the `no-keepalives` statement at the `[edit interfaces interface-name encapsulation cisco-hdlc-tcc]` hierarchy level:

```
[edit interfaces interface-name]
encapsulation cisco-hdlc-tcc {
  no-keepalives;
}
```

For more information about translation cross-connections, see “Configuring Circuit and Translational Cross-Connects” on page 203.

When you configure PPP over ATM or Multilink PPP over ATM encapsulation, you can enable or disable keepalives on the logical interface. For more information, see “Configuring PPP over ATM2 Encapsulation” on page 310.

To explicitly enable the sending of keepalives on a physical interface, include the `keepalives` statement at the `[edit interfaces interface-name]` hierarchy level:

```
[edit interfaces interface-name]
keepalives;
```

To change one or more of the default keepalive values, include the appropriate option at the `[edit interfaces interface-name]` hierarchy level:

```
[edit interfaces interface-name]
keepalives <interval seconds> <down-count number> <up-count number>;
```


On interfaces configured with Cisco HDLC or PPP encapsulation, you can include the following three keepalive statements; note that Frame Relay encapsulation is not affected by these statements:

- **interval *seconds***—The time in seconds between successive keepalive requests. The range is from **1** second through **32767** seconds, with a default of **10** seconds.
- **down-count *number***—The number of keepalive packets a destination must fail to receive before the network takes a link down. The range is from **1** through **255**, with a default of **3**.
- **up-count *number***—The number of keepalive packets a destination must receive to change a link's status from down to up. The range is from **1** through **255**, with a default of **1**.



WARNING: If interface keepalives are configured on an interface that does not support the **keepalives** configuration statement (for example, 10-Gigabit Ethernet), the link layer may go down when the PIC is restarted. Avoid configuring the keepalives on interfaces that do not support the **keepalives** configuration statement.

For information about Frame Relay keepalive settings, see “Configuring Frame Relay Keepalives” on page 353.

Configuring the Clock Source

For both the router and interfaces, the clock source can be the router's internal Stratum 3 clock, which resides on the System Control Board (SCB), the System and Switch Board (SSB), the Forwarding Engine Board (FEB), or the Miscellaneous Control Subsystem (MCS) (depending on the router model), or an external clock that is received on the interface. By default, the 19.44-MHz Stratum 3 reference clock generates the clock signal for all serial PICs (SONET/SDH) and Plesiochronous Digital Hierarchy (PDH) PICs. PDH PICs include DS3, E3, T1, and E1 PICs.

For example, interface A can transmit on interface A's received clock (external, loop timing) or the Stratum 3 clock (internal, line timing or normal timing). Interface A cannot use a clock from any other source. For interfaces such as SONET/SDH that can use different clock sources, you can configure the source of the transmit clock on each interface.

To set the clock source, include the **clocking** statement at the [edit interfaces *interface-name*] hierarchy level:

```
[edit interfaces interface-name]
  clocking (external | internal);
```

For information about clocking on channelized interfaces, see “Clock Sources on Channelized Interfaces” on page 364. Also see “Configuring Channelized IQ and IQE SONET/SDH Loop Timing” on page 687 and “Configuring the Channelized T3 Loop Timing” on page 502. For information about configuring an external synchronization interface that can be used to synchronize the internal Stratum 3 clock to an external

source on the M320 and M120 routing platforms, see “Configuring an External Synchronization Interface” on page 57.

Configuring the Router as a DCE

By default, when you configure an interface with Frame Relay encapsulation, the routing platform is assumed to be data terminal equipment (DTE). That is, the routing platform is assumed to be at a terminal point on the network. To configure the routing platform to be data circuit-terminating equipment (DCE), include the `dce` statement at the [edit interfaces *interface-name*] hierarchy level:

```
[edit interfaces interface-name]  
dce;
```

When you configure the routing platform to be a DCE, keepalives are disabled by default.

For back-to-back Frame Relay connections, either disable the sending of keepalives on both sides of the connection, or configure one side of the connection as a DTE (the default JUNOS configuration) and the other as a DCE.

Configuring Receive and Transmit Leaky Bucket Properties

Congestion control is particularly difficult in high-speed networks with high volumes of traffic. When congestion occurs in such a network, it is usually too late to react. You can avoid congestion by regulating the flow of packets into your network. Smoother flows prevent bursts of packets from arriving at (or being transmitted from) the same interface and causing congestion.

For all interface types except ATM, channelized E1, E1, Fast Ethernet, Gigabit Ethernet, and channelized IQ, you can configure leaky bucket properties, which allow you to limit the amount of traffic received on and transmitted by a particular interface. You effectively specify what percentage of the interface’s total capacity can be used to receive or transmit packets. You might want to set leaky bucket properties to limit the traffic flow from a link that is known to transmit high volumes of traffic.



NOTE: Instead of configuring leaky bucket properties, you can limit traffic flow by configuring policers. Policers work on all interfaces. For more information, see “Applying Policers” on page 181 and the *JUNOS Policy Framework Configuration Guide*.

The leaky bucket is used at the host-network interface to allow packets into the network at a constant rate. Packets might be generated in a bursty manner, but after they pass through the leaky bucket, they enter the network evenly spaced. In some cases, you might want to allow short bursts of packets to enter the network without smoothing them out. By controlling the number of packets that can accumulate in the bucket, the `threshold` property controls burstiness. The maximum number of packets entering the network in t time units is $\text{threshold} + \text{rate} * t$.

By default, leaky buckets are disabled, and the interface can receive and transmit packets at the maximum line rate.

To configure leaky bucket properties, include one or both of the `receive-bucket` and `transmit-bucket` statements at the `[edit interfaces interface-name]` hierarchy level:

```
[edit interfaces interface-name]
receive-bucket {
  overflow (discard | tag);
  rate percentage;
  threshold bytes;
}
transmit-bucket {
  overflow discard;
  rate percentage;
  threshold bytes;
}
```

In the `rate` statement, specify the percentage of the interface line rate that is available to receive or transmit packets. The percentage can be a value from 0 (none of the interface line rate is available) to 100 (the maximum interface line rate is available). For example, when you set the line rate to 33, the interface receives or transmits at one-third of the maximum line rate.

In the `threshold` statement, specify the bucket threshold, which controls the burstiness of the leaky bucket mechanism. The larger the value, the more bursty the traffic, which means that over a very short time the interface can receive or transmit close to line rate, but the average over a longer time is at the configured bucket rate. The threshold can be a value from 0 through 65,535 bytes. For ease of entry, you can enter *number* either as a complete decimal number or as a decimal number followed by the abbreviation k (1,000). For example, the entry `threshold 2k` corresponds to a threshold of 2,000 bytes.

In the `overflow` statement, specify how to handle packets that exceed the threshold:

- `tag` (receive bucket only)—Tag, count, and process received packets that exceed the threshold.
- `discard`—Discard received packets that exceed the threshold. No counting is done.

Configuring Accounting for the Physical Interface

Juniper Networks routing platforms can collect various kinds of data about traffic passing through the routing platform. You can set up one or more *accounting profiles* that specify some common characteristics of this data, including the following:

- The fields used in the accounting records
- The number of files that the routing platform retains before discarding, and the number of bytes per file
- The polling period that the system uses to record the data

You configure the profiles and define a unique name for each profile using statements at the `[edit accounting-options]` hierarchy level. There are two types of accounting profiles: interface profiles and filter profiles. You configure interface profiles by

including the `interface-profile` statement at the `[edit accounting-options]` hierarchy level. You configure filter profiles by including the `filter-profile` statement at the `[edit accounting-options]` hierarchy level. For more information, see the *JUNOS Network Management Configuration Guide*.

You apply filter profiles by including the `accounting-profile` statement at the `[edit firewall filter filter-name]` and `[edit firewall family family filter filter-name]` hierarchy levels. For more information, see the *JUNOS Policy Framework Configuration Guide*.

Applying an Accounting Profile to the Physical Interface

To enable accounting on an interface, include the `accounting-profile` statement at the `[edit interfaces interface-name]` hierarchy level:

```
[edit interfaces interface-name]
  accounting-profile name;
```

You can also reference profiles by logical unit; for more information, see “Configuring Accounting for the Logical Interface” on page 147.

Example: Applying an Accounting Profile to the Physical Interface

Configure an accounting profile for an interface and apply it to a physical interface:

```
[edit]
  accounting-options {
    file if_stats {
      size 4m files 10 transfer-interval 15;
      archive-sites {
        "ftp://login:password@host/path";
      }
    }
    interface-profile if_profile {
      interval 15;
      file if_stats {
        fields {
          input-bytes;
          output-bytes;
          input-packets;
          output-packets;
          input-errors;
          output-errors;
        }
      }
    }
  }
[edit interfaces ge-1/0/1]
  accounting-profile if_profile;
```

Interface Diagnostics

You can use two diagnostic tools to test the physical layer connections of interfaces: Loopback testing and bit error rate test (BERT) testing. Loopback testing enables you

to verify the connectivity of a circuit. BERT testing enables you to identify poor signal quality on a circuit. This section contains the following topics:

- Configuring Loopback Testing on page 123
- Interface Diagnostics on page 125

Configuring Loopback Testing

Loopback testing allows you to verify the connectivity of a circuit. You can configure any of the following interfaces to execute a loopback test: Aggregated Ethernet, Fast Ethernet, Gigabit Ethernet, E1, E3, NxDS0, serial, SONET/SDH, T1, and T3.

The physical path of a network data circuit usually consists of segments interconnected by devices that repeat and regenerate the transmission signal. The transmit path on one device connects to the receive path on the next device. If a circuit fault occurs in the form of a line break or a signal corruption, you can isolate the problem by using a loopback test. Loopback tests allow you to isolate segments of the circuit and test them separately.

To do this, configure a *line loopback* on one of the routers. Instead of transmitting the signal toward the far-end device, the line loopback sends the signal back to the originating router. If the originating router receives back its own data link layer packets, you have verified that the problem is beyond the originating router. Next, configure a line loopback farther away from the local router. If this originating router does not receive its own data link layer packets, you can assume the problem is on one of the segments between the local router and the remote routing platform's interface card. In this case, the next troubleshooting step is to configure a line loopback closer to the local router to find the source of the problem.

There are several types of loopback testing supported by the JUNOS software, as follows:

- DCE local—Loops packets back on the local DCE.
- DCE remote—Loops packets back on the remote DCE.
- Local—Useful for troubleshooting physical PIC errors. A local loopback loops packets, including both data and timing information, back on the local routing platform's PIC. When you configure a local loopback, the interface transmits packets to the channel services unit (CSU) built into the interface. These packets are transmitted onto the circuit toward the far-end device. The PIC receives back its own transmission and ignores any data sent from the physical circuit and the CSU. To test a local loopback, issue the `show interfaces interface-name` command. If PPP keepalives transmitted on the interface are received by the PIC, the **Device Flags** field contains the output **Loop-Detected**.
- Payload—Useful for troubleshooting the physical circuit problems between the local router and the remote router. A payload loopback loops data only (without clocking information) on the remote routing platform's PIC. With payload loopback, overhead is recalculated.
- Remote—Useful for troubleshooting the physical circuit problems between the local router and the remote router. A remote loopback loops packets, including both data and timing information, back on the remote routing platform's interface card. A router at one end of the circuit initiates a remote loopback toward its

remote partner. When you configure a remote loopback, the packets received from the physical circuit and CSU are received by the interface. Those packets are then retransmitted by the PIC back toward the CSU and the circuit. This loopback tests all the intermediate transmission segments.

Table 23 on page 124 shows the loopback modes supported on the various interface types.

Table 23: Loopback Modes by Interface Type

Interface	Loopback Modes	Usage Guidelines
Aggregated Ethernet, Fast Ethernet, Gigabit Ethernet	Local	“Configuring Ethernet Loopback Capability” on page 519
E1 and E3	Local and remote	“Configuring E1 Loopback Capability” on page 472 and “Configuring E3 Loopback Capability” on page 481
NxDS0	Payload	“Configuring NxDS0 IQ Interfaces” on page 378, “Configuring T1 and NxDS0 Interfaces” on page 396, “Configuring NxDS0 IQ Interfaces” on page 407, “Configuring an NxDS0 IQ Interface” on page 426, and “Configuring an NxDS0 IQ Interface” on page 445
Serial (V.35 and X.21)	Local and remote	“Configuring Serial Loopback Capability” on page 251
Serial (EIA-530)	DCE local, DCE remote, local, and remote	“Configuring Serial Loopback Capability” on page 251
SONET/SDH	Local and remote	“Configuring Channelized IQ and IQE SONET/SDH Loop Timing” on page 687
T1 and T3	Local, payload, and remote	“Configuring T1 Loopback Capability” on page 490 and “Configuring T3 Loopback Capability” on page 502 See also “Configuring the T1 Remote Loopback Response” on page 489

To configure loopback testing, include the `loopback` statement:

```
loopback mode;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* aggregated-ether-options]
- [edit interfaces *interface-name* ds0-options]
- [edit interfaces *interface-name* e1-options]

- [edit interfaces *interface-name* e3-options]
- [edit interfaces *interface-name* fastether-options]
- [edit interfaces *interface-name* gigether-options]
- [edit interfaces *interface-name* serial-options]
- [edit interfaces *interface-name* sonet-options]
- [edit interfaces *interface-name* t1-options]
- [edit interfaces *interface-name* t3-options]

Interface Diagnostics

BERT allows you to troubleshoot problems by checking the quality of links. You can configure any of the following interfaces to execute a BERT when the interface receives a request to run this test: E1, E3, T1, T3; the channelized DS3, OC3, OC12, and STM1 interfaces; and the channelized DS3 IQ, E1 IQ, and OC12 IQ interfaces.

A BERT test requires a line loop to be in place on either the transmission devices or the far-end router. The local router generates a known bit pattern and sends it out the transmit path. The received pattern is then verified against the sent pattern. The higher the bit error rate of the received pattern, the worse the noise is on the physical circuit. As you move the position of the line loop increasingly downstream toward the far-end router, you can isolate the troubled portion of the link.

To configure BERT, you must configure the duration of the test, the bit pattern to send on the transmit path, and the error rate to monitor when the inbound pattern is received.

To configure the duration of the test, the pattern to send in the bit stream, and the error rate to include in the bit stream, include the **bert-period**, **bert-algorithm**, and **bert-error-rate** statements, respectively, at the [edit interfaces *interface-name interface-type-options*] hierarchy level:

```
[edit interfaces interface-name interface-type-options]
bert-algorithm algorithm;
bert-error-rate rate;
bert-period seconds;
```

By default, the BERT period is 10 seconds. You can configure the BERT period to last from 1 through 239 seconds on some PICs and from 1 through 240 seconds on other PICs.

rate is the bit error rate. This can be an integer from 0 through 7, which corresponds to a bit error rate from 10^{-0} (1 error per bit) to 10^{-7} (1 error per 10 million bits).

algorithm is the pattern to send in the bit stream. For a list of supported algorithms, enter a ? after the **bert-algorithm** statement; for example:

```
[edit interfaces t1-0/0/0 t1-options]
user@host# set bert-algorithm ?
Possible completions:
```

```

pseudo-2e11-o152    Pattern is 2^11 -1 (per 0.152 standard)
pseudo-2e15-o151    Pattern is 2^15 - 1 (per 0.152 standard)
pseudo-2e20-o151    Pattern is 2^20 - 1 (per 0.151 standard)
pseudo-2e20-o153    Pattern is 2^20 - 1 (per 0.153 standard)
...

```

For specific hierarchy information, see the individual interface types.



NOTE: The 4-port E1 PIC supports only the following algorithms:

```

pseudo-2e11-o152    Pattern is 2^11 -1 (per 0.152 standard)
pseudo-2e15-o151    Pattern is 2^15 - 1 (per 0.151 standard)
pseudo-2e20-o151    Pattern is 2^20 - 1 (per 0.151 standard)
pseudo-2e23-o151    Pattern is 2^23 (per 0.151 standard)

```

When you issue the **help** command from the CLI, all BERT algorithm options are displayed, regardless of the PIC type, and no commit check is available. Unsupported patterns for a PIC type can be viewed in system log messages.

Table 24 on page 126 shows the BERT capabilities for various interface types.

Table 24: BERT Capabilities by Interface Type

Interface	T1 BERT	T3 BERT	Comments
E1 or T1	Yes (port 0–3)	Yes (port 0–3)	<ul style="list-style-type: none"> Single port at a time Limited algorithms
E3 or T3	Yes (port 0–3)	Yes (port 0–3)	<ul style="list-style-type: none"> Single port at a time
Channelized OC12	N/A	Yes (channel 0–11)	<ul style="list-style-type: none"> Single channel at a time Limited algorithms No bit count
Channelized STM1	Yes (channel 0–62)	N/A	<ul style="list-style-type: none"> Multiple channels Only one algorithm No error insert No bit count
Channelized T3 and Multichannel T3	Yes (channel 0–27)	Yes (port 0–3 on channel 0)	<ul style="list-style-type: none"> Multiple ports and channels Limited algorithms for T1 No error insert for T1 No bit count for T1

These limitations do not apply to channelized IQ interfaces. For information about BERT capabilities on channelized IQ interfaces, see “Channelized IQ and IQE Interfaces Properties” on page 367.

Starting and Stopping a BERT Test

Before you can start the BERT test, you must disable the interface. To do this, include the `disable` statement at the `[edit interfaces interface-name]` hierarchy level:

```
[edit interfaces interface-name]  
disable;
```

After you configure the BERT properties and commit the configuration, begin the test by issuing the `test interface interface-name interface-type-bert-start` operational mode command:

```
user@host> test interface interface-name interface-type-bert-start
```

The test runs for the duration you specify with the `bert-period` statement. If you wish to terminate the test sooner, issue the `test interface interface-name interface-type-bert-stop` command:

```
user@host> test interface interface-name interface-type-bert-stop
```

For example:

```
user@host> test interface t3-1/2/0 t3-bert-start  
user@host> test interface t3-1/2/0 t3-bert-stop
```

To view the results of the BERT test, issue the `show interfaces extensive | find BERT` command:

```
user@host> show interfaces interface-name extensive | find BERT
```

For more information about running and evaluating the results of the BERT procedure, see the *JUNOS System Basics and Services Command Reference*.



NOTE: To exchange BERT patterns between a local routing platform and a remote routing platform, include the `loopback remote` statement in the interface configuration at the remote end of the link. From the local routing platform, issue the `test interface` command.

Example: Configuring Bit Error Rate Testing

Configure a BERT test on a T3 interface. In this example, the run duration lasts for 120 seconds. The configured error rate is 0, which corresponds to a bit error rate of 10^{-0} (1 error per bit). The configured bit pattern of `all-ones-repeating` means that every bit the interface sends is a set to a value of 1.

```
[edit interfaces]  
t3-1/2/0 {  
  t3-options {  
    bert algorithm all-ones-repeating;  
    bert-error-rate 0;  
    bert-period 120;  
  }  
}
```

```
}
```

Tracing Operations of an Individual Router Interface

To trace the operations of individual routing platform interfaces, include the `traceoptions` statement at the `[edit interfaces interface-name]` hierarchy level:

```
[edit interfaces interface-name]  
traceoptions {  
    flag flag <disable>;  
}
```

You can specify the following interface tracing flags:

- **all**—Trace all interface operations.
- **event**—Trace all interface events.
- **ipc**—Trace all interface interprocess communication (IPC) messages.
- **media**—Trace all interface media changes.

The interfaces `traceoptions` statement does not support a trace file. The logging is done by the kernel, so the tracing information is placed in the system `syslog` files.

For more information about trace operations, see “Tracing Operations of the Interface Process” on page 222.

Damping Interface Transitions

By default, when an interface changes from being up to being down, or from down to up, this transition is advertised immediately to the hardware and the JUNOS software. In some situations—for example, when an interface is connected to an add-drop multiplexer (ADM) or wavelength-division multiplexer (WDM), or to protect against SONET/SDH framer holes—you might want to damp interface transitions. This means not advertising the interface’s transition until a certain period of time has passed, called the *hold-time*. When you have damped interface transitions and the interface goes from up to down, the interface is not advertised to the rest of the system as being down until it has remained down for the hold-time period. Similarly when an interface goes from down to up, it is not advertised as being up until it has remained up for the hold-time period.

To damp interface transitions, include the `hold-time` statement at the `[edit interfaces interface-name]` hierarchy level:

```
[edit interfaces interface-name]  
hold-time up milliseconds down milliseconds;
```

The time can be a value from 0 through 4,294,967,295 milliseconds. The default value is 0, which means that interface transitions are not damped. The JUNOS software advertises the transition within 100 milliseconds of the time value you specify.

For most Ethernet interfaces, hold timers are implemented using a 1-second polling algorithm. For 1-port, 2-port, and 4-port Gigabit Ethernet interfaces with small form-factor pluggable transceivers (SFPs), hold timers are interrupt-driven.

Configuring Multiservice Physical Interface Properties

The adaptive services (AS), collector, monitoring services, and monitoring services II interfaces are multiservice interfaces specifically designed to enable IP services. To configure multiservice physical interface properties on the collector, monitoring services, and AS interfaces, include the **multiservice-options** statement:

```
multiservice-options {
  (core-dump | no-core-dump);
  (syslog | no-syslog);
}
```

You can include these statements at the following hierarchy levels:

- [edit interfaces *cp-fpc/pic/port*]
- [edit interfaces *mo-fpc/pic/port*]
- [edit interfaces *sp-fpc/pic/port*]

For more information about the services interfaces, see the *JUNOS Services Interfaces Configuration Guide*.

Enabling or Disabling SNMP Notifications on Physical Interfaces

By default, Simple Network Management Protocol (SNMP) notifications are sent when the state of an interface or a connection changes. To explicitly enable these notifications on the physical interface, include the **traps** statement at the [edit interfaces *interface-name*] hierarchy level. To disable these notifications on the physical interface, include the **no-traps** statement at the [edit interfaces *interface-name*] hierarchy level:

```
[edit interfaces interface-name]
(traps | no-traps);
```



NOTE: Gigabit Ethernet interfaces on J-series Services Routers do not support SNMP.

Enabling Unidirectional Traffic Flow on Physical Interfaces

By default, physical interfaces are bidirectional; that is, they both transmit and receive traffic. You can configure unidirectional mode on a 10-Gigabit Ethernet interface that creates two new physical interfaces that are unidirectional. The new transmit-only and receive-only interfaces operate independently, but both are subordinate to the original parent interface.

The unidirectional interfaces enable the configuration of a unidirectional link topology. Unidirectional links are useful for applications such as broadband video services where almost all traffic flow is in one direction, from the provider to the user. Unidirectional mode conserves bandwidth by enabling it to be differentially dedicated to transmit and receive interfaces. In addition, unidirectional mode conserves ports for such applications because the transmit-only and receive-only interfaces act independently. Each can be connected to different routers, for example, reducing the total number of ports required.

To enable unidirectional link mode on a physical interface, include the `unidirectional` statement at the `[edit interfaces interface-name]` hierarchy level:

```
[edit interfaces interface-name]  
unidirectional;
```



NOTE: Unidirectional mode is currently supported on only the 4x10 GE DPC on the MX960 platform.

The transmit-only interface is always operationally up. The operational status of the receive-only interface depends only on local faults; it is independent of remote faults and of the status of the transmit-only interface.

On the parent interface, you can configure attributes common to both interfaces, such as clocking, framing, `gigether-options`, and `sonet-options`. On each of the unidirectional interfaces, you can configure encapsulation, MAC address, MTU size, and logical interfaces.

Unidirectional interfaces support IP and IPv6. Packet forwarding takes place by means of static routes and static ARP entries, which you can configure independently on both unidirectional interfaces.

Only transmit statistics are reported on the transmit-only interface (and shown as zero on the receive-only interface). Only receive statistics are reported on the receive-only interface (and shown as zero on the transmit-only interface). Both transmit and receive statistics are reported on the parent interface.

Disabling a Physical Interface

You can disable a physical interface, marking it as being down, without removing the interface configuration statements from the configuration. To do this, include the `disable` statement at the `[edit interfaces interface-name]` hierarchy level:

```
[edit interfaces interface-name]  
disable;
```

Example: Disabling a Physical Interface

Disable a physical interface:

```
[edit interfaces]
so-1/1/0 {
  mtu 8000;
  clocking internal;
  encapsulation ppp;
  sonet-options {
    fcs 16;
  }
  unit 0 {
    family inet {
      address 172.16.0.0/12 {
        destination 172.16.0.4;
      }
    }
  }
}
[edit interfaces]
user@host# set so-1/1/0 disable
[edit interfaces]
user@host# show so-1/1/0
so-1/1/0 {
  disable;# Interface is marked as disabled
  mtu 8000;
  clocking internal;
  encapsulation ppp;
  sonet-options {
    fcs 16;
  }
  unit 0 {
    family inet {
      address 172.16.0.0 {
        destination 172.16.0.3;
      }
    }
  }
}
```


Chapter 4

Configuring Logical Interface Properties

For a physical interface device to function, you must configure at least one logical interface on that device. For each logical interface, you must specify the protocol family that the interface supports. You can also configure other logical interface properties. These vary by Physical Interface Card (PIC) and encapsulation type, but include the IP address of the interface, and whether the interface supports multicast traffic, data-link connection identifiers (DLCIs), virtual channel identifiers (VCIs) and virtual path identifiers (VPIs), and traffic shaping.

This chapter describes the configuration of logical interface properties:

- Logical Interfaces Configuration Statements on page 133
- Logical Interfaces Statements List on page 137
- Specifying the Logical Interface Number on page 144
- Configuring Logical System Interface Properties on page 145
- Adding a Logical Unit Description to the Configuration on page 146
- Configuring a Point-to-Point Connection on page 146
- Configuring a Multipoint Connection on page 147
- Configuring Accounting for the Logical Interface on page 147
- Configuring the Interface Bandwidth on page 148
- Enabling or Disabling SNMP Notifications on Logical Interfaces on page 149
- Configuring Interface Encapsulation on page 149
- Configuring the PPP Restart Timers on page 151
- Configuring the PPP Clear Loop Detected Timer on page 152
- Configuring PPP CHAP Authentication on page 152
- Configuring PPP PAP Authentication on page 152
- Configuring Dynamic Call Admission Control on page 155
- Disabling a Logical Interface on page 156

Logical Interfaces Configuration Statements

To configure logical interface properties, include the following statements:

```
unit logical-unit-number {  
    accept-source-mac {
```

```

    mac-address mac-address {
        policer {
            input cos-policer-name;
            output cos-policer-name;
        }
    }
}
accounting-profile name;
allow-any-vci;
atm-scheduler-map (map-name | default);
backup-options {
    interface interface-name;
}
bandwidth rate;
cell-bundle-size cells;
clear-dont-fragment-bit;
compression {
    rtp {
        f-max-period number;
        queues [ queue-numbers ];
        port {
            minimum port-number;
            maximum port-number;
        }
    }
}
compression-device interface-name;
copy-tos-to-outer-ip-header;
demux-destination family;
demux-source family;
demux-options {
    underlying-interface interface-name;
}
description text;
dial-options {
    l2tp-interface-id name;
    (dedicated | shared);
}
dialer-options {
    activation-delay seconds;
    callback;
    callback-wait-period time;
    deactivation-delay seconds;
    dial-string [ dial-string-numbers ];
    idle-timeout seconds;
    incoming-map {
        caller (caller-id | accept-all);
        initial-route-check seconds;
        load-interval seconds;
        load-threshold number;
        pool pool-name;
        redial-delay time;
        watch-list {
            [ routes ];
        }
    }
}

```



```

}
disable;
disable-mlppp-inner-ppp-pfc;
dlci dlci-identifier;
drop-timeout milliseconds;
dynamic-call-admission-control {
    activation-priority priority;
    bearer-bandwidth-limit kilobits-per-second;
}
encapsulation type;
epd-threshold plp1 cells;
filter filter-name;
fragment-threshold bytes;
inner-vlan-id-range start start-id end end-id;
input-vlan-map {
    inner-tag-protocol-id;
    inner-vlan-id;
    (pop | pop-pop | pop-swap | push | push-push | swap | swap-push | swap-swap);
    tag-protocol-id tpid;
    vlan-id number;
}
interleave-fragments;
inverse-arp;
link-layer-overhead percent;
layer2-policer {
    input-policer policer-name;
    input-three-color policer-name;
    output-policer policer-name;
    output-three-color policer-name;
}
minimum-links number;
mrru bytes;
multicast-dlci dlci-identifier;
multicast-vci vpi-identifier.vci-identifier;
multilink-max-classes number;
multipoint;
oam-liveness {
    up-count cells;
    down-count cells;
}
oam-period (seconds | disable);
output-vlan-map {
    inner-tag-protocol-id;
    inner-vlan-id;
    (pop | pop-pop | pop-swap | push | push-push | swap | swap-push | swap-swap);
    tag-protocol-id tpid;
    vlan-id number;
}
passive-monitor-mode;
peer-unit unit-number;
plp-to-clp;
point-to-point;
ppp-options {
    chap {
        access-profile name;
        default-chap-secret name;
    }
}

```

```

        local-name name;
        passive;
    }
    compression {
        acfc;
        pfc;
    }
    lcp-restart-timer milliseconds;
    loopback-clear-timer seconds;
    ncp-restart-timer milliseconds;
    pap {
        default-pap-password password;
        local-name name;
        local-password password;
        passive;
    }
    pppoe-options {
        access-concentrator name;
        auto-reconnect seconds;
        (client | server);
        service-name name;
        underlying-interface interface-name;
    }
    proxy-arp;
    service-domain (inside | outside);
    shaping {
        (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained
         rate burst length);
        queue-length number;
    }
    short-sequence;
    transmit-weight number;
    (traps | no-traps);
    trunk-bandwidth rate;
    trunk-id number;
    tunnel {
        backup-destination address;
        destination address;
        key number;
        routing-instance {
            destination routing-instance-name;
        }
        source source-address;
        ttl number;
    }
    vci vpi-identifier.vci-identifier;
    vci-range start start-vci end end-vci;
    vpi vpi-identifier;
    vlan-id number;
    vlan-id-range number-number;
    vlan-tags inner tpid.vlan-id outer tpid.vlan-id;
    family family {
        [ family-statements ];
    }
}

```

You can include these statements at the following hierarchy levels:

- [edit interfaces *interface-name*]
- [edit logical-systems *logical-system-name* interfaces *interface-name*]

For information about interface-specific logical properties, see “Logical Interfaces Statements List” on page 137.

Logical Interfaces Statements List

Table 25 on page 137 lists statements that you can use to configure logical interfaces.

Table 25: Statements for Logical Interface Properties

Statement	Interface Types	Usage Guidelines
access-profile <i>name</i>	ATM2 IQ interfaces	“Configuring PPP PAP Authentication” on page 152
accept-source-mac	Gigabit Ethernet intelligent queuing (IQ) interfaces	“Configuring MAC Address Filtering” on page 613
accounting-profile <i>name</i>	All	“Configuring Accounting for the Logical Interface” on page 147
ack-delay-time <i>time</i>	Ethernet interfaces configured for DLSw	“Configuring LLC2 Options” on page 167
ack-max <i>count</i>	Ethernet interfaces configured for DLSw	“Configuring LLC2 Options” on page 167
activation-delay <i>seconds</i>	ISDN interfaces	“Configuring ISDN Interfaces” on page 657
activation-priority <i>priority</i>	Fast Ethernet and Gigabit Ethernet interfaces, ISDN BRI interfaces, and serial interfaces with PPP or Frame Relay encapsulation on J4350 and J6350 Services Routers supporting voice over IP with the TGM550 media gateway module	“Configuring Dynamic Call Admission Control” on page 155
adaptive-shapers <i>adaptive-shaper-name</i>	Frame Relay interfaces on J-series Services Routers	<i>JUNOS Class of Service Configuration Guide</i>
allow-any-vci	Asynchronous Transfer Mode (ATM) interfaces	“Configuring ATM Interface Encapsulation” on page 306
atm-scheduler-map (<i>map-name</i> default)	ATM2 IQ interfaces	“Configuring ATM2 IQ VC Tunnel CoS Components” on page 315
backup-destination <i>address</i>	Encryption interfaces	<i>JUNOS Class of Service Configuration Guide</i>
backup-options	J-series Services Routers ISDN interfaces	“Configuring an ISDN Dialer Interface as a Backup Interface” on page 664

Table 25: Statements for Logical Interface Properties (*continued*)

Statement	Interface Types	Usage Guidelines
<code>bandwidth rate</code>	All interfaces, except multilink and aggregated	“Configuring the Interface Bandwidth” on page 148
<code>bearer-bandwidth-limit kilobits-per-second</code>	Fast Ethernet and Gigabit Ethernet interfaces, ISDN BRI interfaces, and serial interfaces with PPP or Frame Relay encapsulation on J4350 and J6350 Services Routers supporting voice over IP with the TGM550 media gateway module	“Configuring Dynamic Call Admission Control” on page 155
<code>cbr rate</code>	ATM interfaces	“Defining the ATM Traffic-Shaping Profile” on page 295
<code>cell-bundle-size cells</code>	ATM2 IQ interfaces	“Configuring the Layer 2 Circuit Cell-Relay Cell Maximum” on page 289
<code>clear-dont-fragment-bit</code>	Adaptive services interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
<code>compression</code>	AS PIC or MultiServices PIC link services IQ interfaces (<code>lsq</code>) and voice services interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
<code>compression-device interface-name</code>	J-series Services Routers E1 and T1 interfaces.	<i>JUNOS Services Interfaces Configuration Guide</i>
<code>copy-tos-to-outer-ip-header</code>	GRE tunnel interfaces	<i>JUNOS Class of Service Configuration Guide</i>
<code>deactivation-delay seconds</code>	ISDN interfaces	“Configuring ISDN Interfaces” on page 657
<code>demux-destination family</code>	IP demux interfaces	“Specifying the IP Demux Underlying Interface Family Type” on page 605
<code>demux-options family</code>	IP demux interfaces	“Specifying the Demux Underlying Interface” on page 230
<code>demux-source family</code>	IP demux interfaces	“Specifying the IP Demux Underlying Interface Family Type” on page 605
<code>description text</code>	All	“Adding a Logical Unit Description to the Configuration” on page 146
<code>destination (address routing-instance-name)</code>	Encryption generic routing encapsulation (GRE) tunnel, and IP tunnel interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
<code>dialer-options</code>	Adaptive services interfaces on M7i routing platforms J-series Services Routers ISDN interfaces	<i>JUNOS Services Interfaces Configuration Guide</i> “Configuring ISDN Physical Interface Properties” on page 659
<code>disable</code>	All	“Disabling a Logical Interface” on page 156

Table 25: Statements for Logical Interface Properties (continued)

Statement	Interface Types	Usage Guidelines
<code>disable-mlppp-inner-ppp-pfc</code>	MLPPP interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
<code>dlci dlci-identifier</code>	Point-to-point interfaces with Frame Relay encapsulation	“Configuring Frame Relay DLCIs” on page 356
<code>drop-timeout milliseconds</code>	Multilink interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
<code>dynamic-call-admission-control</code>	Fast Ethernet and Gigabit Ethernet interfaces, ISDN BRI interfaces, and serial interfaces with PPP or Frame Relay encapsulation on J4350 and J6350 Services Routers supporting voice over IP with the TGM550 media gateway module	“Configuring Dynamic Call Admission Control” on page 155
<code>encapsulation type</code>	All interfaces, except aggregated SONET/SDH and loopback	“Configuring the Encapsulation on a Logical Interface” on page 150
<code>epd-threshold cells</code>	ATM2 IQ interfaces	“Configuring the ATM2 IQ EPD Threshold” on page 302
<code>f-max-period number</code>	AS PIC or MultiServices link services IQ interfaces (lsq-) and voice services interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
<code>family</code>	All	“Configuring the Protocol Family” on page 160
<code>fragment-threshold bytes</code>	Multilink interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
<code>frame-relay map-name default)</code>	Frame Relay Interfaces on J-series Services Routers	<i>JUNOS Services Interfaces Configuration Guide</i> and <i>JUNOS Class of Service Configuration Guide</i>
<code>idle-time time</code>	Ethernet interfaces configured for DLSw	“Configuring LLC2 Options” on page 167
<code>idle-timeout</code>	ISDN interfaces	“Configuring Bandwidth on Demand” on page 667
<code>initial-route-check seconds</code>	ISDN interfaces	“Configuring ISDN Logical Interface Properties” on page 661
<code>inner-tag-protocol-id</code>	Gigabit Ethernet IQ interfaces	“Configuring 802.1Q VLANs” on page 525
<code>inner-vlan-id</code>	Gigabit Ethernet IQ interfaces	“Configuring 802.1Q VLANs” on page 525
<code>inner-vlan-id-range</code>	Gigabit Ethernet, 10-Gigabit Ethernet, and aggregated Ethernet IQ interfaces	“Configuring ATM-to-Ethernet Interworking” on page 210
<code>input</code>	AS PIC or MultiServices link services	<i>JUNOS Services Interfaces Configuration Guide</i>

Table 25: Statements for Logical Interface Properties (*continued*)

Statement	Interface Types	Usage Guidelines
<code>input-policer</code> <i>policer-name</i>	For 1-Gigabit Ethernet and 10-Gigabit Ethernet IQ2 interfaces on M-series and T-series routing platforms	<i>JUNOS Services Interfaces Configuration Guide</i> and “Applying a Policer” on page 616
<code>input-three-color</code> <i>policer-name</i>	For 1-Gigabit Ethernet and 10-Gigabit Ethernet IQ2 interfaces on M-series and T-series routing platforms	<i>JUNOS Class of Service Configuration Guide</i> and “Applying a Policer” on page 616
<code>input-vlan-map</code>	Gigabit Ethernet IQ interfaces	“Configuring the Management Ethernet Interface” on page 627
<code>interleave-fragments</code>	Link services interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
<code>inverse-arp</code>	Interfaces with ATM and Frame Relay encapsulation	“Configuring Inverse ATM1 or ATM2 ARP” on page 294 and “Configuring Inverse Frame Relay ARP” on page 355
<code>key</code> <i>number</i>	GRE tunnel interfaces on Adaptive Services PICs	<i>JUNOS Services Interfaces Configuration Guide</i>
<code>layer2-policer</code>	1-Gigabit Ethernet and 10-Gigabit Ethernet IQ2 interfaces	“Applying a Policer” on page 616
<code>lcp-restart-timer</code>	Interfaces with PPP encapsulation	“Configuring the PPP Restart Timers” on page 151
<code>l2tp-interface-id</code> <i>name</i>	Adaptive services interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
<code>link-layer-overhead</code> <i>percent</i>	AS PIC or MultiServices link services IQ interfaces (lsq)	<i>JUNOS Services Interfaces Configuration Guide</i>
<code>llc2</code>	Ethernet interfaces configured for DLSw on J-series Services Routers	“Configuring LLC2 Options” on page 167
<code>load-threshold</code> <i>number</i>	ISDN interfaces	“Configuring Bandwidth on Demand” on page 667
<code>local-name</code> <i>name</i>	ATM2 IQ interfaces	“Configuring PPP CHAP Authentication” on page 152 and “Configuring PPP PAP Authentication” on page 152
<code>local-window</code> <i>count</i>	Ethernet interfaces configured for DLSw	“Configuring LLC2 Options” on page 167
<code>loss-priority-maps</code>	Frame Relay interfaces on J-series Services Routers	<i>JUNOS Services Interfaces Configuration Guide</i> and <i>JUNOS Class of Service Configuration Guide</i>

Table 25: Statements for Logical Interface Properties (continued)

Statement	Interface Types	Usage Guidelines
mac-address <i>mac-address</i>	Gigabit Ethernet IQ interfaces and Gigabit Ethernet interfaces with small form-factor pluggable transceivers (SFPs) (except the 10-port Gigabit Ethernet PIC and the built-in Gigabit Ethernet port on the M7i platform)	“Configuring MAC Address Filtering” on page 613
max-retry <i>count</i>	Ethernet interfaces configured for DLSw	“Configuring LLC2 Options” on page 167
minimum-links <i>number</i>	Multilink interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
mrru <i>bytes</i>	Multilink interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
multicast-dlci <i>dlci-identifier</i>	Point-to-multipoint Frame Relay interfaces	“Configuring a Multicast-Capable Frame Relay Connection” on page 357
multicast-vci <i>vpi-identifier vci-identifier</i>	Point-to-multipoint ATM1 and ATM2 IQ interfaces	“Configuring the ATM OAM F5 Loopback Cell Threshold” on page 305
multilink-max-classes <i>number</i>	AS PIC or MultiServices link services IQ interfaces (lsq-)	<i>JUNOS Services Interfaces Configuration Guide</i>
multipoint	All	“Configuring a Multipoint Connection” on page 147
ncp-restart-timer	Interfaces with PPP encapsulation	“Configuring the PPP Restart Timers” on page 151
oam-liveness	ATM1 and ATM2 IQ interfaces	“Configuring the ATM OAM F5 Loopback Cell Threshold” on page 305
oam-period (disable <i>seconds</i>)	ATM1 and ATM2 IQ interfaces	“Defining the ATM OAM F5 Loopback Cell Period” on page 305
output	All	<i>JUNOS Services Interfaces Configuration Guide</i>
output-policer <i>policer-name</i>	For 1-Gigabit Ethernet and 10-Gigabit Ethernet IQ2 interfaces on M-series and T-series routing platforms	<i>JUNOS Class of Service Configuration Guide</i> and “Applying a Policer” on page 616
output-three-color <i>policer-name</i>	For 1-Gigabit Ethernet and 10-Gigabit Ethernet IQ2 interfaces on M-series and T-series routing platforms	<i>JUNOS Class of Service Configuration Guide</i> and “Applying a Policer” on page 616
output-vlan-map	Gigabit Ethernet IQ interfaces	“Configuring the Management Ethernet Interface” on page 627
passive	ATM2 IQ interfaces	“Configuring PPP CHAP Authentication” on page 152 and “Configuring PPP PAP Authentication” on page 152

Table 25: Statements for Logical Interface Properties (continued)

Statement	Interface Types	Usage Guidelines
<code>passive-monitor-mode</code>	SONET/SDH interfaces	“Enabling Passive Monitoring on SONET/SDH Interfaces” on page 709
<code>p-bit-timeout time</code>	Ethernet interfaces configured for DLSw	“Configuring LLC2 Options” on page 167
<code>peer-unit unit-number</code>	Logical tunnel interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
<code>pfc</code>	Interfaces with PPP, PPP CCC, or PPP TCC encapsulation	“Configuring the PPP Protocol Field Compression” on page 113
<code>plp1 cells</code>	ATM2 IQ interfaces	“Configuring the ATM2 IQ EPD Threshold” on page 302
<code>plp-to-clp</code>	ATM2 IQ interfaces	“Enabling the PLP Setting to Be Copied to the CLP Bit” on page 324
<code>point-to-point</code>	All	“Configuring a Point-to-Point Connection” on page 146
<code>policer</code>	Gigabit Ethernet IQ and Gigabit Ethernet PICs with SFPs (except the 10-port Gigabit Ethernet PIC and the built-in Gigabit Ethernet port on the M7i platform)	“Configuring MAC Address Filtering” on page 613
<code>pop</code>	Gigabit Ethernet IQ interfaces	“Removing a VLAN Tag” on page 555
<code>pop-pop</code>	Gigabit Ethernet IQ interfaces	“Removing the Outer and Inner VLAN Tags” on page 555
<code>pop-swap</code>	Gigabit Ethernet IQ interfaces	“Removing the Outer VLAN Tag and Rewriting the Inner VLAN Tag” on page 556
<code>port</code>	AS PIC or MultiServices or MultiServices link services IQ interfaces (lsq) and voice services interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
<code>ppp-options</code>	Interfaces with PPP, PPP CCC, or PPP TCC encapsulation	“Configuring PPP CHAP Authentication” on page 152 and “Configuring PPP PAP Authentication” on page 152
<code>proxy-arp</code>	Ethernet interfaces	“Configuring Unrestricted Proxy ARP” on page 575
<code>push</code>	Gigabit Ethernet IQ interfaces	“Stacking a VLAN Tag” on page 554
<code>push-push</code>	Gigabit Ethernet IQ interfaces	“Stacking Two VLAN Tags” on page 557
<code>queue-length number</code>	ATM1 interfaces	“Configuring the ATM1 Queue Length” on page 301

Table 25: Statements for Logical Interface Properties (continued)

Statement	Interface Types	Usage Guidelines
queues [<i>queue-numbers</i>]	AS PIC or MultiServices link services IQ interfaces (lsq) and voice services interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
routing-instance	GRE tunnel and IP tunnel interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
rtp	AS PIC or MultiServices link services IQ interfaces (lsq) and voice services interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
rtvbr peak <i>rate</i> sustained <i>rate</i> burst <i>length</i>	ATM2 interfaces	“Configuring ATM2 IQ Real-Time VBR” on page 296
service-domain (inside outside)	Adaptive services interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
shaping	ATM1 and ATM2 IQ interfaces	“Defining the ATM Traffic-Shaping Profile” on page 295
short-sequence	Multilink interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
source <i>source-address</i>	Encryption, GRE tunnel, and IP tunnel interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
swap	Gigabit Ethernet IQ interfaces	“Configuring Frames with Particular TPIDs to Be Processed as Tagged Frames” on page 550
swap-push	Gigabit Ethernet IQ interfaces	“Rewriting a VLAN Tag and Adding a New Tag” on page 558
swap-swap	Gigabit Ethernet IQ interfaces	“Rewriting the Inner and Outer VLAN Tags” on page 559
t1-time <i>time</i>	Ethernet interfaces configured for DLSw	“Configuring LLC2 Options” on page 167
t2-time <i>time</i>	Ethernet interfaces configured for DLSw	“Configuring LLC2 Options” on page 167
tag-protocol-id <i>tpid</i>	Gigabit Ethernet IQ and Gigabit Ethernet PICs with SFPs (except the 10-port Gigabit Ethernet PIC, Aggregated Ethernet with Gigabit Ethernet IQ interfaces, and the built-in Gigabit Ethernet port on the M7i platform)	“Rewriting the VLAN Tag” on page 557
transmit-weight <i>number</i>	ATM2 IQ interfaces	“Configuring the ATM2 IQ Transmission Weight” on page 304
trej-time <i>time</i>	Ethernet interfaces configured for DLSw	“Configuring LLC2 Options” on page 167

Table 25: Statements for Logical Interface Properties (*continued*)

Statement	Interface Types	Usage Guidelines
(traps no-traps)	All	“Enabling or Disabling SNMP Notifications on Logical Interfaces” on page 149
trunk-bandwidth <i>rate</i>	ATM2 IQ interfaces	“Configuring Layer 2 Circuit Trunk Mode Scheduling” on page 285
trunk-id <i>number</i>	ATM2 IQ interfaces	“Configuring Layer 2 Circuit Transport Mode” on page 276
ttl <i>number</i>	GRE tunnel and IP tunnel interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
tunnel	Encryption, GRE tunnel, and IP tunnel interfaces	<i>JUNOS Services Interfaces Configuration Guide</i>
underlying-interface	IP demux interfaces	“Specifying the Demux Underlying Interface” on page 230
vbr peak <i>rate</i> sustained <i>rate</i> burst <i>length</i>	ATM interfaces	“Defining the ATM Traffic-Shaping Profile” on page 295
vci <i>vpi-identifier</i> vci- <i>identifier</i>	ATM1 and ATM2 IQ point-to-point interfaces	“Configuring a Point-to-Point ATM1 or ATM2 IQ Connection” on page 292
vci-range	ATM2 IQ interfaces	“Configuring ATM-to-Ethernet Interworking” on page 210
vpi <i>vpi-identifier</i>	ATM1 and ATM2 IQ point-to-point interfaces	“Configuring a Point-to-Point ATM1 or ATM2 IQ Connection” on page 292
vlan-id <i>number</i>	Fast Ethernet, Gigabit Ethernet interfaces, and Gigabit Ethernet IQ interfaces and aggregated Ethernet using Gigabit Ethernet IQ interfaces	“Binding a VLAN ID to a Logical Interface” on page 530 and “Rewriting the VLAN Tag” on page 557
vlan-tags inner <i>tpid</i> vlan-id outer <i>tpid</i> vlan-id	Gigabit Ethernet IQ interfaces	“Configuring Dual VLAN Tags” on page 551
watch-list	ISDN interfaces	“Configuring Dialer Watch” on page 673

Specifying the Logical Interface Number

Each logical interface must have a logical unit number. The logical unit number corresponds to the logical unit part of the interface name. For more information, see “Interface Naming” on page 47.

Point-to-Point Protocol (PPP), Cisco High-level Data Link Control (HDLC), and Ethernet circuit cross-connect (CCC) encapsulations support only a single logical interface,

whose logical unit number must be 0. Frame Relay and ATM encapsulations support multiple logical interfaces, so you can configure one or more logical unit numbers.

You specify the logical unit number by including the `unit` statement:

```
unit logical-unit-number {
    ...
}
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name*]
- [edit logical-systems *logical-system-name* interfaces *interface-name*]

The logical unit number can be from 0 through 16,384.

Configuring Logical System Interface Properties

With JUNOS software, you can partition a single physical routing platform into multiple logical devices that perform independent routing tasks. Because logical systems perform a subset of the tasks once handled by the physical routing platform, logical systems offer an effective way to maximize the use of a single router platform.

You can include the following logical system statements:

```
[edit logical-systems logical-system-name]
interfaces interface-name {
    unit logical-unit-number {
        logical-interface-statements;
    }
}
policy-options {
    policy-options-statements;
}
protocols {
    protocols-statements;
}
routing-instances {
    routing-instances-statements;
}
routing-options {
    routing-options-statements;
}
```

For an overview of logical systems, see the *JUNOS Feature Guide*. For detailed information about logical system configuration, see the *JUNOS Routing Protocols Configuration Guide*. For information about configuring peer relationships between logical systems, see *JUNOS Services Interfaces Configuration Guide*.

To configure interface properties of a logical system, you must include the following statements at the [edit logical-systems *logical-system-name*] hierarchy level:

```
[edit logical-systems logical-system-name]
```

```

interfaces interface-name {
    unit logical-unit-number {
        logical-interface-statements;
    }
}

```

Example: Configuring Logical System Interface Properties

Configure a logical system's interface properties:

```

[edit interfaces t3-0/0/1]
description "Physical interface to be partitioned into multiple logical systems";
[edit logical-systems 1-on-t3-0/0/1]
interfaces t3-0/0/1 {
    unit 1 {
        family inet {
            address 10.0.0.1/32 {
                destination 10.0.0.2;
            }
        }
    }
}

```

Adding a Logical Unit Description to the Configuration

You can include a text description of each logical unit in the configuration file. Any descriptive text you include is displayed in the output of the `show interfaces` commands, and is also exposed in the `ifAlias` Management Information Base (MIB) object. It has no impact on the interface's configuration. To add a text description, include the `description` statement:

```
description text;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

The description can be a single line of text. If the text contains spaces, enclose it in quotation marks.

For information about describing physical interfaces, see “Adding an Interface Description to the Configuration” on page 88.

Configuring a Point-to-Point Connection

By default, all interfaces are assumed to be point-to-point connections. You must ensure that the maximum transmission unit (MTU) sizes on both sides of the connection are the same.

For all interfaces except aggregated Ethernet, Fast Ethernet, and Gigabit Ethernet, you can explicitly configure an interface to be a point-to-point connection by including the `point-to-point` statement:

```
point-to-point;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

Configuring a Multipoint Connection

By default, all interfaces are assumed to be point-to-point connections. To configure an interface to be a multipoint connection, include the `multipoint` statement:

```
multipoint;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

Configuring Accounting for the Logical Interface

Juniper Networks routing platforms can collect various kinds of data about traffic passing through the routing platform. You can set up one or more *accounting profiles* that specify some common characteristics of this data, including the following:

- The fields used in the accounting records
- The number of files that the routing platform retains before discarding, and the number of bytes per file
- The period that the system uses to record the data

You configure the profiles and define a unique name for each profile using statements at the [edit `accounting-options`] hierarchy level. There are two types of accounting profiles: interface profiles and filter profiles. You configure interface profiles by including the `interface-profile` statement at the [edit `accounting-options`] hierarchy level. You configure filter profiles by including the `filter-profile` statement at the [edit `accounting-options`] hierarchy level. For more information, see the *JUNOS Network Management Configuration Guide*.

You apply filter profiles by including the `accounting-profile` statement at the [edit `firewall filter filter-name`] and [edit `firewall family family filter filter-name`] hierarchy levels. For more information, see the *JUNOS Policy Framework Configuration Guide*.

Applying an Accounting Profile to the Logical Interface

To enable accounting on a logical interface, include the `accounting-profile` statement:

```
accounting-profile name;
```

You can include this statement at the following hierarchy levels:

- `[edit interfaces interface-name unit logical-unit-number]`

You can also reference profiles for the physical interface; for more information, see “Configuring Accounting for the Physical Interface” on page 121.

Example: Applying an Accounting Profile to the Logical Interface

Configure an accounting profile for an interface and apply it to a logical interface:

```
[edit]
accounting-options {
  file if_stats {
    size 4m files 10 transfer-interval 15;
    archive-sites {
      "ftp://login:password@host/path";
    }
  }
  interface-profile if_profile {
    interval 15;
    file if_stats {
      fields {
        input-bytes;
        output-bytes;
        input-packets;
        output-packets;
        input-errors;
        output-errors;
      }
    }
  }
}
[edit interfaces ge-1/0/1 unit 1]
accounting-profile if_profile;
```

To reference profiles by physical interface, see “Applying an Accounting Profile to the Physical Interface” on page 122. For information about configuring a firewall filter accounting profile, see the *JUNOS Policy Framework Configuration Guide*.

Configuring the Interface Bandwidth

By default, the JUNOS software uses the physical interface’s speed for the MIB-II object, `ifSpeed`. You can configure the logical unit to populate the `ifSpeed` variable by configuring a bandwidth value for the logical interface. The `bandwidth` statement sets an informational-only parameter; you cannot adjust the actual bandwidth of an interface with this statement.

To configure the bandwidth value for a logical interface, include the **bandwidth** statement:

```
bandwidth rate;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

rate is the peak rate, in bps or cps. You can specify a value in bits per second either as a complete decimal number or as a decimal number followed by the abbreviation k (1000), m (1,000,000), or g (1,000,000,000). You can also specify a value in cells per second by entering a decimal number followed by the abbreviation c; values expressed in cells per second are converted to bits per second using the formula 1 cps = 384 bps. The value can be any positive integer. The **bandwidth** statement is valid for all logical interfaces, except multilink and aggregated interfaces.

Enabling or Disabling SNMP Notifications on Logical Interfaces

By default, Simple Network Management Protocol (SNMP) notifications are sent when the state of an interface or a connection changes. To explicitly enable these notifications on the logical interface, include the **traps** statement; to disable these notifications on the logical interface, include the **no-traps** statement:

```
(traps | no-traps);
```

You can include these statements at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]



NOTE: Gigabit Ethernet interfaces on J-series Services Routers do not support SNMP.

Configuring Interface Encapsulation

PPP encapsulation is the default encapsulation type for physical interfaces. You need not configure encapsulation for any physical interfaces that support PPP encapsulation. If you do not configure encapsulation, PPP is used by default. For physical interfaces that do not support PPP encapsulation, you must configure an encapsulation to use for packets transmitted on the interface. For more information about physical interface encapsulation, see “Configuring the Encapsulation on a Physical Interface” on page 98.

You can optionally configure an encapsulation on a logical interface, which is the encapsulation used within certain packet types.

Configuring the Encapsulation on a Logical Interface

Generally, you configure an interface's encapsulation at the `[edit interfaces interface-name]` hierarchy level. However, for some encapsulation types, such as Frame Relay, ATM, and Ethernet virtual local area network (VLAN) encapsulations, you can also configure the encapsulation type that is used inside the Frame Relay, ATM, or VLAN circuit itself. To do this, include the `encapsulation` statement:

```
encapsulation (atm-ccc-cell-relay | atm-ccc-vc-mux | atm-tcc-vc-mux | atm-cisco-nlpid |
  atm-mlppp-llc | atm-nlpid | atm-ppp-llc | atm-ppp-vc-mux | atm-snap | atm-tcc-snap |
  atm-vc-mux | ether-over-atm-llc | ether-vpls-over-atm-llc | ethernet |
  frame-relay-ether-type | frame-relay-ether-type-tcc | frame-relay-ccc | frame-relay-tcc
  | multilink-frame-relay-end-to-end | multilink-ppp | vlan-ccc | vlan-tcc | vlan-vpls);
```

You can include this statement at the following hierarchy levels:

- `[edit interfaces interface-name unit logical-unit-number]`
- `[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number]`

Some of the ATM encapsulations are defined in RFC 2684, *Multiprotocol Encapsulation over ATM Adaptation Layer 5*.

The following restrictions apply to logical interface encapsulation:

- With the `atm-nlpid`, `atm-cisco-nlpid`, and `atm-vc-mux` encapsulations, you can configure the `inet` family only.
- With the CCC circuit encapsulations, you cannot configure a family on the logical interface.
- A logical interface cannot have `frame-relay-ccc` encapsulation unless the physical device also has `frame-relay-ccc` encapsulation.
- A logical interface cannot have `frame-relay-tcc` encapsulation unless the physical device also has `frame-relay-tcc` encapsulation. In addition, you must assign this logical interface a DLCI from 512 through 1022 and configure it as point-to-point.
- A logical interface cannot have `frame-relay-ether-type` or `frame-relay-ether-type-tcc` encapsulation unless the physical interface has flexible-frame-relay encapsulation and is on an IQ or IQE PIC.
- For `frame-relay-ether-type-tcc` encapsulation, you must assign this logical interface a DLCI from 512 through 1022.
- For interfaces that carry IP version 6 (IPv6) traffic, you cannot configure `ether-over-atm-llc` encapsulation.
- When you use `ether-over-atm-llc` encapsulation, you cannot configure multipoint interfaces.
- A logical interface cannot have `vlan-ccc` or `vlan-vpls` encapsulation unless the physical device also has `vlan-ccc` or `vlan-vpls` encapsulation, respectively. In addition, you must assign this logical interface a VLAN ID from 512 through 1023; if the VLAN ID is 511 or lower, it is subject to the normal destination filter

lookups in addition to source address filtering. For more information, see “Configuring VLAN Encapsulation” on page 532.

- You can create an ATM cell-relay circuit by configuring an entire ATM physical device or an individual virtual circuit (VC). When you configure an entire device, only cell-relay encapsulation is allowed on the logical interfaces. For more information, see “Configuring an ATM1 Cell-Relay Circuit” on page 308.

For more information about ATM encapsulations, see “Configuring ATM Interface Encapsulation” on page 306.

For more information about Frame Relay encapsulations, see “Configuring Frame Relay Interface Encapsulation” on page 348.

For more information about multilink encapsulations, see the *JUNOS Services Interfaces Configuration Guide*.

Configuring the PPP Restart Timers

You can configure a restart timer for the Link Control Protocol (LCP) and Network Control Protocol (NCP) components of a PPP session. You can configure the LCP restart timer on interfaces with PPP, PPP TCC, PPP over Ethernet, PPP over ATM, and PPP over Frame Relay encapsulations. You can configure the NCP restart timer on interfaces with PPP and PPP TCC encapsulations and on multilink PPP bundle interfaces.

To configure the restart timer for the NCP component of a PPP session, include the `ncp-restart-timer` statement, and specify the number of milliseconds.

To configure the restart timer for the LCP component of a PPP session, include the `lcp-restart-timer` statement, and specify the number of milliseconds:

```
lcp-restart-timer milliseconds;
ncp-restart-timer milliseconds;
```

You can include these statements at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* ppp-options]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* ppp-options]

To monitor the configuration, issue the `show interfaces interface-name` command. Configured options are displayed in the PPP parameters field for the physical interface.

```
user@host> run show interfaces t1-0/0/0:1:1.0 detail
Logical interface t1-0/0/0:1:1.0 (Index 67) (SNMP ifIndex 40)
(Generation 156)
Flags: Hardware-Down Device-Down Point-To-Point SNMP-Traps 0x4000
Encapsulation: PPP
PPP parameters:
  LCP restart timer: 2000 msec
  NCP restart timer: 2000 msec
Protocol inet, MTU: 1500, Generation: 163, Route table: 0
```

```

Flags: Protocol-Down
Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
Destination: 1.1.1/24, Local: 1.1.1.2, Broadcast: 1.1.1.255,

```

Configuring the PPP Clear Loop Detected Timer

When a Point-to-Point Protocol (PPP) session detects a loop, the loop detected flag is set. If the flag is not cleared by the protocol after the loopback is cleared, the clear loop detected timer clears the flag after the specified time has elapsed.

To configure the clear loop detected timer for the LCP component of a PPP session, include the `loopback-clear-timer` statement, and specify the number of seconds.

```
loopback-clear-timer seconds;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* ppp-options]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* ppp-options]

To monitor the configuration, issue the `show interfaces interface-name extensive` command.

Configuring PPP CHAP Authentication

For interfaces with PPP encapsulation, you can configure interfaces to support the PPP Challenge Handshake Authentication Protocol (CHAP), as defined in RFC 1994, *PPP Challenge Handshake Authentication Protocol (CHAP)*. When you enable CHAP on an interface, the interface can authenticate its peer and can be authenticated by its peer.

For information about configuring CHAP on logical interfaces, see the *JUNOS System Basics Configuration Guide*.

For information about configuring CHAP on physical interfaces, see “Configuring the PPP Challenge Handshake Authentication Protocol” on page 103

Configuring PPP PAP Authentication

The Password Authentication Protocol (PAP) provides a simple method for the peer to establish its identity using a 2-way handshake. This is done only upon initial link establishment.

After the link is established, an ID and password pair is repeatedly sent by the peer to the authenticator until authentication is acknowledged or the connection is terminated.

To configure PAP, you must create an access profile, configure tracing operations, and configure the logical and physical interfaces.

To configure PAP on a logical interface with PPP encapsulation, include the **pap** statement with options:

```
pap {
  default-pap-password password;
  local-name name;
  local-password password;
  passive;
}
```

You can include these statements at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

For more information about configuring PAP for physical interfaces, see “Configuring the PPP Password Authentication Protocol” on page 106. For information about configuring tracing operations for the PPP protocol, see “Tracing Operations of the pppd Process” on page 110.

On each logical interface with PPP encapsulation, you can perform the following tasks:

- Configuring a Default PAP Password on page 153
- Configuring the Local Name on page 153
- Configuring the Local Password on page 154
- Configuring Passive Mode on page 154

Configuring a Default PAP Password

The default PAP password is used when no matching PAP access profile exists, or if the PAP access profile name changes during PPP link negotiation.

To configure a default PAP password for an interface, include the **default-pap-password** statement:

```
default-pap-password password;
```

You can include the statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* ppp-options pap]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* ppp-options pap]

Configuring the Local Name

By default, when PAP is enabled on an interface, the interface uses the routing platform’s system hostname as the name sent in PAP request and response packets.

To configure the name the interface uses in PAP request and response packets, include the `local-name` statement:

```
local-name name;
```

You can include the statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* ppp-options pap]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* ppp-options pap]

Configuring the Local Password

You need to configure the password to be used for authentication.

To configure the host password for sending PAP requests, include the `local-password` statement:

```
local-password password;
```

You can include the statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* ppp-options pap]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* ppp-options pap]

Configuring Passive Mode

By default, when PAP is enabled on an interface, the interface always sends authenticate-request packets to the peer, and requires that the peer acknowledge the authenticate-request packets. However, some peer routers may not support bidirectional authentication. In these cases, you can configure PAP to operate in passive mode. In passive mode, the router with the PPP link configured for PAP authenticates any incoming connections, but will not require the peer to authenticate its connection.

To configure the interface to authenticate with PAP in passive mode, include the `passive` statement:

```
passive;
```

You can include the statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* ppp-options pap]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* ppp-options pap]

Configuring Dynamic Call Admission Control

Dynamic call admission control (CAC) provides enhanced control over WAN bandwidth. You can configure dynamic CAC on J4350 and J6350 Services Routers supporting voice over IP through the TGM550 media gateway module. It can be used with the following interfaces:

- Fast Ethernet and Gigabit Ethernet interfaces
- ISDN BRI interfaces
- Serial interfaces with PPP or Frame Relay encapsulation

When dynamic CAC is configured on an interface responsible for providing call bandwidth, the TGM550 informs the Media Gateway Controller (MGC) of the bandwidth limit available for voice packets on the interface and requests the MGC to block new calls when the bandwidth is exhausted.

Dynamic CAC is useful when a primary link becomes unavailable and a backup link with less bandwidth takes its place. Without dynamic CAC, the MGC cannot detect the switchover to the backup link or the resulting changes in network topology and available bandwidth. The MGC would continue to admit calls at the bandwidth of the primary link, causing network congestion and possible jitter, delay, and loss of calls.

To configure dynamic CAC for a logical interface, include the `dynamic-call-admission-control` statement, with options:

```
dynamic-call-admission-control {
  activation-priority priority;
  bearer-bandwidth-limit kilobits-per-second;
}
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

`bearer-bandwidth-limit kilobits-per-second` is the dynamic CAC bearer bandwidth limit (BBL)—the maximum bandwidth available for voice traffic on the interface. The TGM550 reports the BBL to the MGC. When the call bandwidth exceeds the BBL, the MGC blocks new calls and alerts the user with a busy tone. The BBL range is from 0 through 9999. The default BBL is -1, which indicates that dynamic CAC is not configured on an interface.

`activation-priority priority` specifies the order in which interfaces are used for providing call bandwidth. The interface with the highest activation priority value is used as the primary link for providing call bandwidth. If the primary link becomes unavailable, the TGM550 switches to the next active interface with the highest activation priority value, and so on. The activation priority value range is from 0 through 255. The default is 50.



NOTE: Dynamic CAC works in conjunction with the Avaya Communication Manager (CM) Call Admission Control: Bandwidth Limitation (CAC-BL) feature. If you configure dynamic CAC on WAN interfaces, you must also configure CAC-BL on Avaya CM. For more information about configuring CAC-BL, see the *Administrator Guide for Avaya Communication Manager*.

Example: Configuring Dynamic CAC

Configure dynamic CAC on a logical interface:

```
[edit]
interfaces {
  t1-4/0/0 {
    unit 0 {
      dynamic-call-admission-control {
        bearer-bandwidth-limit 900 kbps;
        activation-priority 75;
      }
    }
  }
}
```

Disabling a Logical Interface

You can unconfigure a logical interface, effectively disabling that interface, without removing the logical interface configuration statements from the configuration. When an interface is disabled, a route (pointing to the reject target) with the IP address of the interface and a 32-bit subnet mask is installed in the routing table. To do this, include the `disable` statement:

```
disable;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

Chapter 5

Configuring Protocol Family and Interface Address Properties

This chapter describes the configuration of the interface protocol and address properties:

- Protocol Family Configuration and Interface Address Statements on page 157
- Configuring the Protocol Family on page 160
- Configuring the Interface Address on page 162
- Configuring IPCP Options on page 164
- Configuring LLC2 Options on page 167
- Configuring an Unnumbered Interface on page 172
- Setting the Protocol MTU on page 177
- Disabling the Removal of Address and Control Bytes on page 178
- Disabling the Transmission of Redirect Messages on an Interface on page 178
- Configuring Default, Primary, and Preferred Addresses and Interfaces on page 179
- Applying Policers on page 181
- Applying a Filter to an Interface on page 184
- Configuring Unicast RPF on page 189
- Enabling Source Class and Destination Class Usage on page 194

Protocol Family Configuration and Interface Address Statements

For each logical interface, you must configure one or more protocol families. You can also configure interface address properties. To do this, include the following statements:

```
family family {  
    accounting {  
        destination-class-usage;  
        source-class-usage {  
            direction;  
        }  
    }  
    address address {  
        destination address;  
    }  
}
```

```

}
bundle interface-name;
filter {
    dialer filter-name;
    input filter-name;
    output filter-name;
    group filter-group-number;
}
interface-mode (access | trunk);
ipsec-sa sa-name;
keep-address-and-control;
llc2 {
    ack-delay-time time;
    ack-max count;
    idle-time time;
    local-window count;
    max-retry count;
    p-bit-timeout time;
    redundancy-group group-number {
        advertise-interval seconds;
        map {
            local-mac mac-address request mac-address;
        }
        preempt hold-time seconds;
        no-preempt;
        priority priority;
        track {
            dls {
                peer ip-address priority-cost priority;
                destination mac-address priority-cost priority;
            }
            interface interface-name priority-cost priority;
        }
    }
}
t1-time time;
t2-time time;
trej-time time;
}
mtu bytes;
multicast-only;
negotiate-address;
no-redirects;
policer {
    arp policer-template-name;
    input policer-template-name;
    output policer-template-name;
}
primary;
protocols [inet iso mpls];
proxy inet-address address;
receive-options-packets;
receive-ttl-exceeded;
remote (inet-address address | mac-address address);
rpf-check <fail-filter filter-name>;
sampling {
    direction;

```



```

}
service {
  input {
    service-set service-set-name <service-filter filter-name>;
    post-service-filter filter-name;
  }
  output {
    service-set service-set-name <service-filter filter-name>;
  }
}
(translate-discard-eligible | no-translate-discard-eligible);
(translate-fecn-and-becn | no-translate-fecn-and-becn);
vlan-id number;
vlan-id-list [number number-number];
unnumbered-address interface-name destination address destination-profile
  profile-name;
address address {
  arp ip-address (mac | multicast-mac) mac-address <publish>;
  broadcast address;
  destination address;
  destination-profile name;
  eui-64;
  multipoint-destination address dlcid dlcid-identifier;
  multipoint-destination address {
    epd-threshold cells;
    inverse-arp;
    oam-liveness {
      up-count cells;
      down-count cells;
    }
    oam-period (disable | seconds);
    shaping {
      (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained
        rate burst length);
      queue-length number;
    }
    vci vpi-identifier.vci-identifier;
  }
}
primary;
preferred;
(vrrp-group | vrrp-inet6-group) group-number {
  (accept-data | no-accept-data);
  advertise-interval seconds;
  authentication-type authentication;
  authentication-key key;
  fast-interval milliseconds;
  (preempt | no-preempt) {
    hold-time seconds;
  }
}
priority-number number;
track {
  priority-cost seconds;
  priority-hold-time interface-name {
    interface priority;
    bandwidth-threshold bits-per-second {
      priority;

```

```

    }
  }
  route ip-address/mask routing-instance instance-name priority-cost cost;
}
virtual-address [ addresses ];
}
}
}

```

You can include these statements at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

For information about interface-specific protocol and address properties, see “Configuring T1 and NxDS0 Interfaces” on page 396.

Configuring the Protocol Family

For each logical interface, you can configure one or more of the following protocols that run on the interface:

- **any**—Protocol-independent family used for Layer 2 packet filtering. This option is not supported on J-series Services Routers.
- **bridge**—(M-series and T-series routing platforms only) Configure only when the physical interface is configured with **ethernet-bridge** type encapsulation or when the logical interface is configured with **vlan-bridge** type encapsulation. You can optionally configure this protocol family for the logical interface on which you configure VPLS.
- **ccc**—Circuit cross-connect (CCC). You can configure this protocol family for the logical interface of CCC physical interfaces. When you use this encapsulation type, you can configure the **ccc** family only.
- **inet**—IP. You must configure this protocol family for the logical interface to support IP protocol traffic, including Open Shortest Path First (OSPF), Border Gateway Protocol (BGP), Internet Control Message Protocol (ICMP), and Internet Protocol Control Protocol (IPCP).
- **inet6**—IP version 6 (IPv6). You must configure this protocol family for the logical interface to support IPv6 protocol traffic, including Routing Information Protocol for IPv6 (RIPng), Intermediate System-to-Intermediate System (IS-IS), BGP, and Virtual Router Redundancy Protocol for IPv6 (VRRP). For more information about IPv6, see “IPv6 Overview” on page 161.
- **iso**—International Organization for Standardization (ISO). You must configure this protocol family for the logical interface to support IS-IS traffic.
- **mlfr-uni-nni**—Multilink Frame Relay (MLFR) FRF.16 user-to-network network-to-network (UNI NNI). You must configure this protocol or **mlfr-end-to-end** for the logical interface to support link services and voice services bundling.

- **mlfr-end-to-end**—Multilink Frame Relay end-to-end. You must configure this protocol or multilink Point-to-Point Protocol (MLPPP) for the logical interface to support multilink bundling.
- **mlppp**—MLPPP. You must configure this protocol (or **mlfr-end-to-end**) for the logical interface to support multilink bundling.
- **mpls**—Multiprotocol Label Switching (MPLS). You must configure this protocol family for the logical interface to participate in an MPLS path.
- **tcc**—Translational cross-connect (TCC). You can configure this protocol family for the logical interface of TCC physical interfaces.
- **tnp**—Trivial Network Protocol. This protocol is used to communicate between the Routing Engine and the routing platform's packet forwarding components. The JUNOS software automatically configures this protocol family on the routing platform's internal interfaces only, as discussed in "Displaying the Internal Ethernet Interface" on page 225.
- **vpls**—(M-series and T-series routing platforms only) Virtual private LAN service (VPLS). You can optionally configure this protocol family for the logical interface on which you configure VPLS. VPLS provides an Ethernet-based point-to-multipoint Layer 2 VPN to connect customer edge (CE) routing platforms across an MPLS backbone. When you configure a VPLS encapsulation type, the family **vpls** statement is assumed by default. For more information about VPLS, see the *JUNOS VPNs Configuration Guide* and the *JUNOS Feature Guide*.

To configure the logical interface's protocol family, include the **family** statement, specifying the selected family. To configure more than one protocol family on a logical interface, include multiple **family** statements. Following is the minimum configuration:

```
family family {
    mtu size;
    multicast-only;
    no-redirects;
    primary;
    address address {
        destination address;
        broadcast address;
        preferred;
        primary;
    }
}
```

You can include these statements at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

IPv6 Overview

IP version 4 (IPv4) has been widely deployed and used to network the Internet today. With the rapid growth of the Internet, enhancements to IPv4 are needed to support

the influx of new subscribers, Internet-enabled devices, and applications. IPv6 is designed to enable the global expansion of the Internet.

IPv6 builds upon the functionality of IPv4, providing improvements to addressing, configuration and maintenance, and security.

IPv6 is defined in the following documents:

- RFC 2373, *IP Version 6 Addressing Architecture*
- RFC 2460, *Internet Protocol, Version 6 (IPv6)*

IPv4-to-IPv6 Transition

Implementing IPv6 requires a transition mechanism to allow interoperability between IPv6 nodes (both routing platforms and hosts) and IPv4 nodes. The transition mechanism is the key factor in the successful deployment of IPv6. Because millions of IPv4 nodes already exist, upgrading every node to IPv6 at the same time is not feasible.

As a result, transition from IPv4 to IPv6 happens gradually, allowing nodes to be upgraded independently and without disruption to other nodes. While a gradual upgrade occurs, compatibility between IPv6 and IPv4 nodes becomes a requirement. Otherwise, an IPv6 node would not be able to communicate with an IPv4 node.

Transition mechanisms allow IPv6 and IPv4 nodes to coexist together in the same network, and make gradual upgrading possible. The transition mechanism supported by the JUNOS software is tunneling. Tunnels allow IPv6 packets to be encapsulated into IPv4 headers and sent across an IPv4 infrastructure. For more information about configuring tunnels to support IPv4-to-IPv6 transition, see the *JUNOS Services Interfaces Configuration Guide*.

VRRP Properties

The Virtual Router Redundancy Protocol (VRRP) provides a much faster switchover to a backup router when the default router fails. Using VRRP, a backup router can take over a failed default router within a few seconds. This is done with minimum amount of VRRP traffic and without any interactions with the hosts.

For more information on VRRP properties, see the *JUNOS High Availability Configuration Guide*.

Configuring the Interface Address

You assign an address to an interface by specifying the address when configuring the protocol family. For the `inet` family, configure the interface's IP address. For the `iso` family, configure one or more addresses for the loopback interface. For the `ccc`, `tcc`, `mpls`, `tnp`, and `vpls` families, you never configure an address.

To assign an address to an interface, include the `address` statement:

```
address address {
    broadcast address;
```

```

destination address;
destination-profile name;
eui-64;
preferred;
primary;
}

```

You can include these statements at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* family *family*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family *family*]

In the **address** statement, specify the network address of the interface.

For each address, you can optionally configure one or more of the following:

- Broadcast address for the interface's subnet—Specify this in the **broadcast** statement; this applies only to Ethernet interfaces, such as the management interface **fxp0**, the Fast Ethernet interface, and the Gigabit Ethernet interface.
- Address of the remote side of the connection (for point-to-point interfaces only)—Specify this in the **destination** statement.
- Assign PPP properties to the remote end—Specify this in the **destination-profile** statement. You define the profile at the [edit access group-profile *name* ppp] hierarchy level (for point-to-point interfaces only). For more information, see “Configuring IPCP Options” on page 164.
- Whether the routing platform automatically generates the host number portion of interface addresses—The **eui-64** statement applies only to interfaces that carry IPv6 traffic, where the prefix length of the address is 64 bits or less, and the low-order 64 bits of the address are zero. This option does not apply to the loopback interface (**lo0**) because IPv6 addresses configured on the loopback interface must have a 128-bit prefix length.
- Whether this address is the preferred address—Each subnet on an interface has a preferred local address. If you configure more than one address on the same subnet, the preferred local address is chosen by default as the source address when you originate packets to destinations on the subnet. For more information about preferred addresses, see “Configuring Default, Primary, and Preferred Addresses and Interfaces” on page 179.

By default, the preferred address is the lowest numbered address on the subnet. To override the default and explicitly configure the preferred address, include the **preferred** statement when configuring the address.

- Whether this address is the primary address—Each interface has a primary local address. If an interface has more than one address, the primary local address is used by default as the source address when you originate packets out the interface where the destination gives no hint about the subnet (for example, some `ping` commands). For more information about primary addresses, see “Configuring Default, Primary, and Preferred Addresses and Interfaces” on page 179.

By default, the primary address on an interface is the lowest numbered non-127 preferred address on the interface. To override the default and explicitly configure the preferred address, include the **primary** statement when configuring the address.

Configuring the Interface IPv6 Address

You represent IPv6 addresses in hexadecimal notation using a colon-separated list of 16-bit values.

You assign a 128-bit IPv6 address to an interface by including the **address** statement:

```
address aaaa:bbbb:...:zzzz/nn;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* family inet]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family inet]

The double colon (::) represents all bits set to 0, as shown in the following example:

```
interfaces fe-0/0/1 {
  unit 0 {
    family inet6 {
      address fec0:1:1:1::2/64;
    }
  }
}
```



NOTE: You must manually configure the router advertisement and advertise the default prefix for autoconfiguration to work on a specific interface.

Configuring IPCP Options

For interfaces with PPP encapsulation, you can configure IPCP to negotiate IP address assignments and to pass network-related information such as Windows Name Service (WINS) and Domain Name System (DNS) servers, as defined in RFC 1877, *PPP Internet Protocol Control Protocol Extensions for Name Server Addresses*.



NOTE: The JUNOS software does not request name servers from the remote end; the software does, however, send name servers to the remote end if requested.

On the logical interface, the following PPP encapsulation types are supported:

- atm-mlppp-llc
- atm-ppp-llc
- atm-ppp-vc-mux
- multilink-ppp

When you enable a PPP interface, you can configure an IP address, enable the interface to negotiate an IP address assignment from the remote end, or allow the interface to be unnumbered. You can also assign a destination profile to the remote end. The destination profile includes PPP properties, such as primary and secondary DNS and NetBIOS Name Servers (NBNSs). These options are described in the following sections:

- Configuring an IP Address for an Interface on page 165
- Negotiating an IP Address Assignment from the Remote End on page 165
- Configuring an Interface to Be Unnumbered on page 166
- Assigning a Destination Profile to the Remote End on page 166

Configuring an IP Address for an Interface

You can configure an IP address for the interface by including the **address** statement in the configuration. For more information, see “Configuring the Interface Address” on page 162.

If you include the **address** statement in the configuration, you cannot include the **negotiate-address** or **unnumbered-address** statement in the configuration.

When you include the **address** statement in the interface configuration, you can assign PPP properties to the remote end, as shown in “Assigning a Destination Profile to the Remote End” on page 166.

Negotiating an IP Address Assignment from the Remote End

To enable the interface to obtain an IP address from the remote end, include the **negotiate-address** statement at the [edit interfaces *interface-name* unit *logical-unit-number* family inet] hierarchy level:

```
negotiate-address;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* family inet]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family inet]

If you include the **negotiate-address** statement in the configuration, you cannot include the **address** or **unnumbered-address** statement in the configuration.

Configuring an Interface to Be Unnumbered

To configure an interface to be unnumbered, include the `unnumbered-address` and `destination` statements in the configuration:

```
unnumbered-address interface-name destination address;
```

The `unnumbered-address` statement enables the local address to be derived from the specified interface. The interface name must include a logical unit number and must have a configured address (see “Configuring the Interface Address” on page 162). Specify the IP address of the remote interface with the `destination` statement.

You can include these statements at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* family inet]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family inet]

If you include the `unnumbered-address` statement in the configuration, you cannot include the `address` or `negotiate-address` statement in the interface configuration.

When you include the `unnumbered-address` statement in the interface configuration, you can assign PPP properties to the remote end, as shown in “Assigning a Destination Profile to the Remote End” on page 166.

Assigning a Destination Profile to the Remote End

When you include the `address` or `unnumbered-address` statement in the interface configuration, you can assign PPP properties to the remote end. To do this, include the `destination-profile` statement:

```
destination-profile name;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* family inet address *address*]
- [edit interfaces *interface-name* unit *logical-unit-number* family inet unnumbered-address *interface-name*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family inet address *address*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family inet unnumbered-address *interface-name*]

The profile name is a PPP group profile. You define the profile by including the following statements at the [edit access group-profile *name* ppp] hierarchy level:

```
[edit access group-profile name ppp]
framed-pool pool-id;
interface-id interface-id;
primary-dns primary-dns;
primary-wins primary-win-server;
```



```
secondary-dns secondary-dns;
secondary-wins secondary-wins;
```

For more information about PPP group profiles, see the *JUNOS System Basics Configuration Guide*.

Configuring LLC2 Options

Logical link control 2 (LLC2) options can be configured for data link switching (DLSw) protocol support on J-series Services Routers. DLSw allows you to tunnel System Network Architecture (SNA) and NetBIOS traffic over an IP network.

DLSw enables SNA clients to communicate to SNA applications on a mainframe through an IP network. After a connection is established, a DLSw circuit can be created for transporting SNA traffic.

The IP network between an SNA client and an SNA application becomes transparent with DLSw. DLSw transports any SNA traffic. DLSw has an LLC session on one SNA device and recreates it (almost identically) on the other SNA device, making the devices operate as if they were directly connected. DLSw is configured on peer IP routers and transports everything between the peers using Switch-to-Switch Protocol (SSP).

For information about configuring DLSw, see the *JUNOS Services Interfaces Configuration Guide* and the *J-series Services Router Advanced WAN Access Configuration Guide*.

For more information, see the following sections:

- Configuring LLC2 Properties on page 167
- Configuring DLSw Ethernet Redundancy Using LLC2 Properties on page 168
- Example: Configuring LLC Options on an Interface on page 170
- Example: Configuring DLSw Ethernet Redundancy on page 170

Configuring LLC2 Properties

For basic DLSw configuration, include the `llc2` statement at the `[edit interfaces interface-name unit logical-unit-number family]` hierarchy level. All other LLC2 statements that follow are optional and should be used only if recommended by support or a services professional to solve specific problems or for specific network designs.

To configure logical link control properties, include the `llc2` statement:

```
llc2 {
  ack-delay-time time;
  ack-max count;
  idle-time time;
  local-window count;
  max-retry count;
  p-bit-timeout time;
  t1-time time;
  t2-time time;
```

```
    trej-time time;  
}
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* family]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family]

You can configure the following LLC options:

- **ack-delay-time**—The maximum time allowed for incoming Information-frames (I-frames) to remain unacknowledged. Specify the number of milliseconds from 1 through 60000. The default value is 100 milliseconds.
- **ack-max**—The maximum number of I-frames received before acknowledgment is sent. Specify the number of I-frames from 1 through 127. The default value is three I-frames.
- **idle-time**—The number of seconds that a TCP connection between DLSw peers will stay up without any circuit using the connection. Specify the number of seconds from 1 through 60000. The default value is 10 seconds.
- **local-window**—The maximum number of I-frames to send before waiting for acknowledgment. Specify the number of I-frames from 1 through 127. The default value is 7 I-frames.
- **max-retry**—The number of retries the router should attempt when waiting for a response. Specify the number of I-frames from 1 through 127. The default value is 10 I-frames.
- **p-bit-timeout**—The length of time the router waits for response to a poll bit. Specify the number of milliseconds from 1 through 60000. The default value is 3000 milliseconds.
- **t1-time**—The length of time the router waits for an acknowledgment of transmitted frames. Specify the number of milliseconds from 1 through 60000. The default value is 1000 milliseconds.
- **t2-time**—The length of time the router withholds the I-frame response. Specify the number of milliseconds from 1 through 60000. The default value is 100 milliseconds.
- **trej-time**—Q.391-specific timer for T310, in seconds. Specify the number of milliseconds from 1 through 60000. The default value is 3000 milliseconds.

Configuring DLSw Ethernet Redundancy Using LLC2 Properties

DLSw is a means of tunneling SNA and NetBIOS traffic over IP networks. To achieve fault tolerance and load sharing, you can configure Ethernet redundancy and deploy multiple DLSw routers on the same LAN segment. These redundant routers provide alternate paths to the destinations and avoid a single point of failure.

When you configure DLSw Ethernet redundancy on a LAN segment, a master router is selected from a group of DLSw neighbors. The master router establishes the circuits.

To configure DLSw Ethernet redundancy, include the **redundancy-group** statement and define redundancy group options:

```

llc2 {
  redundancy-group group-number {
    advertise-interval seconds;
    map {
      local-mac mac-address remote-mac mac-address;
      preempt hold-time seconds;
      no-preempt;
      priority priority;
      track {
        dls {
          destination mac-address priority-cost priority;
          peer ip-address priority-cost priority;
        }
        interface interface-name priority-cost priority;
      }
    }
  }
}

```

You can include these statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* family]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family]

You can configure the following redundancy options:

- **redundancy-group *group-number***—The group to which this router belongs. Specify the group number, in the range from 0 through 255.
- **advertise-interval**—The advertisement interval of DLSw peers on the network. All routers in the redundancy group must use the same advertisement interval. Specify the number of seconds, from 1 through 255. The default is 1 second.
- **map**—Map a local peer MAC address to a remote peer MAC address.
 - **local-mac**—The local MAC address to be mapped to a remote destination MAC address.
 - **mac-address**—The MAC address. Specify the MAC address as six hexadecimal bytes in one of the following formats: *nn:nn:nn:nn:nn:nn* or *nnnn .nnnn.nnnn*. For example, 0011.2233.4455 or 00:11:22:33:44:55.
 - **remote-mac**—The remote destination MAC address to be mapped to a local MAC address.
- **preempt hold-time *seconds***— Configure the time to wait before a higher-priority backup router preempts the master router. Specify the number of seconds, from 0 through 3600. DLSw preemption is 0 by default.
- **no-preempt**—Prohibit the preemption of the master router.

- **priority *priority***—The router's priority for becoming the master router. The router with the highest priority within the redundancy group becomes the master. A larger value indicates a higher priority for being elected. Specify the priority from 1 through 255. The default is 100 (for backup routers).
- **track**—Enable the following tracking options for the remote peer and the destination peer:
 - **dls**—DLSw protocol.
 - **destination *mac-address* priority-cost *priority***—The local MAC address and the priority. Specify the MAC address as six hexadecimal bytes in one of the following formats: *nn:nn:nn:nn:nn:nn* or *nnnn.nnnn.nnnn*. For example, 0011.2233.4455 or 00:11:22:33:44:55. The priority cost is the value subtracted from the priority value when remote peer connectivity is lost. Specify a value from 1 through 254.
 - **peer *ip-address* priority-cost *priority***—The IP address of the remote peer. The priority cost is the value subtracted from the priority value when remote peer connectivity is lost. Specify a value from 1 through 254.
 - **interface *interface-name***—The interface name. Include the logical portion of the name, which corresponds to the logical unit number.

Example: Configuring LLC Options on an Interface

Configure LLC options on an unnumbered interface:

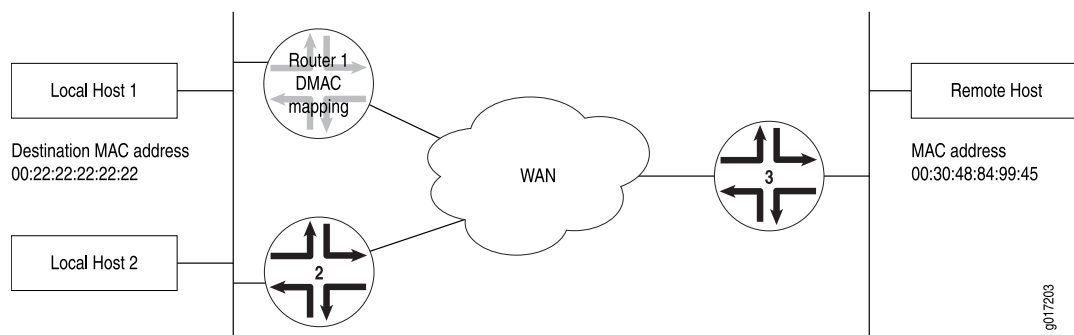
```
[edit]
interfaces {
  fe-0/0/0 {
    unit 0 {
      family inet;
      address 10.10.10.2/24;
    }
    family llc2 {
      ack-delay-time 3000;
      ack-max 10;
      idle-time 102;
      local-window 15;
      max-retry 20;
      p-bit-timeout 100;
      t1-time 101;
      t2-time 101;
      max-retry 5;
      trej-time 4000;
    }
  }
}
```

Example: Configuring DLSw Ethernet Redundancy

In Figure 6 on page 171, the local hosts share the same destination MAC address of 00:00:5E:00:01:01 and send DLSw traffic to the remote host with a MAC address of

00:02:00:00:00:01. Router 1 and Router 2 are configured for DLSw redundancy and map the local destination MAC address to the remote MAC address. Router 1 is also the designated master. If Router 1 becomes unavailable, Router 2, the backup router, takes over as the master router.

Figure 6: DLSw Ethernet Redundancy Topology



To configure DLSw Ethernet redundancy, do the following:

Configuration on Router 1

Configure the redundancy group, redundancy group options, and the priority cost of each redundancy group option:

```
[edit]
interfaces {
  fe-0/0/0 {
    unit 0 {
      family llc2 {
        redundancy-group 1 {
          advertise-interval 1;
          map {
            local-mac 00:00:5e:00:01:01 remote-mac 00:02:00:00:00:01;
            preempt hold-time 20;
            priority 200;
            track {
              dls {
                destination 00:02:00:00:00:01 priority-cost 50;
                peer 10.10.10.10 priority-cost 25;
              }
            }
            interface e1-0/0/2.0 priority-cost 40;
          }
        }
      }
    }
  }
}
```

Configuration on Router 2

Configure the redundancy group, redundancy group options, and the priority cost of each redundancy group option:

```
[edit]
interfaces {
  fe-0/0/1 {
```

```

unit 0 {
  family llc2 {
    redundancy-group 1 {
      map {
        local-mac 00:00:5e:00:01:01 remote-mac 00:02:00:00:00:01;
        priority-cost 190;
        track {
          dls {
            destination 00:02:00:00:00:01 priority-cost 50;
            peer 10.10.10.10 priority-cost 25;
          }
          interface e1-0/0/2.0 priority-cost 40;
        }
      }
    }
  }
}

```

Configuring an Unnumbered Interface

When you need to conserve IP addresses, you can configure unnumbered interfaces. Setting up an unnumbered interface enables IP processing on the interface without assigning an explicit IP address to the interface. The statements you use to configure an unnumbered interface depend on the type of interface you are configuring: a point-to-point interface or an Ethernet interface:

- Configuring an Unnumbered Point-to-Point Interface on page 172
- Configuring an Unnumbered Ethernet or Demux Interface on page 173

Configuring an Unnumbered Point-to-Point Interface

To configure a point-to-point interface to be unnumbered, configure the protocol family, but do not include the **address** statement:

```
family family;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]



NOTE: For interfaces with PPP encapsulation, you can configure an unnumbered interface by including the **unnumbered-interface** statement in the configuration. For more information, see “Configuring IPCP Options” on page 164.

When configuring unnumbered interfaces, you must ensure that a source address is configured on some interface in the routing platform. This address is the default address. We recommend that you do this by assigning an address to the loopback interface (lo0), as described in “Configuring the Loopback Interface” on page 235. If you configure an address (other than a martian) on the lo0 interface, that address is always the default address, which is preferable because the loopback interface is independent of any physical interfaces and therefore is always accessible.

Example: Configuring an Unnumbered Point-to-Point Interface

Configure an unnumbered point-to-point interface:

```
[edit]
interfaces {
  so-6/1/0 {
    unit 0 {
      family inet;
      family iso;
    }
  }
}
```

Configuring an Unnumbered Ethernet or Demux Interface

To configure an Ethernet or demultiplexing interface to be unnumbered, include the `unnumbered-address` statement in the configuration:

```
unnumbered-address interface-name;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* family inet]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family inet]

The `unnumbered-address` statement currently supports configuration of unnumbered Ethernet or unnumbered demux interfaces only for the IPv4 address family.

The interface that you configure to be unnumbered “borrows” an assigned IPv4 address from another interface, and is therefore referred to as the borrower interface. The interface from which the IP address is borrowed is referred to as the donor interface. In the `unnumbered-address` statement, *interface-name* specifies the donor interface. For an Ethernet unnumbered interface, the donor interface can be an Ethernet, ATM, SONET, or loopback interface that has a logical unit number and configured IP address and is not itself an unnumbered interface. For an IP demultiplexing unnumbered interface, the donor interface can be an Ethernet or loopback interface that has a logical unit number and configured IP address and is not itself an unnumbered interface. In addition, for either Ethernet or demux, the donor interface and the borrower interface must be members of the same routing instance and the same logical system.

When you configure an unnumbered Ethernet or demux interface, the IP address of the donor interface becomes the source address in packets generated by the unnumbered interface.

You can configure a host route that points to an unnumbered Ethernet or demux interface. For information about host routes, see the *JUNOS MPLS Applications Configuration Guide*.

For more information, see the following sections:

- Configuring a Preferred Source Address for Unnumbered Ethernet or Demux Interfaces on page 174
- Configuring Static Routes on Unnumbered Ethernet Interfaces on page 175
- Restrictions for Configuring Unnumbered Ethernet Interfaces on page 175
- Example: Configuring an Unnumbered Ethernet Interface on page 176
- Example: Configuring the Preferred Source Address for an Unnumbered Ethernet Interface on page 176
- Example: Configuring an Unnumbered Ethernet Interface as the Next Hop for a Static Route on page 177

Configuring a Preferred Source Address for Unnumbered Ethernet or Demux Interfaces

When a loopback interface with multiple secondary IPv4 addresses is configured as the donor interface for an unnumbered Ethernet or demux interface, you can optionally specify any one of the loopback interface's secondary addresses as the preferred source address for the unnumbered Ethernet or demux interface. This feature enables you to use an IP address other than the primary IP address on some of the unnumbered Ethernet or demux interfaces in your network.

To configure a secondary address on a loopback donor interface as the preferred source address for an unnumbered Ethernet or demux interface, include the `preferred-source-address` option in the `unnumbered-address` statement:

```
unnumbered-address interface-name <preferred-source-address address>;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* family inet]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family inet]

The following considerations apply when you configure a preferred source address on an unnumbered Ethernet or demux interface:

- The `unnumbered-address` statement currently supports the configuration of a preferred source address only for the IPv4 address family. Configuration of a preferred source address for families other than IPv4 is not currently supported.
- If you do not specify the preferred source address, the router uses the default primary IP address of the donor interface.

- You cannot delete an address on a donor loopback interface while it is being used as the preferred source address for an unnumbered Ethernet or demux interface.
- The router uses the preferred source address, if configured for an unnumbered Ethernet or demux interface, in ARP requests and replies. ARP requests must match the preferred source address.

For a configuration example that illustrates this feature, see “Example: Configuring the Preferred Source Address for an Unnumbered Ethernet Interface” on page 176.

To display the preferred source address for an unnumbered Ethernet or demux interface, use the **show interfaces** operational mode command. For information about using this command, see the *JUNOS Interfaces Command Reference*.

Configuring Static Routes on Unnumbered Ethernet Interfaces

You can configure static routes on an unnumbered Ethernet interface. To do so, you use the **qualified-next-hop** statement to specify the unnumbered Ethernet interface as the next-hop interface for a configured static route. This feature enables you to specify independent preferences and metrics for static routes on a next-hop basis.

For a configuration example that illustrates this feature, see “Example: Configuring an Unnumbered Ethernet Interface as the Next Hop for a Static Route” on page 177.

For information about how to specify an independent preference for a static route, see the *JUNOS Routing Protocols Configuration Guide*.

Restrictions for Configuring Unnumbered Ethernet Interfaces

The following restrictions apply when you configure unnumbered Ethernet interfaces:

- The **unnumbered-address** statement currently supports the configuration of unnumbered Ethernet interfaces only for the IPv4 address family. Unnumbered Ethernet configuration for families other than IPv4 is not supported.
- You cannot assign an IP address to an Ethernet interface that is already configured as an unnumbered interface.
- The donor interface for an unnumbered Ethernet interface must have one or more configured IP addresses.
- The donor interface for an unnumbered Ethernet interfaced cannot be configured as unnumbered.
- An unnumbered Ethernet interface does not support configuration of the following **address** statement options: **arp**, **broadcast**, **primary**, **preferred**, and **vrp-group**. For information about these options, see “Configuring the Interface Address” on page 162.
- Running IGMP and PIM are supported only on unnumbered Ethernet interfaces that directly face the host and have no downstream PIM neighbors. IGMP and PIM are not supported on unnumbered Ethernet interfaces that act as upstream interfaces in a PIM topology.
- Running OSPF and IS-IS on unnumbered Ethernet interfaces is not supported.

- You cannot configure this feature on the TX Matrix platform.
- The configuration of unnumbered Ethernet interfaces is not supported when graceful Routing Engine switchover (GRES) is enabled on the router.

Example: Configuring an Unnumbered Ethernet Interface

In this example, `ge-1/0/0` is the unnumbered interface and `ge-0/0/0` is the donor interface from which `ge-1/0/0` “borrows” an IP address.

```

interfaces {
  ge-0/0/0 {
    unit 0 {
      family inet {
        address 4.4.4.1/24;
      }
    }
  }
  ge-1/0/0 {
    unit 0 {
      family inet {
        unnumbered-address ge-0/0/0.0;
      }
    }
  }
}

```

Example: Configuring the Preferred Source Address for an Unnumbered Ethernet Interface

In this example, loopback interface `lo0` is the donor interface from which unnumbered Ethernet interface `ge-4/0/0` “borrows” an IP address. The example also configures one of the loopback interface’s secondary addresses, `3.3.3.1`, as the preferred source address for the unnumbered Ethernet interface.

```

interfaces {
  lo0 {
    unit 0 {
      family inet {
        address 2.2.2.1/32;
        address 3.3.3.1/32;
      }
    }
  }
}
interfaces {
  ge-4/0/0 {
    unit 0 {
      family inet {
        unnumbered-address lo0.0 preferred-source-address 3.3.3.1;
      }
    }
  }
}

```

Example: Configuring an Unnumbered Ethernet Interface as the Next Hop for a Static Route

In this example, `ge-0/0/0` is the unnumbered interface and a loopback interface, `lo0`, is the donor interface from which `ge-0/0/0` “borrows” an IP address. The example also configures a static route to `7.7.7.1/32` with a next hop through unnumbered interface `ge-0/0/0.0`.

```

interfaces {
  lo0 {
    unit 0 {
      family inet {
        address 5.5.5.1/32;
        address 6.6.6.1/32;
      }
    }
  }
}
interfaces
  ge-0/0/0 {
    unit 0 {
      family inet {
        unnumbered-address lo0.0;
      }
    }
  }
}
routing-options {
  static {
    route 7.7.7.1/32 {
      qualified next-hop ge-0/0/0.0;
    }
  }
}

```

Setting the Protocol MTU

When you initially configure an interface, the protocol maximum transmission unit (MTU) is calculated automatically. If you subsequently change the media MTU, the protocol MTU on existing address families automatically changes.

For a list of default protocol MTU values, see “Configuring the Media MTU” on page 89.

To modify the MTU for a particular protocol family, include the `mtu` statement:

```
mtu bytes;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* family *family*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family *family*]

If you increase the size of the protocol MTU, you must ensure that the size of the media MTU is equal to or greater than the sum of the protocol MTU and the encapsulation overhead. For a list of encapsulation overhead values, see Table 20 on page 95. If you reduce the media MTU size, but there are already one or more address families configured and active on the interface, you must also reduce the protocol MTU size. (You configure the media MTU by including the `mtu` statement at the `[edit interfaces interface-name]` hierarchy level, as discussed in “Configuring the Media MTU” on page 89.)



NOTE: Changing the media MTU or protocol MTU causes an interface to be deleted and added again.

The maximum number of data-link connection identifiers (DLCIs) is determined by the MTU on the interface. If you have keepalives enabled, the maximum number of DLCIs is 1000, with the MTU set to 5012.

The actual frames transmitted also contain cyclic redundancy check (CRC) bits, which are not part of the MTU. For example, the default protocol MTU for a Gigabit Ethernet interface is 1500 bytes, but the largest possible frame size is actually 1504 bytes; you need to consider the extra bits in calculations of MTUs for interoperability.

Disabling the Removal of Address and Control Bytes

For Point-to-Point Protocol (PPP) CCC-encapsulated interfaces, the address and control bytes are removed by default before the packet is encapsulated into a tunnel.

You can disable the removal of address and control bytes. To do this, include the `keep-address-and-control` statement:

```
keep-address-and-control;
```

You can include this statement at the following hierarchy levels:

- `[edit interfaces interface-name unit logical-unit-number family ccc]`
- `[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number family ccc]`

Disabling the Transmission of Redirect Messages on an Interface

By default, the interface sends protocol redirect messages. To disable the sending of these messages on an interface, include the `no-redirects` statement:

```
no-redirects;
```

You can include this statement at the following hierarchy levels:

- `[edit interfaces interface-name unit logical-unit-number family family]`
- `[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number family family]`

To disable the sending of protocol redirect messages for the entire routing platform, include the `no-redirects` statement at the [edit system] hierarchy level.

Configuring Default, Primary, and Preferred Addresses and Interfaces

The routing platform has a default address and a primary interface, and interfaces have primary and preferred addresses.

The *default address* of the routing platform is used as the source address on unnumbered interfaces. The routing protocol process tries to pick the default address as the routing platform ID, which is used by protocols, including OSPF and internal BGP (IBGP).

The *primary interface* for the routing platform is the interface that packets go out when no interface name is specified and when the destination address does not imply a particular outgoing interface.

An interface's *primary address* is used by default as the local address for broadcast and multicast packets sourced locally and sent out the interface. An interface's *preferred address* is the default local address used for packets sourced by the local routing platform to destinations on the subnet.

The default address of the routing platform is chosen using the following sequence:

1. The primary address on the loopback interface `lo0` that is not `127.0.0.1` is used.
2. The primary address on the primary interface is used.

To configure these addresses and interfaces, you can do the following:

- Configuring the Primary Interface for the Routing Platform on page 179
- Configuring the Primary Address for an Interface on page 180
- Configuring the Preferred Address for an Interface on page 180

Configuring the Primary Interface for the Routing Platform

The *primary interface* for the routing platform has the following characteristics:

- It is the interface that packets go out when you type a command such as `ping 255.255.255.255`—that is, a command that does not include an interface name (there is no interface `type-0/0/0.0` qualifier) and where the destination address does not imply any particular outgoing interface.
- It is the interface on which multicast applications running locally on the routing platform, such as Session Announcement Protocol (SAP), do group joins by default.
- It is the interface from which the default local address is derived for packets sourced out an unnumbered interface if there are no non-127 addresses configured on the loopback interface, `lo0`.

By default, the multicast-capable interface with the lowest-index address is chosen as the primary interface. If there is no such interface, the point-to-point interface

with the lowest index address is chosen. Otherwise, any interface with an address could be picked. In practice, this means that, on the routing platform, the `fxp0` interface is picked by default.

To configure a different interface to be the primary interface, include the `primary` statement:

```
primary;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* family *family*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family *family*]

Configuring the Primary Address for an Interface

The *primary address* on an interface is the address that is used by default as the local address for broadcast and multicast packets sourced locally and sent out the interface. For example, the local address in the packets sent by a `ping interface so-0/0/0.0 255.255.255.255` command is the primary address on interface `so-0/0/0.0`. The primary address flag also can be useful for selecting the local address used for packets sent out unnumbered interfaces when multiple non-127 addresses are configured on the loopback interface, `lo0`. By default, the primary address on an interface is selected as the numerically lowest local address configured on the interface.

To set a different primary address, include the `primary` statement:

```
primary;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* family *family* address *address*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family *family* address *address*]

Configuring the Preferred Address for an Interface

The *preferred address* on an interface is the default local address used for packets sourced by the local routing platform to destinations on the subnet. By default, the numerically lowest local address is chosen. For example, if the addresses `172.16.1.1/12`, `172.16.1.2/12`, and `172.16.1.3/12` are configured on the same interface, the preferred address on the subnet (by default, `172.16.1.1`) would be used as a local address when you issue a `ping 172.16.1.5` command.

To set a different preferred address for the subnet, include the `preferred` statement:

```
preferred;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* family *family* address *address*]

- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family *family* address *address*]

Applying Policers

Policers allow you to perform simple traffic policing on specific interfaces or Layer 2 virtual private networks (VPNs) without configuring a firewall filter. To apply policers, include the **policer** statement:

```
policer {
  arp policer-template-name;
  input policer-template-name;
  output policer-template-name;
}
```

You can include these statements at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* family *family*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family *family*]

In the **family** statement, the protocol family can be **ccc**, **inet**, **inet6**, **mpls**, **tcc**, or **vpls**.

In the **arp** statement, list the name of one policer template to be evaluated when Address Resolution Protocol (ARP) packets are received on the interface. By default, an ARP policer is installed that is shared among all the Ethernet interfaces on which you have configured the **family inet** statement. If you want more stringent or lenient policing of ARP packets, you can configure an interface-specific policer and apply it to the interface. You configure an ARP policer just as you would configure any other policer, at the [edit firewall policer] hierarchy level. If you apply this policer to an interface, the default ARP packet policer is overridden. If you delete this policer, the default policer takes effect again.

In the **input** statement, list the name of one policer template to be evaluated when packets are received on the interface.

In the **output** statement, list the name of one policer template to be evaluated when packets are transmitted on the interface.



NOTE: To use policing on a CCC or TCC interface, you must configure the CCC or TCC protocol family.

You can configure a different policer on each protocol family on an interface, with one input policer and one output policer for each family. When you apply policers, you can configure the family **ccc**, **inet**, **inet6**, **mpls**, **tcc**, or **vpls** only, and one ARP policer for the family **inet** protocol only. Each time a policer is referenced, a separate copy of the policer is installed on the packet forwarding components for that interface.

If you apply both policers and firewall filters to an interface, input policers are evaluated before input firewall filters, and output policers are evaluated after output firewall filters.

If you apply the policer to the interface `lo0`, it is applied to packets received or transmitted by the Routing Engine.

On M-series platforms (except the M320 and M120 routers), if you apply a firewall filter or policer to multiple interfaces, the filter or policer acts on the sum of traffic entering or exiting those interfaces. On T-series, M120, and M320 platforms, the filter or policer acts on the sum of traffic, if the interfaces are on the same FPC.

For more information about policers, see the *JUNOS Policy Framework Configuration Guide*.

Applying Aggregate Policers

By default, if you apply a policer to multiple protocol families on the same logical interface, the policer restricts traffic for each protocol family individually. For example, a policer with a 50 Mbps bandwidth limit applied to both IPv4 and IPv6 traffic would allow the interface to accept 50 Mbps of IPv4 traffic and 50 Mbps of IPv6 traffic. If you apply an aggregate policer, the policer would allow the interface to receive only 50 Mbps of IPv4 and IPv6 traffic combined.

To configure an aggregate policer, include the `logical-interface-policer` statement at the `[edit firewall policer policer-template-name]` hierarchy level:

```
[edit firewall policer policer-template-name]  
logical-interface-policer;
```

For the policer to be treated as an aggregate, you must apply it to multiple protocol families on a single logical interface by including the `policer` statement:

```
policer {  
  arp policer-template-name;  
  input policer-template-name;  
  output policer-template-name;  
}
```

You can include these statements at the following hierarchy levels:

- `[edit interfaces interface-name unit logical-unit-number family family]`
- `[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number family family]`

In the `family` statement, the protocol family can be `ccc`, `inet`, `inet6`, `mpls`, `tcc`, or `vppls`.

The protocol families on which you do not apply the policer are not affected by the policer. For example, if you configure a single logical interface to accept MPLS, IPv4, and IPv6 traffic and you apply the logical interface policer `policer1` to only the IPv4 and IPv6 protocol families, MPLS traffic is not subject to the constraints of `policer1`.

If you apply `policer1` to a different logical interface, there are two instances of the policer. This means the JUNOS software polices traffic on separate logical interfaces separately, not as an aggregate, even if the same logical-interface policer is applied to multiple logical interfaces on the same physical interface port.



NOTE: Logical interface policers are not supported for filter policers. In other words, you cannot include the `logical-interface-policer` statement at the `[edit firewall filter name term name then policer]` hierarchy level.

Example: Applying Aggregate Policers

Configure two logical interface policers: `aggregate_police1` and `aggregate_police2`. Apply `aggregate_police1` to IPv4 and IPv6 traffic received on logical interface `fe-0/0/0.0`. Apply `aggregate_police2` to CCC and MPLS traffic received on logical interface `fe-0/0/0.0`. This configuration causes the software to create only one instance of `aggregate_police1` and one instance of `aggregate_police2`.

Apply `aggregate_police1` to IPv4 and IPv6 traffic received on another logical interface `fe-0/0/0.1`. This configuration causes the software to create a new instance of `aggregate_police1`, one that applies to unit 0 and another that applies to unit 1.

```
[edit firewall]
policer aggregate_police1 {
  logical-interface-policer;
  if-exceeding {
    bandwidth-limit 100m;
    burst-size-limit 500k;
  }
  then {
    discard;
  }
}
policer aggregate_police2 {
  logical-interface-policer;
  if-exceeding {
    bandwidth-limit 10m;
    burst-size-limit 200k;
  }
  then {
    discard;
  }
}
[edit interfaces fe-0/0/0]
unit 0 {
  family inet {
    policer {
      input aggregate_police1;
    }
  }
  family inet6 {
    policer {
      input aggregate_police1;
    }
  }
}
```

```

    }
  }
  family ccc {
    policer {
      input aggregate_police2;
    }
  }
  family mpls {
    policer {
      input aggregate_police2;
    }
  }
}
unit 1 {
  family inet {
    policer {
      input aggregate_police1;
    }
  }
  family inet6 {
    policer {
      input aggregate_police1;
    }
  }
}
}

```

Applying a Filter to an Interface

To apply firewall filters to an interface, include the **filter** statement:

```

filter {
  group filter-group-number;
  input filter-name;
  output filter-name;
}

```

To apply a single filter, include the **input** statement:

```

filter {
  input filter-name;
}

```

To apply a list of filters to evaluate packets received on an interface, include the **input-list** statement.

```

filter {
  input-list [ filter-names ];
}

```

Up to 16 filter names can be included in an input list.

To apply a list of filters to evaluate packets transmitted on an interface, include the **output-list** statement.

```

filter {

```

```
    output-list [ filter-names ];
}
```

When you apply filters using the `input-list` statement or the `output-list` statement, a new filter is created with the name `< interface-name > . < unit-direction >`. This filter is exclusively interface-specific.

You can include these statements at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* family *family*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family *family*]

In the `family` statement, the protocol family can be `ccc`, `inet`, `inet6`, `mpls`, or `vppls`.

In the `group` statement, specify the interface group number to associate with the filter.

In the `input` statement, list the name of one firewall filter to be evaluated when packets are received on the interface.

In the `input-list` statement, list the names of filters to evaluate when packets are received on the interface. You can include up to 16 filter names.

In the `output` statement, list the name of one firewall filter to be evaluated when packets are transmitted on the interface.



NOTE: Output filters do not work for broadcast and multicast traffic, including VPLS traffic, as shown in “Example: Applying a Filter to an Interface” on page 186.

In the `output-list` statement, list the names of filters to evaluate when packets are transmitted on the interface. You can include up to 16 filter names.

You can use the same filter one or more times. On M-series platforms (except the M320 and M120 routers), if you apply a firewall filter or policer to multiple interfaces, the filter or policer acts on the sum of traffic entering or exiting those interfaces.

On T-series, M120, and M320 platforms, interfaces are distributed among multiple packet forwarding components. Therefore, on these platforms, if you apply a firewall filter or policer to multiple interfaces, the filter or policer acts on the traffic stream entering or exiting each interface, regardless of the sum of traffic on the multiple interfaces.

If you apply the filter to the interface `lo0`, it is applied to packets received or transmitted by the Routing Engine. You cannot apply MPLS filters to the management interface (`fxp0`) or the loopback interface (`lo0`).

For more information about firewall filters, see the *JUNOS Policy Framework Configuration Guide*. For more information about MPLS filters, see the *JUNOS MPLS Applications Configuration Guide*.

See also the following sections:

- Defining Interface Groups in Firewall Filters on page 186
- Filter-Based Forwarding on the Output Interface on page 186
- Example: Applying a Filter to an Interface on page 186

Defining Interface Groups in Firewall Filters

When applying a firewall filter, you can define an interface to be part of an *interface group*. Packets received on that interface are tagged as being part of the group. You can then match these packets using the **interface-group** match statement, as described in the *JUNOS Policy Framework Configuration Guide*.

To define the interface to be part of an interface group, include the **group** statement:

```
group filter-group-number;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* family *family* filter]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family *family* filter]

Filter-Based Forwarding on the Output Interface

If port-mirrored packets are to be distributed to multiple monitoring or collection interfaces, based on patterns in packet headers, it is helpful to configure a filter-based forwarding (FBF) filter on the port-mirroring egress interface.

When an FBF filter is installed as an output filter, a packet that is forwarded to the filter has already undergone at least one route lookup. After the packet is classified at the egress interface by the FBF filter, it is redirected to another routing table for additional route lookup. To avoid packet looping inside the Packet Forwarding Engine, the route lookup in the latter routing table (designated by an FBF routing instance) must result in a different next hop from any next hop specified in a table that has already been applied to the packet.

If an input interface is configured for FBF, the source lookup is disabled for those packets headings to a different routing instance, since the routing table is not set up to handle the source lookup.

For more information about FBF configuration, see the *JUNOS Routing Protocols Configuration Guide*. For more information about port mirroring, see the *JUNOS Services Interfaces Configuration Guide*.

Example: Applying a Filter to an Interface

Input Filter for VPLS Traffic

For M-series and T-series routing platforms only, apply an input filter to VPLS traffic. Output filters do not work for broadcast and multicast traffic, including VPLS traffic.

```
[edit interfaces]
fe-2/2/3 {
```

```

vlan-tagging;
encapsulation vlan-vpls;
unit 601 {
    encapsulation vlan-vpls;
    vlan-id 601;
    family vpls {
        filter {
            input filter1; # Works for multicast destination MAC address
            output filter1; # Does not work for multicast destination MAC address
        }
    }
}
[edit firewall]
family vpls {
    filter filter1 {
        term 1 {
            from {
                destination-mac-address {
                    01:00:0c:cc:cc:cd/48;
                }
            }
            then {
                discard;
            }
        }
        term 2 {
            then {
                accept;
            }
        }
    }
}

```

Filter-Based Forwarding at the Output Interface

The following example illustrates the configuration of filter-based forwarding at the output interface. In this example, the packet flow follows this path:

1. A packet arrives at interface **fe-1/2/0.0** with source and destination addresses **10.50.200.1** and **10.50.100.1** respectively.
2. The route lookup in routing table **inet.0** points to the egress interface **so-0/0/3.0**.
3. The output filter installed at **so-0/0/3.0** redirects the packet to routing table **fbf.inet.0**.
4. The packet matches the entry **10.50.100.0/25** in the **fbf.inet.0** table, and finally leaves the router from interface **so-2/0/0.0**.

```

[edit interfaces]
so-0/0/3 {
    unit 0 {
        family inet {
            filter {
                output fbf;
            }
            address 10.50.10.2/25;
        }
    }
}

```

```

    }
  }
}
fe-1/2/0 {
  unit 0 {
    family inet {
      address 10.50.50.2/25;
    }
  }
}
so-2/0/0 {
  unit 0 {
    family inet {
      address 10.50.20.2/25;
    }
  }
}
[edit firewall]
filter fbf {
  term 0 {
    from {
      source-address {
        10.50.200.0/25;
      }
    }
    then routing-instance fbf;
  }
  term d {
    then count d;
  }
}
[edit routing-instances]
fbf {
  instance-type forwarding;
  routing-options {
    static {
      route 10.50.100.0/25 next-hop so-2/0/0.0;
    }
  }
}
[edit routing-options]
interface-routes {
  rib-group inet fbf-group;
}
static {
  route 10.50.100.0/25 next-hop 10.50.10.1;
}
rib-groups {
  fbf-group {
    import-rib [inet.0 fbf.inet.0];
  }
}

```

Configuring Unicast RPF

For interfaces that carry IPv4 or IPv6 traffic, you can reduce the impact of denial of service (DoS) attacks by configuring unicast reverse path forwarding (RPF). Unicast RPF helps determine the source of attacks and rejects packets from unexpected source addresses on interfaces where unicast RPF is enabled.



NOTE: If you want to configure unicast RPF, your routing platform must be equipped with the Internet Processor II application-specific integrated circuit (ASIC).

If you enable unicast RPF on live traffic, some packets are dropped while the packet forwarding components are updating.

For transit packets exiting the router through the tunnel, forwarding path features, such as RPF, forwarding table filtering, source class usage, and destination class usage are not supported on the interfaces you configure as the output interface for tunnel traffic. For firewall filtering, you must allow the output tunnel packets through the firewall filter applied to input traffic on the interface that is the next-hop interface towards the tunnel destination.

The following sections describe unicast RPF in detail:

- Configuring Unicast RPF Strict Mode on page 189
- Configuring Unicast RPF Loose Mode on page 190
- Unicast RPF and Default Routes on page 191
- Unicast RPF with Routing Asymmetry on page 192
- Configuring Unicast RPF on a VPN on page 193
- Example: Configuring Unicast RPF on page 193

Configuring Unicast RPF Strict Mode

In strict mode, unicast RPF checks whether the incoming packet has a source address that matches a prefix in the routing table, and whether the interface expects to receive a packet with this source address prefix.

If the incoming packet fails the unicast RPF check, the packet is not accepted on the interface. When a packet is not accepted on an interface, unicast RPF counts the packet and sends it to an optional fail filter. If the fail filter is not configured, the default action is to silently discard the packet.

The optional fail filter allows you to apply a filter to packets that fail the unicast RPF check. You can define the fail filter to perform any filter operation, including accepting, rejecting, logging, sampling, or policing.

When unicast RPF is enabled on an interface, Bootstrap Protocol (BOOTP) packets and Dynamic Host Configuration Protocol (DHCP) packets are not accepted on the interface. To allow the interface to accept BOOTP packets and DHCP packets, you must apply a fail filter that accepts all packets with a source address of 0.0.0.0 and

a destination address of **255.255.255.255**. For a configuration example, see “Example: Configuring Unicast RPF” on page 193.

For more information about unicast RPF, see the *JUNOS Routing Protocols Configuration Guide*. For more information about defining fail filters, see the *JUNOS Policy Framework Configuration Guide*.

To configure unicast RPF, include the **rpf-check** statement:

```
rpf-check <fail-filter filter-name>;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* family (inet | inet6)]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family (inet | inet6)]

Using unicast RPF can have several consequences when implemented with traffic filters:

- RPF fail filters are evaluated after input filters and before output filters.
- If you configure a filter counter for packets dropped by an input filter, and you want to know the total number of packets dropped, you must also configure a filter counter for packets dropped by the RPF check.
- To count packets that fail the RPF check and are accepted by the RPF fail filter, you must configure a filter counter.
- If an input filter forwards packets anywhere other than the **inet.0** or **inet6.0** routing tables, the unicast RPF check is not performed.
- If an input filter forwards packets anywhere other than the routing instance the input interface is configured for, the unicast RPF check is not performed.

Configuring Unicast RPF Loose Mode

By default, unicast RPF uses strict mode. Unicast RPF loose mode is similar to unicast RPF strict mode and has the same configuration restrictions. The only check in loose mode is whether the packet has a source address with a corresponding prefix in the routing table; loose mode does not check whether the interface expects to receive a packet with a specific source address prefix. If a corresponding prefix is not found, unicast RPF loose mode does not accept the packet. As in strict mode, loose mode counts the failed packet and optionally forwards it to a fail filter, which either accepts, rejects, logs, samples, or polices the packet.

To configure unicast RPF loose mode, include the **mode**:

```
mode loose;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* family (inet | inet6) rpf-check <fail-filter filter-name>]

- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family (inet | inet6) rpf-check <fail-filter *filter-name*>]

Unicast RPF and Default Routes

When the active route cannot be chosen from the routes in a routing table, the routing platform chooses a default route. A default route is equivalent to an IP address of 0.0.0.0/0. If you configure a default route, and you configure unicast RPF on an interface that the default route uses, unicast RPF behaves differently than it does otherwise. For information about configuring default routes, see the *JUNOS Routing Protocols Configuration Guide*.

To determine whether the default route uses an interface, enter the **show route** command:

```
user@host> show route address
```

address is the next-hop address of the configured default route. The default route uses the interfaces shown in the output of the **show route** command.

The following sections describe how unicast RPF behaves when a default route uses an interface and when a default route does not use an interface:

- Unicast RPF Behavior with a Default Route on page 191
- Unicast RPF Behavior Without a Default Route on page 192

Unicast RPF Behavior with a Default Route

If you configure a default route that uses an interface configured with unicast RPF, unicast RPF behaves as follows:

- Loose mode—All packets are automatically accepted. For this reason, we recommend that you not configure unicast RPF loose mode on interfaces that the default route uses.
- Strict mode—The packet is accepted when either of the following is true:
 - The source address of the packet matches any of the routes (either default or learned) that can be originated from the interface. Note that routes can have multiple destinations associated with them; therefore, if one of the destinations matches the incoming interface of the packet, the packet is accepted.
 - The source address of the packet does not match any of the routes.

The packet is not accepted when either of the following is true:

- The source address of the packet does not match a prefix in the routing table.

- The interface does not expect to receive a packet with this source address prefix.

Unicast RPF Behavior Without a Default Route

If you do not configure a default route, or if the default route does not use an interface configured with unicast RPF, unicast RPF behaves as described in “Configuring Unicast RPF Strict Mode” on page 189 and “Configuring Unicast RPF Loose Mode” on page 190. To summarize, unicast RPF without a default route behaves as follows:

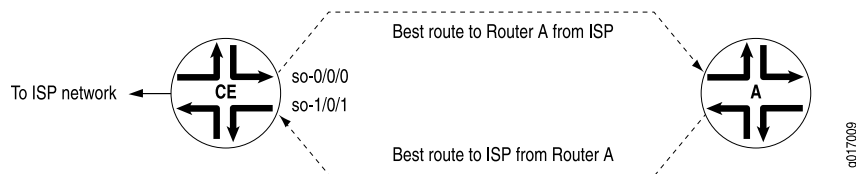
- Strict mode—The packet is not accepted when either of the following is true:
 - The packet has a source address that does not match a prefix in the routing table.
 - The interface does not expect to receive a packet with this source address prefix.
- Loose mode—The packet is not accepted when the packet has a source address that does not match a prefix in the routing table.

Unicast RPF with Routing Asymmetry

In general, we recommend that you not enable unicast RPF on interfaces that are internal to the network because internal interfaces are likely to have *routing asymmetry*. Routing asymmetry means that a packet’s outgoing and return paths are different. Routers in the core of the network are more likely to have asymmetric reverse paths than routing platforms at the customer or provider edge.

Figure 7 on page 192 shows unicast RPF in an environment with routing asymmetry.

Figure 7: Unicast RPF with Routing Asymmetry



In Figure 7 on page 192, if you enable unicast RPF on interface `so-0/0/0`, traffic destined for Router A is not rejected. If you enable unicast RPF on interface `so-1/0/1`, traffic from Router A is rejected.

If you need to enable unicast RPF in an asymmetric routing environment, you can use fail filters to allow the routing platform to accept incoming packets that are known to be arriving by specific paths. For an example of a fail filter that accepts packets with a specific source and destination address, see “Example: Configuring Unicast RPF” on page 193.

Configuring Unicast RPF on a VPN

You can configure unicast RPF on a VPN interface by enabling unicast RPF on the interface and including the `interface` statement at the `[edit routing-instances routing-instance-name]` hierarchy level.

You can configure unicast RPF only on the interfaces you specify in the routing instance. This means the following:

- For Layer 3 VPNs, unicast RPF is supported on the CE router interface.
- Unicast RPF is not supported on core-facing interfaces.
- For virtual-router routing instances, unicast RPF is supported on all interfaces you specify in the routing instance.
- If an input filter forwards packets anywhere other than the routing instance the input interface is configured for, the unicast RPF check is not performed.

For unicast RPF configuration guidelines, see “Configuring Unicast RPF” on page 189. For more information about VPNs and virtual-router routing instances, see the *JUNOS VPNs Configuration Guide*. For more information about FBF, see the *JUNOS Routing Protocols Configuration Guide*.

Example: Configuring Unicast RPF on a VPN

Configure unicast RPF on a Layer 3 VPN interface:

```
[edit interfaces]
so-0/0/0 {
  unit 0 {
    family inet {
      rpf-check;
    }
  }
}
[edit routing-instance]
VPN-A {
  interface so-0/0/0.0;
}
```

Example: Configuring Unicast RPF

Configure unicast RPF strict mode, and apply a fail filter that allows the interface to accept BOOTP packets and DHCP packets. The filter accepts all packets with a source address of 0.0.0.0 and a destination address of 255.255.255.255.

```
[edit firewall]
filter rpf-special-case-dhcp-bootp {
  term allow-dhcp-bootp {
    from {
      source-address {
        0.0.0.0/32;
      }
    }
    address {
```

```

        255.255.255.255/32;
    }
}
then {
    count rpf-dhcp-bootp-traffic;
    accept;
}
}
term default {
    then {
        log;
        reject;
    }
}
}
[edit]
interfaces {
    so-0/0/0 {
        unit 0 {
            family inet {
                rpf-check fail-filter rpf-special-case-dhcp-bootp;
            }
        }
    }
}
}

```

Enabling Source Class and Destination Class Usage

For interfaces that carry IPv4, IPv6, or MPLS traffic, you can maintain packet counts based on the entry and exit points for traffic passing through your network. Entry and exit points are identified by source and destination prefixes grouped into disjoint sets defined as *source classes* and *destination classes*. You can define classes based on a variety of parameters, such as routing neighbors, autonomous systems, and route filters.

Source class usage (SCU) counts packets sent to customers by performing lookup on the IP source address. SCU makes it possible to track traffic originating from specific prefixes on the provider core and destined for specific prefixes on the customer edge. You must enable SCU accounting on both the inbound and outbound physical interfaces, and the route for the source of the packet must be in located in the forwarding table.



NOTE: SCU and DCU accounting do not work with directly connected interface routes. Source class usage does not count packets coming from sources with direct routes in the forwarding table because of software architecture limitations.

Destination class usage (DCU) counts packets from customers by performing lookup of the IP destination address. DCU makes it possible to track traffic originating from the customer edge and destined for specific prefixes on the provider core router.



NOTE: SCU and DCU accounting are supported on the J-series routing platform only for IPv4 and IPv6 traffic.

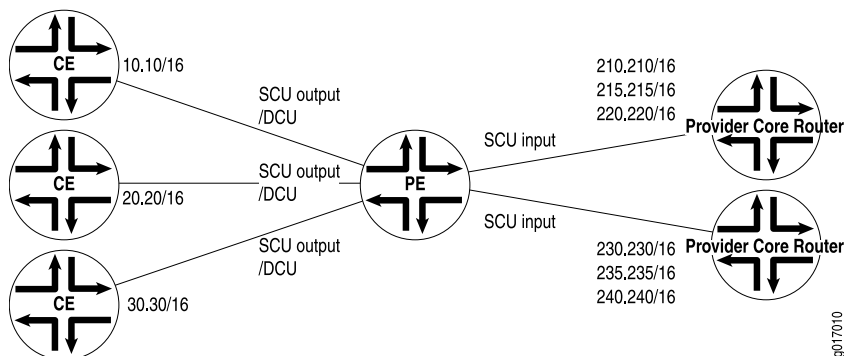


NOTE: We recommend that you stop the network traffic on an interface before you modify the DCU or SCU configuration for that interface. Modifying the DCU or SCU configuration without stopping the traffic might corrupt the DCU or SCU statistics. Before you restart the traffic after modifying the configuration, enter the **clear interfaces statistics** command.

Figure 8 on page 195 illustrates an Internet service provider (ISP) network. In this topology, you can use DCU to count packets customers send to specific prefixes. For example, you can have three counters, one per customer, that count the packets destined for prefix 210.210/16 and 220.220/16.

You can use SCU to count packets the provider sends from specific prefixes. For example, you can count the packets sent from prefix 210.210/16 and 215.215/16 and transmitted on a specific output interface.

Figure 8: Prefix Accounting with Source and Destination Classes



You can configure up to 126 source classes and 126 destination classes. For each interface on which you enable destination-class usage and source class usage, the JUNOS software maintains an interface-specific counter for each corresponding class up to the 126 class limit.



NOTE: To configure source class and destination class usage, your routing platform must be equipped with the Internet Processor II ASIC.

For transit packets exiting the router through the tunnel, forwarding path features, such as RPF, forwarding table filtering, source class usage, and destination class usage are not supported on the interfaces you configure as the output interface for tunnel traffic. For firewall filtering, you must allow the output tunnel packets through the firewall filter applied to input traffic on the interface that is the next-hop interface towards the tunnel destination.

To enable packet counting on an interface, include the **accounting** statement:

```
accounting {
  destination-class-usage;
  source-class-usage {
    direction;
  }
}
```

direction can be one of the following:

- **input**—Configure at least one expected ingress point.
- **output**—Configure at least one expected egress point.
- **input output**—On a single interface, configure at least one expected ingress point and one expected egress point.

You can include these statements at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* family (inet | inet6 | mpls)]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family (inet | inet6 | mpls)]

For SCU to work, you must configure at least one input interface and at least one output interface. An incoming packet is counted only once, and SCU takes priority over DCU. This means that when a packet arrives on an interface on which you include the **source-class-usage input** and **destination-class-usage** statements in the configuration, and when the source and destination both match accounting prefixes, the JUNOS software associates the packet with the source class only. To ensure the outgoing packet is counted, include the **source-class-usage output** statements in the configuration of the outgoing interface.

On T-series, M120, and M320 routing platforms, the source class and destination classes are not carried across the platform fabric. The implications of this are as follows:

- On T-series, M120, and M320 platforms, SCU and DCU accounting is performed before the packet enters the fabric.
- On T-series, M120, and M320 routing platforms, DCU is performed before output filters are evaluated. On other M-series platforms, DCU is performed after output filters are evaluated.
- If an output filter drops traffic on T-series, M120, and M320 routing platforms, the dropped packets are included in DCU statistics. If an output filter drops traffic on other M-series platforms, the dropped packets are excluded from DCU statistics.
- On T-series, M120, and M320 platforms, the **destination-class** and **source-class** statements are not supported at the [edit firewall family *family-name* > filter *filter-name* term *term-name* from] hierarchy level. On other M-series platforms, these statements are supported.

Once you enable accounting on an interface, the JUNOS software maintains packet counters for that interface, with separate counters for `inet`, `inet6`, and `mpls` protocol families. You must then configure the source class and destination class attributes in policy action statements, which must be included in forwarding-table export policies.

For a complete discussion about source and destination class accounting profiles, see the *JUNOS Network Management Configuration Guide*. For more information about MPLS, see the *JUNOS MPLS Applications Configuration Guide*.

Examples: Enabling Source Class and Destination Class Usage

Configure DCU and SCU output on one interface:

```
[edit]
interfaces {
  so-6/1/0 {
    unit 0 {
      family inet {
        accounting {
          destination-class-usage;
          source-class-usage {
            output;
          }
        }
      }
    }
  }
}
```

Complete SCU Configuration

Source routers A and B use loopback addresses as the prefixes to be monitored. Most of the configuration tasks and actual monitoring occur on transit Router SCU.

The loopback address on Router A contains the origin of the prefix that is to be assigned to source class A on Router SCU. However, no SCU processing happens on this router. Therefore, configure Router A for basic Open Shortest Path First (OSPF) routing and include your loopback interface and interface `so-0/0/2` in the OSPF process.

Router A

```
[edit]
interfaces {
  so-0/0/2 {
    unit 0 {
      family inet {
        address 10.255.50.2/24;
      }
    }
  }
  lo0 {
    unit 0 {
      family inet {
        address 10.255.192.10/32;
      }
    }
  }
}
```

```

}
protocols {
  ospf {
    area 0.0.0.0 {
      interface so-0/0/2.0;
      interface lo0.0;
    }
  }
}

```

Router SCU Router SCU handles the bulk of the activity in this example. On Router SCU, enable source class usage on the inbound and outbound interfaces at the `[edit interfaces interface-name unit unit-number family inet accounting]` hierarchy level. Make sure you specify the expected traffic: input, output, or, in this case, both.

Next, configure a route filter policy statement that matches the prefixes of the loopback addresses from routers A and B. Include statements in the policy that classify packets from Router A in one group named **scu-class-a** and packets from Router B in a second class named **scu-class-b**. Notice the efficient use of a single policy containing multiple terms.

Last, apply the policy to the forwarding table.

```

[edit]
interfaces {
  so-0/0/1 {
    unit 0 {
      family inet {
        accounting {
          source-class-usage {
            input;
            output;
          }
        }
        address 10.255.50.1/24;
      }
    }
  }
  so-0/0/3 {
    unit 0 {
      family inet {
        accounting {
          source-class-usage {
            input;
            output;
          }
        }
        address 10.255.10.3/24;
      }
    }
  }
  lo0 {
    unit 0 {
      family inet {
        address 10.255.6.111/32;
      }
    }
  }
}

```



```

    }
  }
}
protocols {
  ospf {
    area 0.0.0.0 {
      interface so-0/0/1.0;
      interface so-0/0/3.0;
    }
  }
}
routing-options {
  forwarding-table {
    export scu-policy;
  }
}
policy-options {
  policy-statement scu-policy {
    term 0 {
      from {
        route-filter 10.255.192.0/24 orlonger;
      }
      then source-class scu-class-a;
    }
    term 1 {
      from {
        route-filter 10.255.165.0/24 orlonger;
      }
      then source-class scu-class-b;
    }
  }
}
}

```

Router B Just as Router A provides a source prefix, Router B's loopback address matches the prefix assigned to **scu-class-b** on Router SCU. Again, no SCU processing happens on this router, so configure Router B for basic OSPF routing and include your loopback interface and interface **so-0/0/4** in the OSPF process.

```

interfaces {
  so-0/0/4 {
    unit 0 {
      family inet {
        address 10.255.10.4/24;
      }
    }
  }
  lo0 {
    unit 0 {
      family inet {
        address 10.255.165.226/32;
      }
    }
  }
}

```

```

protocols {
  ospf {
    area 0.0.0.0 {
      interface so-0/0/4.0;
      interface lo0.0;
    }
  }
}

```

Enabling Packet Counting for Layer 3 VPNs

You can use SCU and DCU to count packets on Layer 3 VPNs. To enable packet counting for Layer 3 VPN implementations at the egress point of the MPLS tunnel, you must configure a virtual loopback tunnel interface (vt) on the PE router, map the virtual routing and forwarding (VRF) instance type to the virtual loopback tunnel interface, and send the traffic received from the VPN out the source class output interface, as shown in the following example:

1. Configure a virtual loopback tunnel interface on a provider edge router equipped with a tunnel PIC:

```

[edit interfaces]
vt-0/3/0 {
  unit 0 {
    family inet {
      accounting {
        source-class-usage {
          input;
        }
      }
    }
  }
}

```

2. Map the VRF instance type to the virtual loopback tunnel interface.

For SCU and DCU to work, you must not include the `vrf-table-label` statement at the `[edit routing-instances instance-name]` hierarchy level.

```

[edit routing-instances]
VPN-A {
  instance-type vrf;
  interface at-2/1/1.0;
  interface vt-0/3/0.0;
  route-distinguisher 10.255.14.225:100;
  vrf-import import-policy-A;
  vrf-export export-policy-A;
  protocols {
    bgp {
      group to-r4 {
        local-address 10.27.253.1;
        peer-as 400;
        neighbor 10.27.253.2;
      }
    }
  }
}

```

3. Send traffic received from the VPN out the source class output interface:

```
[edit interfaces]
at-1/1/0 {
  unit 0 {
    family inet {
      accounting {
        source-class-usage {
          output;
        }
      }
    }
  }
}
```

For more information about VPNs, see the *JUNOS VPNs Configuration Guide*. For more information about virtual loopback tunnel interfaces, see the *JUNOS Services Interfaces Configuration Guide*.

Chapter 6

Configuring Circuit and Translational Cross-Connects

This chapter describes circuit and translational cross-connects:

- Circuit and Translational Cross-Connects Overview on page 203
- Defining the Encapsulation for Switching Cross-Connects on page 205
- Defining the Connection for Switching Cross-Connects on page 208
- Configuring MPLS for Switching Cross-Connects on page 209
- Configuring IS-IS or MPLS Traffic for TCC Interfaces on page 209
- Configuring ATM-to-Ethernet Interworking on page 210
- Examples: Configuring Switching Cross-Connects on page 213

Circuit and Translational Cross-Connects Overview

Circuit cross-connect (CCC) and translational cross-connect (TCC) allow you to configure transparent connections between two circuits, where a circuit can be a Frame Relay data-link connection identifier (DLCI), an Asynchronous Transfer Mode (ATM) virtual circuit (VC), a Point-to-Point Protocol (PPP) interface, a Cisco High-level Data Link Control (HDLC) interface, or a Multiprotocol Label Switching (MPLS) label-switched path (LSP).

Using CCC or TCC, packets from the source circuit are delivered to the destination circuit with, at most, the Layer 2 address being changed. No other processing, such as header checksums, time-to-live (TTL) decrementing, or protocol processing, is done.

To connect interfaces of the same type, use CCC. To connect unlike interfaces, use TCC.

CCC and TCC circuits fall into three categories: logical interfaces, which include ATM VCs and Frame Relay DLCIs; physical interfaces, which include PPP and Cisco HDLC; and paths, which include LSPs. The three circuit categories provide three types of cross-connect:

- Layer 2 switching (interface-to-interface)—Cross-connects between logical interfaces provide what is essentially Layer 2 switching.

- **MPLS tunneling (interface-to-LSP)**—Cross-connects between interfaces and LSPs allow you to connect two distant interface circuits by creating MPLS tunnels that use LSPs as the conduit.
- **LSP stitching (LSP-to-LSP)**—Cross-connects between LSPs provide a way to “stitch” together two label-switched paths, including paths that fall in two different traffic engineering database (TED) areas.

The cross-connect is bidirectional, so packets received on the first interface are transmitted out the second interface, and those received on the second interface are transmitted out the first interface.

For most CCC connections that connect interfaces, the interfaces must be of the same type; that is, ATM to ATM, Frame Relay to Frame Relay, PPP to PPP, or Cisco HDLC to Cisco HDLC.

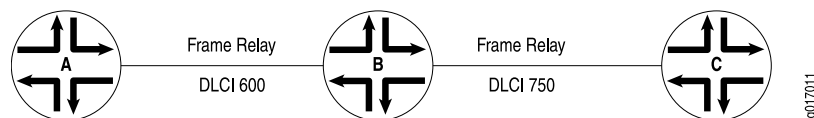
ATM-to-Ethernet interworking cross-connect circuits connect logical interfaces configured on an ATM2 and Gigabit Ethernet IQ2 or 10-Gigabit Ethernet IQ2 physical interfaces.

For all TCC connections that connect interfaces, the interfaces can be of unlike types. Mainly, TCC is used for Layer 2.5 virtual private networks (VPNs), but it can also be used as a simple “unlike circuit” switch.

Switching cross-connects join logical interfaces to form what is essentially Layer 2 switching.

Figure 9 on page 204 illustrates a Layer 2 switching circuit cross-connect. In this topology, Router A and Router C have Frame Relay connections to Router B, which is a Juniper Networks routing platform. CCC allows you to configure Router B to act as a Frame Relay (Layer 2) switch. To do this, configure a circuit from Router A to Router C that passes through Router B, effectively configuring Router B as a Frame Relay switch with respect to these routing platforms. This configuration allows Router B to transparently switch packets (frames) between Router A and Router C without regard to the packets’ contents or the Layer 3 protocols. The only processing that Router B performs is to translate DLCI 600 to 750.

Figure 9: Layer 2 Switching Circuit Cross-Connect



If the Router A-to-Router B and Router B-to-Router C circuits are PPP, for example, the Link Control Protocol and Network Control Protocol exchanges occur between Router A and Router C. These messages are handled transparently by Router B, allowing Router A and Router C to use various PPP options (such as header or address compression and authentication) that Router B might not support. Similarly, Router A and Router C exchange keepalives, providing circuit-to-circuit connectivity status.

You can configure Layer 2 switching cross-connects on PPP, Cisco HDLC, Frame Relay, Ethernet CCC, Ethernet VLAN, and ATM circuits. With CCC, only like interfaces

can be connected in a single cross-connect. With TCC, unlike interfaces can be connected in a single cross-connect. In Layer 2 switching cross-connects, the exchanges take place between point-to-point links.

This chapter discusses the Layer 2 switching cross-connect configuration tasks. For information about MPLS tunneling and LSP stitching, see the *JUNOS MPLS Applications Configuration Guide*.

For information about Layer 2 and Layer 2.5 VPNs, see the *JUNOS VPNs Configuration Guide*.

To configure switching cross-connects, you must configure the following on the routing platform that is acting as the switch (Router B in Figure 9 on page 204):

Defining the Encapsulation for Switching Cross-Connects

To configure Layer 2 or Layer 2.5 switching cross-connects, configure the CCC or TCC encapsulation on the routing platform that is acting as the switch (Router B in Figure 9 on page 204).



NOTE: When you use CCC encapsulation, you can configure the `ccc` family only. Likewise, when you use TCC encapsulation, you can configure the `tcc` family only.

This section contains the following topics:

- Configuring PPP or Cisco HDLC Circuits on page 205
- Configuring ATM Circuits on page 205
- Configuring Frame Relay Circuits on page 206
- Configuring Ethernet CCC Circuits on page 207
- Configuring Ethernet VLAN Circuits on page 208

Configuring PPP or Cisco HDLC Circuits

For PPP or Cisco HDLC circuits, specify the encapsulation by including the `encapsulation` statement at the `[edit interfaces interface-name]` hierarchy level. This statement configures the entire physical device. For these circuits to work, you must configure a logical interface unit 0.

```
[edit interfaces interface-name]
encapsulation (ppp-ccc | cisco-hdlc-ccc | ppp-tcc | cisco-hdlc-tcc);
unit 0;
```

Configuring ATM Circuits

For ATM circuits, include the `vpi` statement `[edit interfaces interface-name atm-options]` hierarchy level:

```
[edit interfaces at-fpc/pic/port]
atm-options {
```

```

    vpi vpi-identifier;
}

```

On the logical interface, include the following statements:

```

point-to-point;
encapsulation (atm-ccc-cell-relay | atm-ccc-vc-mux | atm-tcc-vc-mux | atm-tcc-snap);
vci vpi-identifier.vci-identifier;

```

You can include the logical interface statements at the following hierarchy levels:

- [edit interfaces *at-fpc/pic/port* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *at-fpc/pic/port* unit *logical-unit-number*]

For each VC, configure whether it is a circuit or a regular logical interface. The default interface type is point-to-point.

Configuring Frame Relay Circuits

For Frame Relay circuits, include the **encapsulation** statement at the [edit interfaces *interface-name*] hierarchy level:

```

[edit interfaces interface-name]
encapsulation type;

```

On the logical interface, include the following statements:

```

point-to-point;
encapsulation type;
dlci dlci-identifier;

```

You can include the logical interface statements at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

The encapsulation type can be one of the following:

- **Flexible Frame Relay (flexible-frame-relay)**—Intelligent queuing (IQ) interfaces can use flexible Frame Relay encapsulation. You use flexible Frame Relay encapsulation when you want to configure multiple per-unit Frame Relay encapsulations. This encapsulation type allows you to configure any combination of TCC, CCC, and standard Frame Relay encapsulations on a single physical port. Also, each logical interface can have any DLCI value from 1 through 1022.
- **Frame Relay CCC version (frame-relay-ccc)**—For E1, E3, SONET/SDH, T1, and T3 interfaces, this encapsulation type is the same as standard Frame Relay for DLCIs 0 through 511. DLCIs 512 through 1022 are dedicated to CCC. This numbering restriction does not apply to IQ interfaces. The logical interface must also have **frame-relay-ccc** encapsulation. When you use this encapsulation type, you can configure the **ccc** family only.

- Frame Relay TCC version (**frame-relay-tcc**)—Similar to Frame Relay CCC and has the same configuration restrictions, but used for circuits with different media on either side of the connection.
- Extended CCC version (**extended-frame-relay-ccc**)—This encapsulation type allows you to dedicate DLCIs 1 through 1022 to CCC. The logical interface must have **frame-relay-ccc** encapsulation. When you use this encapsulation type, you can configure the **ccc** family only.
- Extended TCC version (**extended-frame-relay-tcc**)—Similar to extended Frame Relay CCC, this encapsulation type allows you to dedicate DLCIs 1 through 1022 to TCC, which is used for circuits with different media on either side of the connection.
- Port CCC version (**frame-relay-port-ccc**)—Defined in the IETF document *Frame Relay Encapsulation over Pseudo-Wires* (expired December 2002). This encapsulation type allows you to transparently carry all the DLCIs between two customer edge (CE) routers without explicitly configuring each DLCI on the two provider edge (PE) routers with Frame Relay transport. The connection between the two CE routers can be either user-to-network interface (UNI) or network-to-network interface (NNI); this is completely transparent to the PE routers. The logical interface does not require an encapsulation statement. When you use this encapsulation type, you can configure the **ccc** family only.

For each DLCI, configure whether it is a circuit or a regular logical interface. The DLCI for regular interfaces must be from 1 through 511. For CCC and TCC interfaces, it must be from 512 through 1022. This restriction does not apply to IQ interfaces. The default interface type is point to point.

Configuring Ethernet CCC Circuits

You can configure Ethernet CCC encapsulation on Fast Ethernet, Gigabit Ethernet, and aggregated Ethernet interfaces.



NOTE: CCC over aggregated Ethernet requires an M-series Enhanced Flexible PIC Concentrator (FPC).

For example configurations of CCC over aggregated Ethernet, see “Examples: Configuring Switching Cross-Connects” on page 213.

For Ethernet CCC circuits, specify the encapsulation by including the **encapsulation** statement at the **[edit interfaces *interface-name*]** hierarchy level. This statement configures the entire physical device.

```
[edit interfaces interface-name]
encapsulation ethernet-ccc;
unit logical-unit-number {
    ...
}
[edit interfaces aex]
encapsulation ethernet-ccc;
unit logical-unit-number {
```

```
} ...
```

Configuring Ethernet VLAN Circuits

You can configure Ethernet virtual local area network (VLAN) circuits on Fast Ethernet, Gigabit Ethernet, and aggregated Ethernet interfaces. For Ethernet VLAN circuits, specify the encapsulation by including the `encapsulation` statement at the `[edit interfaces interface-name]` hierarchy level. This statement configures the entire physical device. You must also enable VLAN tagging. To do this, include the following statements:

```
[edit interfaces interface-name]
vlan-tagging;
encapsulation (extended-vlan-ccc | vlan-ccc);
[edit interfaces aex]
vlan-tagging;
encapsulation vlan-ccc;
```

On the logical interface, include the following statements:

```
encapsulation vlan-ccc;
vlan-id number;
```

You can include the logical interface statements at the following hierarchy levels:

- `[edit interfaces interface-name unit logical-unit-number]`
- `[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number]`

Ethernet interfaces in VLAN mode can have multiple logical interfaces. For encapsulation type `vlan-ccc`, VLAN IDs 1 through 511 are reserved for normal VLANs, and VLAN IDs 512 through 1023 are reserved for CCC VLANs. For encapsulation type `extended-vlan-ccc`, VLAN IDs 1 through 4094 are valid. VLAN ID 0 is reserved for tagging the priority of frames.

Defining the Connection for Switching Cross-Connects

To configure Layer 2 switching cross-connects, define the connection between the two circuits. You configure this on the routing platform that is acting as the switch (Router B in Figure 9 on page 204). The connection joins the interface that comes from the circuit's source to the interface that leads to the circuit's destination. When you specify the interface names, include the logical portion of the name, which corresponds to the logical unit number. The cross-connect is bidirectional, so packets received on the first interface are transmitted out the second interface, and those received on the second interface are transmitted out the first interface.

```
[edit protocols]
connections {
  remote-interface-switch connection-name {
    interface interface-name.unit-number;
    interface interface-name.unit-number;
```

```

    }
    lsp-switch connection-name {
        transmit-lsp lsp-number;
        receive-lsp lsp-number;
    }
}

```

Configuring MPLS for Switching Cross-Connects

For Layer 2 switching cross-connects to work, you must configure MPLS. The following is a minimal MPLS configuration:

```

[edit protocols]
mpls {
    interface (interface-name | all);
}

```

For more information, see the *JUNOS MPLS Applications Configuration Guide*.

Configuring IS-IS or MPLS Traffic for TCC Interfaces

Layer 2.5 VPNs on T-series, M120, and M320 routers support IPv4, IS-IS, and MPLS traffic types. By default, IPv4 traffic runs on T-series, M120, and M320 routers and over TCC interfaces. To configure IS-IS (ISO traffic) or MPLS traffic on Layer 2.5 VPNs, you must configure the same traffic type on both ends of the Layer 2.5 VPN.

To specify which traffic can run over a TCC interface, include the **protocols** statement with the appropriate value (**inet**, **mpls**, and **iso**) at the **[edit interfaces interface-name unit logical-unit-number family tcc]** hierarchy level:

```

[edit interfaces interface-name unit logical-unit-number family tcc]
protocols [ inet iso mpls ];

```



NOTE: Layer 2.5 VPNs running on M-series routers support only IPv4 traffic. IPv6 is not supported on Layer 2.5 VPNs.

When enabling ISO over a Layer 2.5 VPN that is configured on a CE Ethernet interface, you must also include the **point-to-point** statement at the **[edit protocols isis interface interface-name]** hierarchy level:

```

[edit protocols isis interface interface-name]
point-to-point;

```

For more information about Layer 2 VPNs, see the *JUNOS VPNs Configuration Guide*.

Configuring ATM-to-Ethernet Interworking

This section describes ATM-to-Ethernet interworking:

- Enabling ATM-to-Ethernet Interworking on page 210
- Configuring the ATM-to-Ethernet Interworking Ethernet Interface on page 211
- Configuring the ATM-to-Ethernet Interworking Ethernet Encapsulation on page 211
- Configuring the ATM-to-Ethernet Interworking Outer VLAN Identifier on page 211
- Configuring the ATM-to-Ethernet Interworking Inner VLAN Identifier Range on page 211
- Configuring the ATM-to-Ethernet Interworking Physical Interface VPI on page 212
- Configuring the ATM-to-Ethernet Interworking ATM Logical Interface on page 212
- Configuring the ATM-to-Ethernet Interworking Protocol Family on page 212
- Configuring the ATM-to-Ethernet Interworking Logical Interface VPI on page 213
- Configuring the ATM-to-Ethernet Interworking Logical Interface VCI on page 213

ATM-to-Ethernet interworking is supported on M320, M120, and T-series routers.

The ATM-to-Ethernet interworking feature is useful where ATM2 interfaces are used to terminate ATM DSLAM traffic. The ATM traffic can be forwarded with encapsulation type `ccc` (circuit cross-connect) to a local or remote Gigabit Ethernet IQ2 or 10-Gigabit Ethernet IQ2 interface or label-switched path (LSP). The ATM VPI and VCI are converted to stacked VLAN inner and outer VLAN tags.

These ATM-to-Ethernet interworking circuits can be mapped to individual logical interfaces configured on an ATM2 IQ interface and Gigabit Ethernet IQ2 or 10-Gigabit Ethernet IQ2 physical interface.

The ATM-to-Ethernet interworking cross-connect essentially provides Layer 2 switching, and statistics are reported at the logical interface level.

During conversion from ATM to Ethernet, the least significant 12 bits of the ATM cell VCI are copied to the Ethernet frame inner VLAN tag. Cells received on an ATM logical interface configured with encapsulation type `vlan-vci-ccc` and falling within the configured VCI range are reassembled into packets and forwarded to a designated Ethernet logical interface that is configured with encapsulation type `vlan-vci-ccc`.

During conversion from Ethernet to ATM, the Ethernet frame inner VLAN tags that fall within the configured range, are copied to the least significant 12 bits of the ATM cell VCI. The ATM logical interface uses its configured VPI when segmenting the Ethernet packets into cells.

Enabling ATM-to-Ethernet Interworking

To enable the ATM-to-Ethernet interworking cross-connect function, include the `vlan-vci-tagging` statement at the `[edit interfaces interface-name]` hierarchy level:

```
[edit interfaces interface-name]  
vlan-vci-tagging;
```

Configuring the ATM-to-Ethernet Interworking Ethernet Interface

Configure the Ethernet or aggregated Ethernet physical interface by including the encapsulation statement with the `vlan-vci-ccc` option at the `[edit interfaces interface-name]` hierarchy level:

```
[edit interfaces interface-name]  
encapsulation vlan-vci-ccc;
```

When the encapsulation type `vlan-vci-ccc` is configured on the physical interface, all logical interfaces configured on the Ethernet interface must also have the encapsulation type set to `vlan-vci-ccc`.

Configuring the ATM-to-Ethernet Interworking Ethernet Encapsulation

Configure the Ethernet logical interface by including the encapsulation statement with the `vlan-vci-ccc` option at the `[edit interfaces interface-name unit logical-unit-number]` hierarchy level:

```
[edit interfaces interface-name unit logical-unit-number]  
encapsulation vlan-vci-ccc;
```

The chassis configuration cannot contain the `atm-l2circuit-mode` statement if any logical interfaces are configured with the `vlan-vci-ccc` encapsulation option.

Configuring the ATM-to-Ethernet Interworking Outer VLAN Identifier

Configure the Ethernet logical interface outer VLAN ID by including the `vlan-id` statement specifying the outer VLAN ID at the `[edit interfaces interface-name unit logical-unit-number]` hierarchy level:

```
[edit interfaces interface-name unit logical-unit-number]  
vlan-id outer-vlan-identifier;
```

It is the administrator's responsibility to ensure that the outer VLAN tag and VPI match and the inner VLAN tags fall within the VCI range of the VPI.

The allowable VPI range is from 0 to 255. So the outer VLAN tags must not be configured for values above 255.

Configuring the ATM-to-Ethernet Interworking Inner VLAN Identifier Range

Configure the Ethernet logical interface inner VLAN ID range by including the `inner-vlan-id-range` statement and specifying the starting VLAN ID and ending VLAN ID at the `[edit interfaces interface-name unit logical-unit-number]` hierarchy level:

```
[edit interfaces interface-name unit logical-unit-number]  
inner-vlan-id-range start start-id end end-id;
```

VLAN IDs 0 and 4095 are reserved by IEEE 801.1q and must not be used for the inner or outer VLAN ID.

VCI 0 through 31 are reserved for ATM management purposes by convention. Therefore inner VLAN IDs 1 through 31 should not be used.

VLAN ID 1 might be used by Ethernet switches for certain bridge management services, so using VLAN ID 1 for the inner or outer VLAN ID is discouraged.

Configuring the ATM-to-Ethernet Interworking Physical Interface VPI

Configure the ATM physical interface VPI by including the `vpi` statement at the [edit interfaces *interface-name* atm-options] hierarchy level:

```
[edit interfaces interface-name atm-options]
vpi virtual-path-identifier;
```

VPI 0 is reserved, and must not be used.

ATM F4/F5 OAM is not supported for VPIs used in ATM-to-Ethernet interworking cross-connects. Any F4/F5 OAM cells received are discarded.

Only one logical interface may be declared per virtual path specified in the `atm-options` statement hierarchy.

It is not necessary to dedicate all the VPIs of an ATM2 interface for ATM-to-Ethernet interworking cross-connects.

Configuring the ATM-to-Ethernet Interworking ATM Logical Interface

Configure the ATM logical interface by including the `encapsulation` statement and specifying the encapsulation type `vlan-vci-ccc` at the [edit interfaces *interface-name* unit *logical-unit-number*] hierarchy level:

```
[edit interfaces interface-name unit logical-unit-number]
encapsulation vlan-vci-ccc;
```

An ATM logical interface configured with the encapsulation type `vlan-vci-ccc` only supports the `epd-threshold`, `shaping`, `traps | no-traps`, `disable`, and `description` statements. No other configuration statements are supported. ATM interface CoS features are not supported by logical interfaces configured with the encapsulation type `vlan-vci-ccc`.

The ATM2 OC48 PIC does not support the encapsulation type `vlan-vci-ccc`.

The encapsulation type `vlan-vci-ccc` only supports the `ccc` protocol family. Attempts to configure any other interface protocol family are rejected.

Configuring the ATM-to-Ethernet Interworking Protocol Family

Configure the ATM logical interface protocol family by including the `family` statement and specifying the `ccc` option at the [edit interfaces *interface-name* unit *logical-unit-number*] hierarchy level:

```
[edit interfaces interface-name unit logical-unit-number]
```

```
family ccc;
```

Configuring the ATM-to-Ethernet Interworking Logical Interface VPI

Configure the ATM logical interface virtual path identifier by including the `vpi` statement at the `[edit interfaces interface-name unit logical-unit-number]` hierarchy level:

```
[edit interfaces interface-name unit logical-unit-number]  
vpi virtual-path-identifier;
```

VPI 0 is reserved, and must not be used.

It is the administrator's responsibility to ensure the outer VLAN tag and VPI match and the inner VLAN tags fall within the VCI range of the VPI.

Once a VPI is used in an ATM-to-Ethernet interworking cross-connect, it cannot be used with any other logical interface, even if the `vpi.vci` value falls outside the VCI range for the cross-connect.

Configuring the ATM-to-Ethernet Interworking Logical Interface VCI

Configure the ATM logical interface virtual channel identifier range by including the `vci-range` statement and specifying the starting VCI and ending VCI at the `[edit interfaces interface-name unit logical-unit-number]` hierarchy level:

```
[edit interfaces interface-name unit logical-unit-number]  
vci-range start start-vci end end-vci;
```

VCI 0 through 31 are reserved for ATM management purposes by convention. Therefore, VCI 0 through 31 should not be used.

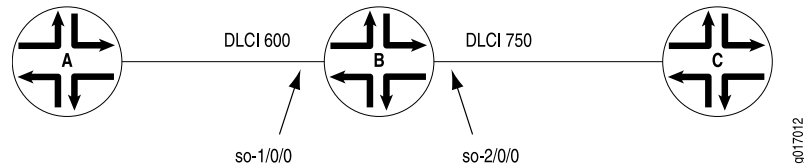
Examples: Configuring Switching Cross-Connects

This section includes the following examples:

- Example: Configuring a CCC over Frame Relay Encapsulated Interface on page 213
- Example: Configuring a TCC on page 214
- Example: Configuring CCC over Aggregated Ethernet on page 216
- Example: Configuring a Remote LSP CCC over Aggregated Ethernet on page 217
- Example: Configuring ATM-to-Ethernet Interworking on page 219

Example: Configuring a CCC over Frame Relay Encapsulated Interface

Configure a full-duplex Layer 2 switching circuit cross-connect between Router A and Router C, using a Juniper Networks routing platform, Router B, as the virtual switch. See the topology in Figure 10 on page 214.

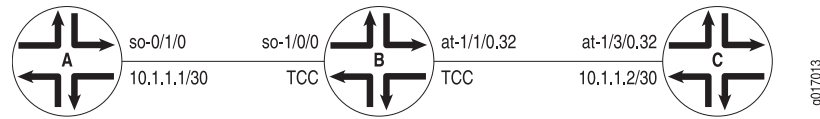
Figure 10: Example Topology of a Switching Circuit Cross-Connect with Frame Relay CCC Encapsulation

```
[edit]
interfaces {
  so-1/0/0 {
    encapsulation frame-relay-ccc;
    unit 1 {
      point-to-point;
      eui-64 frame-relay-ccc;
      dlci 600;
    }
  }
  so-2/0/0 {
    encapsulation frame-relay-ccc;
    unit 2 {
      point-to-point;
      encapsulation frame-relay-ccc;
      dlci 750;
    }
  }
}
protocols {
  connections {
    interface-switch router-a-router-c {
      interface so-1/0/0.1;
      interface so-2/0/0.2;
    }
  }
  mpls {
    interface all;
  }
}
```

Example: Configuring a TCC

Configure a full-duplex switching translational cross-connect with PPP TCC encapsulation between Router A and Router C, using a Juniper Networks routing platform, Router B, as the virtual switch. See the topology in Figure 11 on page 215.

In this topology, Router B has a PPP connection to Router A and an ATM connection to Router C.

Figure 11: Layer 2.5 Switching Translational Cross-Connect

On Router A

```
[edit]
interfaces {
  so-0/1/0 {
    description "to Router B so-1/0/0";
    encapsulation ppp;
    unit 0 {
      family inet {
        address 10.1.1.1/30;
      }
    }
  }
}
```

On Router B

```
[edit]
interfaces {
  so-1/0/0 {
    description "to Router A so-0/1/0";
    encapsulation ppp-tcc;
    unit 0 {
    }
  }
  at-1/1/0 {
    description "to Router C at-0/3/0";
    atm-options {
      vpi 0 maximum-vc 2000;
    }
    unit 32 {
      vci 32;
      encapsulation atm-tcc-vc-mux;
    }
  }
}
[edit]
protocols {
  mpls {
    interface so-1/0/0.0;
    interface at-1/1/0.32;
  }
  connections {
    interface-switch PPP-to-ATM {
      interface so-1/0/0.0;
      interface at-1/1/0.32;
    }
  }
}
```

On Router C

```
[edit]
interfaces {
  at-0/3/0 {
```

```

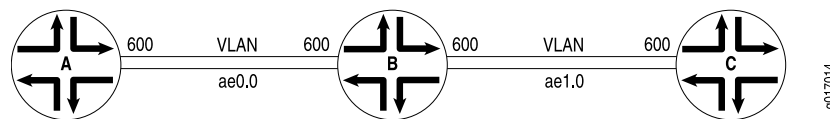
description "to Router B at-1/1/0";
atm-options {
    vpi 0 maximum-vc 2000;
}
unit 32 {
    vci 32;
    encapsulation atm-vc-mux;
    family inet {
        address 10.1.1.2/30;
    }
}
}
}

```

Example: Configuring CCC over Aggregated Ethernet

See the topology in Figure 12 on page 216. In this topology, CE Routers A and C have aggregated Ethernet connections to PE Router B. With CCC, you specify that the circuit from Router A is connected to the circuit from Router C. Router B functions as a cross-connect switch between the two circuits. For a back-to-back connection, all VLAN IDs must be the same on Router A through Router C. You configure Router A and Router C as standard aggregated Ethernet interfaces. For more information about aggregated Ethernet, see “Configuring Aggregated Ethernet Interfaces” on page 535.

Figure 12: Interface-to-Interface Circuit Cross-Connect over Aggregated Ethernet Interfaces



On Router A

```

[edit interfaces]
ae0 {
    vlan-tagging;
    aggregated-ether-options {
        minimum-links 1;
        link-speed 1g;
    }
    unit 0 {
        vlan-id 600;
        family inet {
            address 192.168.1.1/30;
        }
    }
}

```

On Router B

```

[edit interfaces]
ae0 {
    encapsulation vlan-ccc;
    vlan-tagging;
    aggregated-ether-options {
        minimum-links 1;
        link-speed 1g;
    }
}

```

```

    }
    unit 0 { # CCC switch
        encapsulation vlan-ccc;
        vlan-id 600;
        family ccc;
    }
    ae1 {
        encapsulation vlan-ccc;
        vlan-tagging;
        aggregated-ether-options {
            minimum-links 1;
            link-speed 100m;
        }
        unit 0 {
            encapsulation vlan-ccc;
            vlan-id 600;
            family ccc;
        }
    }
    [edit protocols]
    mpls {
        interface all;
    }
    connections {
        interface-switch layer2-cross-connect {
            interface ae0.0;
            interface ae1.0;
        }
    }
}

```

On Router C

```

[edit interfaces]
ae1 {
    vlan-tagging;
    aggregated-ether-options {
        minimum-links 1;
        link-speed 1g;
    }
    unit 0 {
        vlan-id 600;
        family inet {
            address 192.168.1.2/30;
        }
    }
}

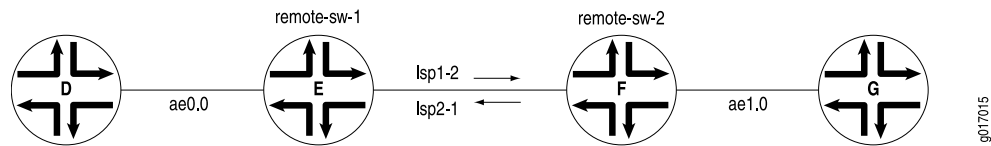
```

Example: Configuring a Remote LSP CCC over Aggregated Ethernet

See the topology in Figure 13 on page 218. In this topology, CE Router G has an aggregated Ethernet connection to PE Router F. CE Router D has an aggregated Ethernet connection to PE Router E. Router E and Router F have an MPLS LSP between them. With remote CCC, you specify that the circuit from Router D is connected to the circuit from Router G. The circuit from Router D is connected to the LSP on Router E; the circuit from Router G is connected to the LSP on Router F. In other words, **ae0.0** and **ae1.0** are connected using **lsp1-2** and **lsp2-1**. You configure Router D and

Router G as standard aggregated Ethernet interfaces. For more information about aggregated Ethernet, see “Configuring Aggregated Ethernet Interfaces” on page 535.

Figure 13: Remote Interface-LSP-Interface Circuit Cross-Connect over Aggregated Ethernet Interfaces



On Router D

```
[edit interface]
ae0 {
    aggregated-ether-options {
        minimum-links 1;
        link-speed 1g;
        lacp {
            active;
            periodic fast;
        }
    }
    unit 0 {
        family inet {
            address 192.168.2.1/30;
        }
    }
}
```

On Router E

```
[edit interfaces]
ae0 {
    encapsulation ethernet-ccc;
    aggregated-ether-options {
        minimum-links 1;
        link-speed 100m;
        lacp {
            active;
            periodic fast;
        }
    }
    unit 0 {
        encapsulation vlan-ccc; # default
        family ccc; # default
    }
}

[edit protocols]
mpls {
    interface all;
}

connections {
    remote-interface-switch remote-sw-1 {
        interface ae1.0;
        receive-lsp lsp2_1;
        transmit-lsp lsp1_2;
    }
}
```

```

On Router F [edit interfaces]
ae1 {
  encapsulation ethernet-ccc;
  aggregated-ether-options {
    minimum-links 1;
    link-speed 100m;
    lacp {
      active;
      periodic fast;
    }
  }
  unit 0 {
    encapsulation vlan-ccc; # default
    family ccc; # default
  }
}
[edit protocols]
mpls {
  interface all;
}
connections {
  remote-interface-switch remote-sw-2 {
    interface ae0.0;
    receive-lsp lsp1_2;
    transmit-lsp lsp2_1;
  }
}

On Router G [edit interface]
ae1 {
  aggregated-ether-options {
    minimum-links 1;
    link-speed 1g;
    lacp {
      active;
      periodic fast;
    }
  }
  unit 0 {
    family inet {
      address 192.168.2.2/30;
    }
  }
}

```

Example: Configuring ATM-to-Ethernet Interworking

The following example shows the configuration of the ATM and Ethernet interfaces for an ATM-to-Ethernet interworking cross connect. In the example ATM DSLAM traffic is terminated on an ATM2 interface. The ATM traffic is forwarded using encapsulation type `vlan-vci-ccc` to a local Ethernet IQ2 interface. See the topology in Figure 14 on page 220.

Figure 14: ATM-to-Ethernet Interworking

In this example, the ATM traffic comes from the DSLAM to the router on ATM interface `at-4/0/0` and is forwarded out on Ethernet interface `ge-2/2/1`.

```
[edit interfaces]
ge-2/2/1 {
  vlan-vci-tagging;
  encapsulation vlan-vci-ccc;
  unit 0 {
    encapsulation vlan-vci-ccc;
    vlan-id 100;
    inner-vlan-id-range start 100 end 500;
  }
}
at-4/0/0 {
  atm-options {
    vpi 100;
  }
  unit 0 {
    encapsulation vlan-vci-ccc;
    family ccc;
    vpi 100;
    vci-range start 100 end 500;
  }
}
```

Chapter 7

Tracing Interface Operations

You can trace the operations of individual routing platform interfaces and those of the interface process (dcd). For a general discussion of tracing and of the precedence of multiple tracing operations, see the *JUNOS System Basics Configuration Guide*.

For information about the operations of Virtual Router Resolution Protocol (VRRP)-enabled interfaces, see the *JUNOS High Availability Configuration Guide*.

This chapter discusses the following interface trace operation configuration tasks:

- Tracing Operations of an Individual Router Interface on page 221
- Tracing Operations of the Interface Process on page 222

Tracing Operations of an Individual Router Interface

To trace the operations of individual routing platform interfaces, include the `traceoptions` statement at the `[edit interfaces interface-name]` hierarchy level:

```
[edit interfaces interface-name]  
traceoptions {  
  flag flag <disable>;  
  file filename <files number> <size size> <world-readable | no-world-readable> <match  
    regexp>;  
  flag flag <disable>;  
}
```

You can specify the following interface tracing flags:

- **all**—Trace all interface operations.
- **event**—Trace all interface events.
- **ipc**—Trace all interface interprocess communication (IPC) messages.
- **media**—Trace all interface media changes.

The interfaces `traceoptions` statement does not support a trace file. The logging is done by the kernel, so the tracing information is placed in the system `syslog` files.

Tracing Operations of the Interface Process

To trace the operations of the routing platform's interface process, dcd, include the `traceoptions` statement at the `[edit interfaces]` hierarchy level:

```
[edit interfaces]
traceoptions {
  file filename <files number> <size size> <world-readable | no-world-readable> <match
    regex>;
  flag flag <disable>;
}
```

By default, interface process operations are placed in the file named `dcd` and three 1-MB files of tracing information are maintained.

You can specify the following flags in the `interfaces traceoptions` statement:

- `change-events`—Log changes that produce configuration events.
- `config-states`—Log the configuration state machine changes.
- `kernel`—Log configuration IPC messages to kernel.
- `kernel-detail`—Log details of configuration messages to kernel.

For general information about tracing, see the tracing and logging information in the *JUNOS System Basics Configuration Guide*.

Part 3

Configuring Special Router Interfaces

This section describes configuration of multiple unique interface types used for special purposes in the router.

- [Displaying the Internal Ethernet Interface on page 225](#)
- [Configuring Discard Interfaces on page 227](#)
- [Configuring IP Demultiplexing Interfaces on page 229](#)
- [Configuring the Loopback Interface on page 235](#)
- [Configuring Serial Interfaces on page 239](#)

Chapter 8

Displaying the Internal Ethernet Interface

This section contains the following topic:

- Displaying the Internal Ethernet Interface on page 225

Displaying the Internal Ethernet Interface

The internal Ethernet interface, **fxp1**, connects the Routing Engine with the routing platform's packet forwarding components. The JUNOS software automatically configures this interface.



NOTE: Do not modify or remove the configuration for the internal Ethernet interface that the JUNOS software automatically configures. If you do, the routing platform will stop functioning.

```
user@host> show configuration
...
interfaces {
  ...
  fxp1 {
    unit 0 {
      family tnp {
        address 1;
      }
    }
  }
}
```


Chapter 9

Configuring Discard Interfaces

On the routing platform, you can configure one physical discard interface, **dsc**. The discard interface allows you to identify the ingress point of a denial-of-service (DoS) attack. When your network is under attack, the target host IP address is identified, and the local policy forwards attacking packets to the discard interface. When traffic is routed out of the discard interface, the traffic is silently discarded.

You can configure the **inet** family protocol on the discard interface, which allows you to apply an output filter to the interface. If you apply an output filter to the interface, the action specified by the filter is executed before the traffic is discarded.

Once you configure a discard interface, you must then configure a local policy to forward attacking traffic to the discard interface. For a complete discussion about using the discard interface to protect your network against DoS attacks, see the *JUNOS Policy Framework Configuration Guide*.

To configure a discard interface, include the following statements at the **[edit interfaces]** hierarchy level:

```
[edit interfaces]
dsc {
  unit 0 {
    family inet {
      filter {
        output filter-name;
      }
      address address {
        destination address;
      }
    }
  }
}
```

Keep the following guidelines in mind when configuring the discard interface:

- Only the logical interface unit 0 is supported.
- The **filter** and **address** statements are optional.
- Although you can configure an input filter and a filter group, these configuration statements have no effect because traffic is not transmitted from the discard interface.

- The **show interface** command is not relevant for the discard interface.
- The discard interface does not support class of service (CoS).

Chapter 10

Configuring IP Demultiplexing Interfaces

IP demultiplexing (demux) interfaces are logical interfaces that share a common, underlying logical interface. The demux interfaces use the IP source or destination address to demultiplex received packets when the subscriber is not uniquely identified by a Layer 2 circuit.

This chapter contains the following topics:

- Configuring an IP Demultiplexing Interface on page 229
- Specifying the Demux Underlying Interface on page 230
- Configuring IP Demux Prefixes on page 230
- Configuring an IP Demux Underlying Interface on page 231
- Configuring MAC Address Validation on Static Demux Interfaces on page 231
- Example: Configuring a Demux Interface on page 232

Configuring an IP Demultiplexing Interface

To configure a demux interface, include the following statements at the [edit interfaces] hierarchy level:

```
[edit interfaces]
demux0 {
  unit logical-unit-number {
    demux-options {
      underlying-interface interface-name;
    }
    family family {
      demux-destination {
        destination-prefix;
      }
      demux-source {
        source-prefix;
      }
      mac-validate (loose | strict)
      unnumbered-address interface-name <preferred-source-address address>;
    }
  }
}
```

Keep the following guidelines in mind when configuring the demux interface:

- Demux interfaces are supported on M120 or MX-series platforms only.
- You can configure only one **demux0** interface per chassis, but you can define logical demux interfaces on top of it (for example, **demux0.1**, **demux0.2**, and so on).
- You must associate demux interfaces with an underlying logical interface.



NOTE: IP demux interfaces currently support only Gigabit Ethernet, Fast Ethernet, and 10-Gigabit Ethernet underlying interfaces.

- The demux underlying interface must reside on the same logical system as the demux interfaces that you configure over it.
- IP demux interfaces currently support only the Internet Protocol version 4 (IPv4) suite **inet** family type.
- You can configure more than one demux prefix for a given demux unit. However, you cannot configure the exact same demux prefix on two different demux units with the same underlying interface.
- You can configure overlapping demux prefixes on two different demux units with the same underlying prefix. However, under this configuration, best match rules apply (in other words, the most specific prefix wins).
- If the address in a received packet does not match any demux prefix, the packet is logically received on the underlying interface. For this reason, the underlying interface is often referred to as the “primary” interface.

Specifying the Demux Underlying Interface

You must specify an underlying interface for the demux interfaces to use. The underlying interface must reside on the same logical system as the demux interface.

To specify the logical underlying interface, include the **underlying-interface** statement:

```
[edit interfaces unit logical-unit-number demux-options]
  underlying-interface interface-name;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* demux-options]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* demux-options]
- [edit logical-systems *logical-system-name* routing-instances *routing-instance-name* interfaces *interface-name* unit *logical-unit-number* demux-options]

Configuring IP Demux Prefixes

You configure demux prefixes for use by the underlying interface. The demux prefixes can represent individual hosts or networks. For a given demux interface unit, you

can configure either demux source or demux destination prefixes but not both. You can choose not to configure a demux source or demux destination prefix. This type of configuration results in a transmit-only interface.

To configure IP demux prefixes, include the **demux-destination** or **demux-source** statements:

```
[edit interfaces interface-name unit logical-unit-number]
demux-destination {
    destination-prefix;
}
demux-source {
    source-prefix
}
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* family *family*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family *family*]
- [edit logical-systems *logical-system-name* routing-instances *routing-instance-name* interfaces *interface-name* unit *logical-unit-number* family *family*]

Configuring an IP Demux Underlying Interface

When configuring demux interfaces, you must configure the referenced underlying interface to check either destination or source prefixes when determining which IP demux interface to use. The underlying interface prefix type must match the demux interface prefix type.

For additional information about configuring an IP demux underlying interface, see “Specifying the IP Demux Underlying Interface Family Type” on page 605.

Configuring MAC Address Validation on Static Demux Interfaces

MAC address validation enables the router to validate that received packets contain a trusted IP source and an Ethernet MAC source address.

MAC address validation is supported on static demux interfaces on MX-series routers only.

There are two types of MAC address validation that you can configure:

- Loose—Forwards packets when both the IP source address and the MAC source address match one of the trusted address tuples.

Drops packets when the IP source address matches one of the trusted tuples, but the MAC address does not support the MAC address of the tuple

Continues to forward packets when the source address of the incoming packet does not match any of the trusted IP addresses.

- Strict—Forwards packets when both the IP source address and the MAC source address match one of the trusted address tuples.

Drops packets when the MAC address does not match the tuple's MAC source address, or when IP source address of the incoming packet does not match any of the trusted IP addresses.

To configure MAC address validation on static Ethernet interfaces, include the `mac-validate (loose | strict)` statement in the `[edit demux0 unit logical-unit-number family family]` hierarchy.

Example: Configuring a Demux Interface

Configure two VLANs, each with two IP demux interfaces. One VLAN demultiplexes based on the source address; the other VLAN demultiplexes based on the destination address.



NOTE: This example is not intended to depict any realistic deployment; it is intended to demonstrate many possible CLI variations.

```
[edit]
interfaces {
  fe-0/0/0 {
    vlan-tagging;
    unit 100 {
      vlan-id 100;
      demux-source inet; # Enable demux of inet prefixes
      family inet {
        address 10.1.1.1/24;
        filter {
          input vlan1-primary-in-filter;
          output vlan1-primary-out-filter;
        }
        mac-validate loose;
      }
    }
    unit 200 {
      vlan-id 200;
      demux-destination inet; # Enable demux of inet using destination addresses
      family inet {
        address 20.1.1.1/24;
      }
    }
    unit 300 {
      vlan-id 300;
      demux-source inet; # Enable demux of inet using source addresses
      family inet {
        address 20.1.2.1/24;
      }
    }
  }
}
```

```

demux0 {
  unit 101 {
    description vlan1-sub1;
    demux-options {
      underlying-interface fe-0/0/0.100;
    }
    family inet {
      demux-source 10.1.1.0/24;
      filter {
        input vlan1-sub1-in-filter;
        output vlan1-sub1-out-filter;
      }
      mac-validate loose;
    }
  }
  unit 102 {
    description vlan1-sub2;
    demux-options {
      underlying-interface fe-0/0/0.100;
    }
    family inet {
      demux-source {
        10.1.0.0/16;
        10.2.1.0/24;
      }
      filter {
        input vlan1-sub2-in-filter;
        output vlan1-sub2-out-filter;
      }
      mac-validate loose;
    }
  }
  unit 202 {
    description vlan2-sub2;
    demux-options {
      underlying-interface fe-0/0/0.200;
    }
    family inet {
      demux-destination 100.1.2.0/24;
    }
  }
  unit 302 {
    description vlan2-sub2;
    demux-options {
      underlying-interface fe-0/0/0.300;
    }
    family inet {
      demux-source 100.1.2.0/24;
    }
  }
}

```


Chapter 11

Configuring the Loopback Interface

On the routing platform, you can configure one physical loopback interface, `lo0`, and one or more addresses on the interface.

- Configuring the Loopback Interface on page 235

Configuring the Loopback Interface

To configure the physical loopback interface, include the following statements at the `[edit interfaces]` hierarchy level:

```
[edit interfaces]
lo0 {
  unit 0 {
    family inet {
      address loopback-address;
      address <loopback-address2>;
      ...
    }
    family inet6 {
      address loopback-address;
    }
  }
}
```

When specifying the loopback address, do not include a destination prefix. Also, in most cases, do not specify a loopback address on any unit other than unit 0.



NOTE: For Layer 3 virtual private networks (VPNs), you can configure multiple logical units for the loopback interface. This allows you to configure a logical loopback interface for each virtual routing and forwarding (VRF) routing instance. For more information, see the *JUNOS VPNs Configuration Guide*.

For some applications, such as SSL for JUNOScript, the address for the interface `lo0.0` must be `127.0.0.1`.

You can configure loopback interfaces using a subnetwork address for both `inet` and `inet6` address families. Many protocols require a subnetwork address as their source address. Configuring a subnetwork loopback address as a donor interface enables these protocols to run on unnumbered interfaces.

If you configure the loopback interface, it is automatically used for unnumbered interfaces. If you do not configure the loopback interface, the routing platform chooses the first interface to come online as the default. If you configure more than one address on the loopback interface, we recommend that you configure one to be the primary address to ensure that it is selected for use with unnumbered interfaces. By default, the primary address is used as the source address when packets originate from the interface.

For more information about unnumbered interfaces, see “Configuring an Unnumbered Interface” on page 172. For more information about primary addresses, see “Configuring the Interface Address” on page 162.

Example: Configuring the Loopback Interface

Configure two addresses on the loopback interface with host routes:

```
[edit]
user@host# edit interfaces lo0 unit 0 family inet
[edit interfaces lo0 unit 0 family inet]
user@host# set address 172.16.0.1
[edit interfaces lo0 unit 0 family inet]
user@host# set address 10.0.0.1
[edit interfaces lo0 unit 0 family inet]
user@host# top
[edit]
user@host# show
interfaces {
  lo0 {
    unit 0 {
      family inet {
        10.0.0.1;
        127.0.0.1;
        172.16.0.1;
      }
    }
  }
}
```

Configure two addresses on the loopback interface with subnetwork routes:

```
[edit]
user@host# edit interfaces lo0 unit 0 family inet
[edit interfaces lo0 unit 0 family inet]
user@host# set address 192.16.0.1/24
[edit interfaces lo0 unit 0 family inet]
user@host# set address 10.2.0.1/16
[edit interfaces lo0 unit 0 family inet]
user@host# top
[edit]
user@host# show
interfaces {
  lo0 {
    unit 0 {
      family inet {
        10.2.0.1/16;

```

```

        127.0.0.1/32;
        192.16.0.1/24;
    }
}
}

```

Configure an IP and an IPv6 address on the loopback interface with subnetwork routes:

```

[edit]
user@host# edit interfaces lo0 unit 0 family inet
[edit interfaces lo0 unit 0 family inet]
user@host# set address 192.16.0.1/24
[edit interfaces lo0 unit 0 family inet]
user@host# up
[edit interfaces lo0 unit 0 family]
user@host# edit interfaces lo0 unit 0 family inet6
[edit interfaces lo0 unit 0 family inet6]
user@host# set address 3ffe::1:200:f8ff:fe75:50df/64
[edit interfaces lo0 unit 0 family inet6]
user@host# top
[edit]
user@host# show
interfaces {
  lo0 {
    unit 0 {
      family inet {
        127.0.0.1/32;
        192.16.0.1/24;
      }
      family inet6 {
        3ffe::1:200:f8ff:fe75:50df/64;
      }
    }
  }
}

```


Chapter 12

Configuring Serial Interfaces

This chapter discusses configuration of the following serial interface properties:

- Serial Interfaces Overview on page 239
- Physical Interface Configuration Statements on page 240
- Configuring the Serial Line Protocol on page 241
- Configuring the Serial Clocking Mode on page 244
- Configuring the Serial Idle Cycle Flag on page 247
- Configuring the Serial Signal Handling on page 247
- Configuring the Serial DTR Circuit on page 250
- Configuring Serial Signal Polarities on page 250
- Configuring Serial Loopback Capability on page 251
- Configuring Serial Line Encoding on page 253

Serial Interfaces Overview

Devices that communicate over a serial interface are divided into two classes: data terminal equipment (DTE) and data circuit-terminating equipment (DCE). Juniper Networks Serial Physical Interface Cards (PICs) have two ports per PIC and support full-duplex data transmission. These PICs support DTE mode only. On the Serial PIC, you can configure three types of serial interfaces:

- EIA-530—An Electronics Industries Alliance (EIA) standard for the interconnection of DTE and DCE using serial binary data interchange with control information exchanged on separate control circuits.
- V.35—An ITU-T standard describing a synchronous, physical layer protocol used for communications between a network access device and a packet network. V.35 is most commonly used in the United States and in Europe.
- X.21—An ITU-T standard for serial communications over synchronous digital lines. The X.21 protocol is used primarily in Europe and Japan.

The following standards apply to serial interfaces:

- TIA/EIA Standard 530, *High-Speed 25-Position Interface for Data Terminal Equipment and Data Circuit-Terminating Equipment*, defines the signals on the cable and specifies the connector at the end of the cable.
- TIA/EIA Standard 232, *Interface between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange*, describes the physical interface and protocol for serial data communication.
- ITU-T Recommendation V.35, *Data Transmission at 48 kbit/s Using 60-108 kHz Group Band Circuits*. Note that the Juniper Networks Serial PIC supports V.35 interfaces with speeds higher than 48 kilobits per second.
- ITU-T Recommendation X.21, *Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment for Synchronous Operation on Public Data Networks*.

There are no serial interface-specific logical properties. For information about general logical properties that you can configure, see “Configuring Logical Interface Properties” on page 133. On J-series Services Routers, link fragmentation and interleaving (LFI) and Multilink Point-to-Point Protocol (MLPPP) support has been extended to serial interfaces. This support on serial interfaces is the same as the existing LFI and MLPPP support on T1 and E1 interfaces.

Physical Interface Configuration Statements

To configure serial physical interface properties, include the `serial-options` statement for the J-series routing platform at the `[edit interfaces se-pim/0/port]` hierarchy level or at the `[edit interfaces se-fpc/pic/port]` hierarchy level for M-series and T-series routing platforms:

```
[edit interfaces se-fpc/pic/port]
serial-options {
  clock-rate rate;
  clocking-mode (dce | dte | loop);
  control-polarity (negative | positive);
  cts-polarity (negative | positive);
  dcd-polarity (negative | positive);
  dce-options {
    control-signal (assert | de-assert | normal);
    cts (ignore | normal | require);
    dcd (ignore | normal | require);
    dsr (ignore | normal | require);
    dtr signal-handling-option;
    ignore-all;
    indication (ignore | normal | require);
    rts (assert | de-assert | normal);
    tm (ignore | normal | require);
  }
  dsr-polarity (negative | positive);
  dte-options {
    control-signal (assert | de-assert | normal);
    cts (ignore | normal | require);
    dcd (ignore | normal | require);
    dsr (ignore | normal | require);
    dtr signal-handling-option;
```

```

    ignore-all;
    indication (ignore | normal | require);
    rts (assert | de-assert | normal);
    tm (ignore | normal | require);
}
dtr-circuit (negative | positive);
dtr-polarity (negative | positive);
encoding (nrz | nrzi);
idle-cycle-flag flag;
indication-polarity (negative | positive);
line-protocol protocol;
loopback mode;
rts-polarity (negative | positive);
tm-polarity (negative | positive);
transmit-clock invert;
}

```

Configuring the Serial Line Protocol

By default, serial interfaces use the EIA-530 line protocol. You can configure each port on the PIC independently to use one of the following line protocols:

- EIA-530
- V.35
- X.21

To configure the serial line protocol, include the `line-protocol` statement, specifying the `eia530`, `v.35`, or `x.21` option:

```
line-protocol protocol;
```

You can include these statements at the following hierarchy levels:

- [edit interfaces *se-pim*/0/*port* serial-options]
- [edit interfaces *se-fpc*/*pic*/*port* serial-options]

For more information about serial interfaces, see the following sections:

- Serial Interface Default Settings on page 241
- Invalid Serial Interface Statements on page 243

Serial Interface Default Settings

The following sections show the default settings for serial interfaces:

- EIA-530 Interface Default Settings on page 242
- V.35 Interface Default Settings on page 242
- X.21 Interface Default Settings on page 243

EIA-530 Interface Default Settings

If you do not include the `line-protocol` statement or if you explicitly configure the default EIA-530 line protocol, the default settings are as follows:

```
dce-options | dte-options {
  cts normal;
  dcd normal;
  dsr normal;
  dtr normal;
  rts normal;
  tm normal;
}
clock-rate 16.384mhz;
clocking-mode loop;
cts-polarity positive;
dcd-polarity positive;
dsr-polarity positive;
dtr-circuit balanced;
dtr-polarity positive;
encoding nrz;
rts-polarity positive;
tm-polarity positive;
```

You can include the `line-protocol` statement at the following hierarchy levels:

- [edit interfaces *se-pim*/0/*port* serial-options]
- [edit interfaces *se-fpc*/*pic*/*port* serial-options]

V.35 Interface Default Settings

If you include the `line-protocol v.35` statement, the default settings are as follows:

```
dce-options | dte-options {
  cts normal;
  dcd normal;
  dsr normal;
  dtr normal;
  rts normal;
}
clock-rate 16.384mhz;
clocking-mode loop;
cts-polarity positive;
dcd-polarity positive;
dsr-polarity positive;
dtr-circuit balanced;
dtr-polarity positive;
encoding nrz;
rts-polarity positive;
```

You can include the `line-protocol` statement at the following hierarchy levels:

- [edit interfaces *se-pim*/0/*port* serial-options]
- [edit interfaces *se-fpc*/*pic*/*port* serial-options]

X.21 Interface Default Settings

If you include the `line-protocol x.21` statement, the default settings are as follows:

```
dce-options | dte-options {
    control-signal normal;
    indication normal;
}
clock-rate 16.384mhz;
clocking-mode loop;
control-polarity positive;
encoding nrz;
indication-polarity positive;
```

You can include the `line-protocol` statement at the following hierarchy levels:

- [edit interfaces *se-pim/0/port* serial-options]
- [edit interfaces *se-fpc/pic/port* serial-options]

Invalid Serial Interface Statements

The following sections show the invalid configuration statements for each type of serial interface. If you include the following statements in the configuration, an error message indicates the location of the error and the configuration is not activated.

- Invalid EIA-530 Interface Statements on page 243
- Invalid V.35 interface Statements on page 243
- Invalid X.21 Interface Statements on page 244

Invalid EIA-530 Interface Statements

If you do not include the `line-protocol` statement or if you explicitly configure the default EIA-530 line protocol, the following statements are invalid:

```
dce-options | dte-options {
    control-signal (assert | de-assert | normal);
    indication (ignore | normal | require);
}
control-polarity (negative | positive);
indication-polarity (negative | positive);
```

You can include the `line-protocol` statement at the following hierarchy levels:

- [edit interfaces *se-pim/0/port* serial-options]
- [edit interfaces *se-fpc/pic/port* serial-options]

Invalid V.35 interface Statements

If you include the `line-protocol v.35` statement, the following statements are invalid:

```
dce-options | dte-options {
```

```

    control-signal (assert | de-assert | normal);
    indication (ignore | normal | require);
    tm (ignore | normal | require);
}
control-polarity (negative | positive);
indication-polarity (negative | positive);
loopback (dce-local | dce-remote);
tm-polarity (negative | positive);

```

You can include the `line-protocol` statement at the following hierarchy levels:

- [edit interfaces *se-pim*/0/*port* serial-options]
- [edit interfaces *se-fpc*/*pic*/*port* serial-options]

Invalid X.21 Interface Statements

If you include the `line-protocol x.21` statement, the following statements are invalid:

```

dce-options | dte-options {
    cts (ignore | normal | require);
    dcd (ignore | normal | require);
    dsr (ignore | normal | require);
    dtr (assert | de-assert | normal);
    rts (assert | de-assert | normal);
    tm (ignore | normal | require);
}
clocking-mode (dce | dte);
cts-polarity (negative | positive);
dce-polarity (negative | positive);
dsr-polarity (negative | positive);
dtr-circuit (balanced | unbalanced);
dtr-polarity (negative | positive);
loopback (dce-local | dce-remote);
rts-polarity (negative | positive);
tm-polarity (negative | positive);

```

You can include the `line-protocol` statement at the following hierarchy levels:

- [edit interfaces *se-pim*/0/*port* serial-options]
- [edit interfaces *se-fpc*/*pic*/*port* serial-options]

Configuring the Serial Clocking Mode

By default, serial interfaces use loop clocking mode. For EIA-530 and V.35 interfaces, you can configure each port on the PIC independently to use loop, DCE, or DTE clocking mode. For X.21 interfaces, only loop clocking mode is supported.

The three clocking modes work as follows:

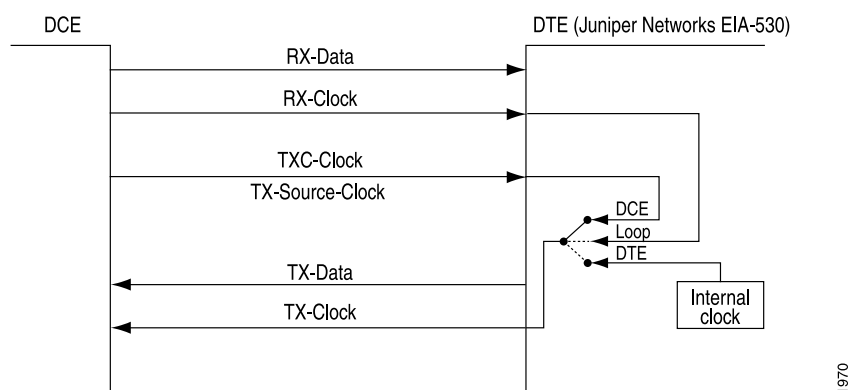
- Loop clocking mode—Uses the DCE's RX clock to clock data from the DCE to the DTE.

- DCE clocking mode—Uses the TXC clock, which is generated by the DCE specifically to be used by the DTE as the DTE's transmit clock.
- DTE clocking mode—Also known as line timing, uses an internally generated clock. You can configure the speed of this clock by including the clock-rate statement at the [edit interfaces se-pim/0/port serial-options] or [edit interfaces se-fpc/pic/port dte-options] hierarchy levels. For more information about the DTE clock rate, see “Configuring the DTE Clock Rate” on page 246.

Note that DCE clocking mode and loop clocking mode use external clocks generated by the DCE.

Figure 15 on page 245 shows the clock sources of loop, DCE, and DTE clocking modes.

Figure 15: Serial Interface Clocking Mode



To configure the clocking mode of a serial interface, include the **clocking-mode** statement:

```
clocking-mode (dce | dte | loop);
```

You can include the **clocking-mode** statement at the following hierarchy levels:

- [edit interfaces se-pim/0/port serial-options]
- [edit interfaces se-fpc/pic/port serial-options]
- Inverting the Serial Interface Transmit Clock on page 245
- Configuring the DTE Clock Rate on page 246

Inverting the Serial Interface Transmit Clock

When an externally timed clocking mode (DCE or loop) is used, long cables might introduce a phase shift of the DTE-transmitted clock and data. At high speeds, this phase shift might cause errors. Inverting the transmit clock corrects the phase shift, thereby reducing error rates.

By default, the transmit clock is not inverted. To invert the transmit clock, include the **transmit-clock invert** statement:

```
transmit-clock invert;
```

You can include the `transmit-clock` statement at the following hierarchy levels:

- [edit interfaces *se-pim/0/port* serial-options]
- [edit interfaces *se-fpc/pic/port* serial-options]

Configuring the DTE Clock Rate

By default, the serial interface has a clock rate of 16.384 MHz. For EIA-530 and V.35 interfaces with DTE clocking mode configured, you can configure the clock rate. For more information about DTE clocking mode, see “Configuring the Serial Clocking Mode” on page 244.

To configure the clock rate, include the `clock-rate` statement:

```
clock-rate rate;
```

You can include the `clock-rate` statement at the following hierarchy levels:

- [edit interfaces *se-pim/0/port* serial-options]
- [edit interfaces *se-fpc/pic/port* serial-options]

You can configure the following interface speeds:

- 2.048 MHz
- 2.341 MHz
- 2.731 MHz
- 3.277 MHz
- 4.096 MHz
- 5.461 MHz
- 8.192 MHz
- 16.384 MHz

Although the serial interface is intended for use at the default rate of 16.384 MHz, you might need to use a slower rate if any of the following conditions prevail:

- The interconnecting cable is too long for effective operation.
- The interconnecting cable is exposed to an extraneous noise source that might cause an unwanted voltage in excess of + 1 volt measured differentially between the signal conductor and circuit common at the load end of the cable, with a 50-ohm resistor substituted for the generator.
- You need to minimize interference with other signals.
- You need to invert signals.

For detailed information about the relationship between signaling rate and interface cable distance, see the following standards:

- EIA-422-A, *Electrical Characteristics of Balanced Voltage Digital Interface Circuits*
- EIA-423-A, *Electrical Characteristics of Unbalanced Voltage Digital Interface Circuits*

Configuring the Serial Idle Cycle Flag

By default, a serial interface on J-series Services Routers transmits the value 0x7E in the idle cycles. To have the interface transmit the value 0xFF (all ones) instead, include the `idle-cycle-flag` statement at the [edit interfaces *interface-name* serial-options] hierarchy level, specifying the `ones` option:

```
[edit interfaces interface-name serial-options]
idle-cycle-flag ones;
```

To explicitly configure the default value of 0x7E, include the `idle-cycle-flag` statement with the `flags` option:

```
[edit interfaces interface-name serial-options]
idle-cycle-flag flags;
```

Configuring the Serial Signal Handling

By default, normal signal handling is enabled for all signals. For each signal, the `normal` option applies to the normal signal handling for that signal, as defined by the following standards:

- TIA/EIA Standard 530
- ITU-T Recommendation V.35
- ITU-T Recommendation X.21

Table 26 on page 247 shows the serial interface modes that support each signal type.

Table 26: Signal Handling by Serial Interface Type

Signal	Serial Interfaces
From-DCE signals	
Clear to send (CTS)	EIA-530 and V.35
Data carrier detect (DCD)	EIA-530 and V.35
Data set ready (DSR)	EIA-530 and V.35
Indication	X.21 only
Test mode (TM)	EIA-530 only
To-DCE signals	
Control signal	X.21 only
Data transfer ready (DTR)	EIA-530 and V.35

Table 26: Signal Handling by Serial Interface Type (*continued*)

Signal	Serial Interfaces
Request to send (RTS)	EIA-530 and V.35

You configure serial interface signal characteristics by including the `dce-options | dte-options` statement:

```
dce-options | dte-options {
  control-signal (assert | de-assert | normal);
  cts (ignore | normal | require);
  dcd (ignore | normal | require);
  dsr (ignore | normal | require);
  dtr signal-handling-option;
  ignore-all;
  indication (ignore | normal | require);
  rts (assert | de-assert | normal);
  tm (ignore | normal | require);
}
```

You can include the `dce-options | dte-options` statement at the following hierarchy levels:

- [edit interfaces *se-pim*/0/*port* serial-options]
- [edit interfaces *se-fpc*/*pic*/*port* serial-options]

For EIA-530 and V.35 interfaces, configure to-DCE signals by including the `dtr` and `rts` statements, specifying the `assert`, `de-assert`, or `normal` option:

```
dtr (assert | de-assert | normal);
rts (assert | de-assert | normal);
```

For X.21 interfaces, configure to-DCE signals by including the `control-signal` statement, specifying the `assert`, `de-assert`, or `normal` option:

```
control-signal (assert | de-assert | normal);
```

Assertion is when the positive side of a given signal is at potential high-level output voltage (Voh), while the negative side of the same signal is at potential low-level output voltage (Vol). *Deassertion* is when the positive side of a given signal is at potential Vol, while the negative side of the same signal is at potential Voh.

For the DTR signal, you can configure normal signal handling using the `signal` for automatic resynchronization by including the `dtr` statement, and specifying the `auto-synchronize` option:

```
dtr {
  auto-synchronize {
    duration milliseconds;
    interval seconds;
  }
}
```

The pulse duration of resynchronization can be from 1 through 1000 milliseconds. The offset interval for resynchronization can be from 1 through 31 seconds.

For EIA-530 and V.35 interfaces, configure from-DCE signals by including the **cts**, **dcd**, and **dsr** statements, specifying the **ignore**, **normal**, or **require** option:

```
cts (ignore | normal | require);
dcd (ignore | normal | require);
dsr (ignore | normal | require);
```

For X.21 interfaces, configure from-DCE signals by including the **indication** statement, specifying the **ignore**, **normal**, or **require** option:

```
indication (ignore | normal | require);
```

For EIA-530 interfaces only, you can configure from-DCE test-mode (TM) signaling by including the **tm** statement, specifying the **ignore**, **normal**, or **require** option:

```
tm (ignore | normal | require);
```

To specify that the from-DCE signal must be asserted, include the **require** option in the configuration. To specify that the from-DCE signal must be ignored, include the **ignore** option in the configuration.



NOTE: For V.35 and X.21 interfaces, you cannot include the **tm** statement in the configuration.

For X.21 interfaces, you cannot include the **cts**, **dcd**, **dsr**, **dtr**, and **rts** statements in the configuration.

For EIA-530 and V.35 interfaces, you cannot include the **control-signal** and **indication** statements in the configuration.

For a complete list of serial options statements that are not supported by each serial interface mode, see “Invalid Serial Interface Statements” on page 243.

To return to the default normal signal handling, delete the **require**, **ignore**, **assert**, **de-assert**, or **auto-synchronize** statement from the configuration, as shown in the following example:

```
[edit]
user@host# delete interfaces se-fpc/pic/port dte-options control-leads cts require
```

To explicitly configure normal signal handling, include the **control-signal** statement with the **normal** option:

```
control-signal normal;
```

You can configure the serial interface to ignore all control leads by including the **ignore-all** statement:

```
ignore-all;
```

You can include the `ignore-all` statement in the configuration only if you do not explicitly enable other signal handling options at the `[edit interfaces se-pim/0/port serial-options dce-options]` or `[edit interfaces se-fpc/pic/port serial-options dte-options]` hierarchy levels.

You can include the `control-signal`, `cts`, `dcd`, `dsr`, `dtr`, `indication`, `rts`, and `tm` statements at the following hierarchy levels:

- `[edit interfaces se-pim/0/port serial-options dte-options]`
- `[edit interfaces se-fpc/pic/port serial-options dte-options]`

Configuring the Serial DTR Circuit

A balanced circuit has two currents that are equal in magnitude and opposite in phase. An unbalanced circuit has one current and a ground; if a pair of terminals is unbalanced, one side is connected to electrical ground and the other carries the signal. By default, the DTR circuit is balanced.

For EIA-530 and V.35 interfaces, configure the DTR circuit by including the `dtr-circuit` statement:

```
dtr-circuit (balanced | unbalanced);
```

You can include the `dtr-circuit` statement at the following hierarchy levels:

- `[edit interfaces se-pim/0/port serial-options]`
- `[edit interfaces se-fpc/pic/port serial-options]`

Configuring Serial Signal Polarities

Serial interfaces use a differential protocol signaling technique. Of the two serial signals associated with a circuit, the one referred to as the A signal is denoted with a plus sign, and the one referred to as the B signal is denoted with a minus sign; for example, DTR+ and DTR-. If DTR is low, then DTR+ is negative with respect to DTR-. If DTR is high, then DTR+ is positive with respect to DTR-.

By default, all signal polarities are positive. You can reverse this polarity on a Juniper Networks serial interface. You might need to do this if signals are miswired as a result of reversed polarities.

For EIA-530 and V.35 interfaces, configure signal polarities by including the `cts-polarity`, `dcd-polarity`, `dsr-polarity`, `dtr-polarity`, `rts-polarity`, and `tm-polarity` statements:

```
cts-polarity (negative | positive);
dcd-polarity (negative | positive);
dsr-polarity (negative | positive);
dtr-polarity (negative | positive);
rts-polarity (negative | positive);
tm-polarity (negative | positive);
```

You can include the `cts-polarity`, `dcd-polarity`, `dsr-polarity`, `dtr-polarity`, `rts-polarity`, and `tm-polarity` statements at the following hierarchy levels:

- [edit interfaces *se-pim*/0/*port* serial-options]
- [edit interfaces *se-fpc*/*pic*/*port* serial-options]

For X.21 interfaces, configure signal polarities by including the `control-polarity` and `indication-polarity` statements:

```
control-polarity (negative | positive);
indication-polarity (negative | positive);
```

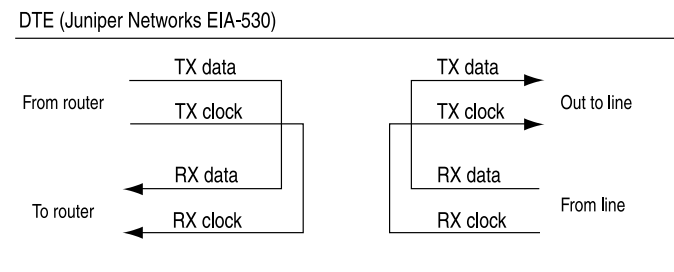
You can include the `control-polarity` and `indication-polarity` statements at the following hierarchy levels:

- [edit interfaces *se-pim*/0/*port* serial-options]
- [edit interfaces *se-fpc*/*pic*/*port* serial-options]

Configuring Serial Loopback Capability

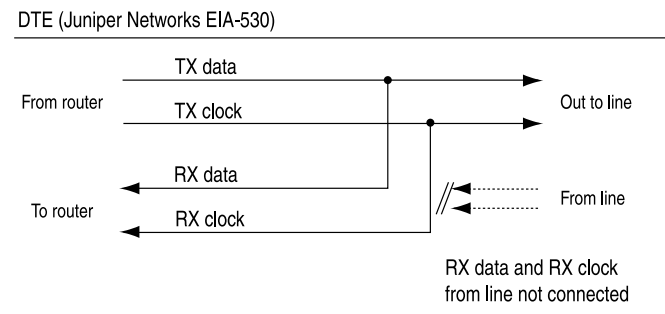
From the routing platform, remote line interface unit (LIU) loopback loops the TX (transmit) data and TX clock back to the routing platform as RX (receive) data and RX clock. From the line, LIU loopback loops the RX data and RX clock back out the line as TX data and TX clock, as shown in Figure 16 on page 251.

Figure 16: Serial Interface LIU Loopback



1972

DCE local and DCE remote control the EIA-530 interface-specific signals for enabling local and remote loopback on the link partner DCE. Local loopback is shown in Figure 17 on page 252.

Figure 17: Serial Interface Local Loopback

1971

For EIA-530 interfaces, you can configure DCE local, DCE remote, local, and remote (LIU) loopback capability.

For V.35, you can configure remote LIU and local loopback capability. DCE local and DCE remote loopbacks are not supported on V.35 and X.21 interfaces. Local and remote loopbacks are not supported on X.21 interfaces.

To configure the loopback capability on a serial interface, include the **loopback** statement, specifying the **dce-local**, **dce-remote**, **local**, or **remote** option:

```
loopback mode;
```

You can include the **loopback** statement at the following hierarchy levels:

- [edit interfaces *se-pim/0/port* serial-options]
- [edit interfaces *se-fpc/pic/port* serial-options]

To disable the loopback capability, remove the **loopback** statement from the configuration:

```
[edit]
user@host# delete interfaces se-fpc/pic/port serial-options loopback
```

You can determine whether there is an internal or external problem by checking the error counters in the output of the **show interface *se-fpc/pic/port* extensive** command:

```
user@host> show interfaces se-fpc/pic/port extensive
```

Example: Configuring Serial Loopback Capability

To determine the source of a problem, loop packets on the local routing platform, the local DCE, the remote DCE, and the remote line interface unit (LIU). To do this, include the **no-keepalives** and **encapsulation cisco-hdlc** statements at the [edit interfaces *se-fpc/pic/port*] hierarchy level, and the **loopback local** option at the [edit interfaces *se-pim/0/port* serial-options] or [edit interfaces *se-fpc/pic/port* serial-options] hierarchy level. With this configuration, the link stays up, so you can loop ping packets to a remote routing platform. The **loopback local** statement causes the interface to loop within the PIC just before the data reaches the transceiver.

```
[edit interfaces]
```

```

se-1/0/0 {
  no-keepalives;
  encapsulation cisco-hdlc;
  serial-options {
    loopback local;
  }
  unit 0 {
    family inet {
      address 10.100.100.1/24;
    }
  }
}

```

Configuring Serial Line Encoding

By default, serial interfaces use non-return to zero (NRZ) line encoding. You can configure non-return to zero inverted (NRZI) line encoding if necessary.

To have the interface use NRZI line encoding, include the **encoding** statement, specifying the **nrzi** option:

```
encoding nrzi;
```

To explicitly configure the default NRZ line encoding, include the **encoding** statement, specifying the **nrz** option:

```
encoding nrz;
```

You can include the **encoding** statement at the following hierarchy levels:

- [edit interfaces *se-pim/0/port* serial-options]
- [edit interfaces *se-fpc/pic/port* serial-options]

When setting the line encoding parameter, you must set the same value for paired ports. Ports 0 and 1 must share the same value.

Part 4

Configuring ATM Interfaces

This part describes the configuration of the following ATM interfaces:

- Configuring ATM Interfaces on page 257
- Configuring ATM-over-ADSL Interfaces on page 331
- Configuring ATM-over-SHDSL Interfaces on page 337

Chapter 13

Configuring ATM Interfaces

This section contains the following topics:

- Overview of ATM Interfaces on page 258
- ATM1 Physical and Logical Configuration Hierarchies on page 259
- ATM2 IQ Physical and Logical Configuration Hierarchies on page 261
- Supported Features on ATM1 and ATM2 IQ Interfaces on page 263
- Configuring Communication with Directly Attached ATM Switches and Routers on page 267
- Enabling ILMI for Cell Relay on page 268
- Enabling Passive Monitoring on ATM Interfaces on page 269
- Removing MPLS Labels from Incoming Packets on page 270
- Configuring the ATM PIC Type on page 271
- Configuring ATM Cell-Relay Promiscuous Mode on page 272
- Configuring the Maximum Number of ATM1 VCs on a VP on page 276
- Configuring Layer 2 Circuit Transport Mode on page 276
- Configuring Layer 2 Circuit Cell-Relay Promiscuous Mode on page 284
- Configuring Layer 2 Circuit Trunk Mode Scheduling on page 285
- Configuring CoS Queues in Layer 2 Circuit Trunk Mode on page 287
- Configuring the Layer 2 Circuit Cell-Relay Cell Maximum on page 289
- Configuring the OAM F4 Cell Flows on page 291
- Defining Virtual Path Tunnels on page 292
- Configuring a Point-to-Point ATM1 or ATM2 IQ Connection on page 292
- Configuring a Point-to-Multipoint ATM1 or ATM2 IQ Connection on page 293
- Configuring a Multicast-Capable ATM1 or ATM2 IQ Connection on page 294
- Configuring Inverse ATM1 or ATM2 ARP on page 294
- Defining the ATM Traffic-Shaping Profile on page 295
- Configuring the ATM1 Queue Length on page 301
- Configuring the ATM2 IQ EPD Threshold on page 302
- Configuring Two EPD Thresholds per Queue on page 304
- Configuring the ATM2 IQ Transmission Weight on page 304

- Defining the ATM OAM F5 Loopback Cell Period on page 305
- Configuring the ATM OAM F5 Loopback Cell Threshold on page 305
- Configuring ATM Interface Encapsulation on page 306
- Configuring an ATM1 Cell-Relay Circuit on page 308
- Configuring PPP over ATM2 Encapsulation on page 310
- Configuring E3 and T3 Parameters on ATM Interfaces on page 313
- Configuring SONET/SDH Parameters on ATM Interfaces on page 314
- Configuring ATM2 IQ VC Tunnel CoS Components on page 315
- Example: Configuring ATM1 Interfaces on page 326
- Example: Configuring ATM2 IQ Interfaces on page 328

Overview of ATM Interfaces

Asynchronous Transfer Mode (ATM) is a network protocol designed to facilitate the simultaneous handling of various types of traffic streams (voice, data, and video) at very high speeds over the same physical connection. By always using 53-byte cells, ATM simplifies the design of hardware, enabling it to quickly determine the destination address of each cell. This allows simple switching of network traffic at much higher speeds than are easily accomplished using protocols with variable sizes of transfer units, such as Frame Relay and Transmission Control Protocol/Internet Protocol (TCP/IP).

Although ATM was designed to operate without the requirement of any other networking protocol, other protocols are frequently segmented and encapsulated across multiple, smaller ATM cells. This makes ATM a transport mechanism for pre-existing technologies such as Frame Relay and the TCP/IP family of protocols.

ATM relies on the concepts of virtual paths and virtual circuits. A virtual path, represented by a specific virtual path identifier (VPI), establishes a route between two devices in a network. Each VPI can contain multiple virtual circuits, each represented by a virtual circuit identifier (VCI).

VPIs and VCIs are local to the routing platform, which means that only the two devices connected by the VCI or VPI need know the details of the connection. In a typical ATM network, user data might traverse multiple connections, using many different VPI and VCI connections. Each end device, just like each device in the network, needs to know only the VCI and VPI information for the path to the next device.



NOTE: The ATM three-bit payload type identifier (PTI) field is not supported.

With ATM2 intelligent queuing (IQ) interfaces, you can configure virtual path (VP) shaping and Operation, Administration, and Management (OAM) F4 cell flows.

ATM1 Physical and Logical Configuration Hierarchies

To configure ATM1 physical interface properties, include the `atm-options`, `e3-options`, `t3-options`, and `sonet-options` statements at the `[edit interfaces at-fpc/pic/port]` hierarchy level:

ATM1 Physical Configuration Hierarchy	<pre> [edit interfaces at-fpc/pic/port] atm-options { ilmi; mpls { pop-all-labels { required-depth <i>number</i>; } } pic-type atm1; promiscuous-mode { vpi <i>vpi-identifier</i>; } vpi <i>vpi-identifier</i> { maximum-vcs <i>maximum-vcs</i>; } } e3-options { atm-encapsulation (direct plcp); buildout <i>feet</i>; framing (g.751 g.832); loopback (local remote); (payload-scrambler no-payload-scrambler); } encapsulation (atm-ccc-cell-relay atm-pvc ethernet-over-atm); sonet-options { aps { advertise-interval <i>milliseconds</i>; authentication-key <i>key</i>; force; hold-time <i>milliseconds</i>; lockout; neighbor <i>address</i>; paired-group <i>group-name</i>; protect-circuit <i>group-name</i>; request; revert-time <i>seconds</i>; working-circuit <i>group-name</i>; } bytes { e1-quiet <i>value</i>; f1 <i>value</i>; f2 <i>value</i>; s1 <i>value</i>; z3 <i>value</i>; z4 <i>value</i>; } loopback (local remote); (payload-scrambler no-payload-scrambler); rfc-2615; trigger { </pre>
--	--

```

        defect ignore {
            hold-time up milliseconds down milliseconds;
        }
    }
    (z0-increment | no-z0-increment);
}
t3-options {
    atm-encapsulation (direct | plcp);
    buildout feet;
    (cbit-parity | no-cbit-parity);
    loopback (local | payload | remote);
    (payload-scrambler | no-payload-scrambler);
}

```

To configure ATM1 logical interface properties, include the following statements:

**ATM1 Logical
Configuration Hierarchy**

```

allow-any-vci;
multicast-vci vpi-identifier.vci-identifier;
oam-liveness {
    up-count cells;
    down-count cells;
}
oam-period (disable | seconds);
shaping {
    (cbr rate | vbr peak rate sustained rate burst length);
    queue-length number;
}
vci vpi-identifier.vci-identifier;
vpi vpi-identifier;
family inet {
    address address {
        multipoint-destination address {
            inverse-arp;
            oam-liveness {
                up-count cells;
                down-count cells;
            }
            oam-period (disable | seconds);
            shaping {
                (cbr rate | vbr peak rate sustained rate burst length);
                queue-length number;
            }
        }
        vci vpi-identifier.vci-identifier;
    }
}
}

```

You can include these statements at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

ATM2 IQ Physical and Logical Configuration Hierarchies

To configure ATM2 IQ physical interface properties, include the `atm-options` and `sonet-options` statements at the `[edit interfaces at-fpc/pic/port]` hierarchy level:

ATM2 IQ Physical Configuration Hierarchy

```
[edit interfaces at-fpc/pic/port]
atm-options {
  cell-bundle-size cells;
  ilmi;
  linear-red-profiles profile-name{
    high-plp-max-threshold percent;
    low-plp-max-threshold percent;
    queue-depth cells high-plp-threshold percent low-plp-threshold percent;
  }
  mpls {
    pop-all-labels {
      required-depth number;
    }
  }
  pic-type atm2;
  plp-to-clp;
  promiscuous-mode {
    vpi vpi-identifier;
  }
  scheduler-maps map-name {
    forwarding-class class-name {
      epd-threshold cells plp1 cells;
      linear-red-profile profile-name;
      priority (high | low);
      transmit-weight (cells number | percent number);
    }
    vc-cos-mode (alternate | strict);
  }
  vpi vpi-identifier {
    oam-liveness {
      up-count;
      down-count;
    }
    oam-period (disable | seconds);
    shaping {
      (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained
        rate burst length);
    }
  }
}
sonet-options {
  aps {
    advertise-interval milliseconds;
    authentication-key key;
    force;
    hold-time milliseconds;
    lockout;
    neighbor address;
    paired-group group-name;
    protect-circuit group-name;
    request;
```

```

    revert-time seconds;
    working-circuit group-name;
}
bytes {
    e1-quiet value;
    f1 value;
    f2 value;
    s1 value;
    z3 value;
    z4 value;
}
loopback (local | remote);
(payload-scrambler | no-payload-scrambler);
rfc-2615;
trigger {
    defect ignore {
        hold-time up milliseconds down milliseconds;
    }
}
(z0-increment | no-z0-increment);
}

```

To configure ATM2 IQ logical interface properties, include the following statements:

ATM2 IQ Logical Configuration Hierarchy

```

allow-any-vci;
atm-scheduler-map (map-name | default);
cell-bundle-size cells;
epd-threshold cells;
multicast-vci vpi-identifier.vci-identifier;
oam-liveness {
    up-count cells;
    down-count cells;
}
oam-period (disable | seconds);
plp-to-clp;
shaping {
    (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained rate
    burst length);
}
transmit-weight number;
trunk-id number;
vci vpi-identifier.vci-identifier;
vpi vpi-identifier;
family inet address address {
    multipoint-destination address;
    epd-threshold cells;
    inverse-arp;
    oam-liveness {
        up-count cells;
        down-count cells;
    }
}
oam-period (disable | seconds);
shaping {
    (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained
    rate burst length);
}

```



```

    }
    transmit-weight number;
    vci vpi-identifier.vci-identifier;
  }

```

You can include these statements at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

Supported Features on ATM1 and ATM2 IQ Interfaces

Table 27 on page 263 lists the supported features on ATM1 and ATM2 IQ interfaces.

Table 27: ATM1 and ATM2 IQ Supported Features

Item	ATM1	ATM2 IQ	Comments
Encapsulation and Transport Modes			
ATM Adaptation Layer 5 (AAL5) circuit cross-connect (CCC)	Supported	Supported	For ATM1 and ATM2 IQ Physical Interface Cards (PICs), you can configure any combination of AAL5 CCC, nonpromiscuous cell relay, and AAL5 permanent virtual connections (PVCs) on the same PIC at the same time. See “Configuring ATM Interface Encapsulation” on page 306.
Cell-relay accumulation mode: The incoming cells (1 to 8) are packaged into a single packet and forwarded to the label-switched path (LSP).	Supported	Not supported	Cell-relay accumulation mode is per PIC, not per port. If you configure accumulation mode, the entire ATM1 PIC uses the configured mode. See “Configuring ATM Interface Encapsulation” on page 306.
Cell-relay promiscuous port mode: All cells from 0 through 65,535 of all VPIs (0 through 255) are sent to or received from an LSP.	Supported	Supported	For promiscuous mode, you must configure the port with atm-ccc-cell-relay encapsulation. For ATM2 IQ multiport PICs, you can configure one or more ports in port promiscuous mode, and the other ports with any ATM encapsulation.
Cell-relay promiscuous VPI mode: All cells in the VCI range 0 through 65,535 of a single VPI are sent to or received from an LSP.	Supported	Supported	For ATM2 IQ PICs, you can configure one or more logical interfaces in VPI promiscuous mode, and the other logical interfaces with any ATM encapsulation. For ATM1 PICs, if you configure one port in port mode, all ports on the PIC operate in port mode. Likewise if you configure one logical interface in VPI mode, all logical interfaces on the PIC operate in VPI mode. See “Configuring ATM Cell-Relay Promiscuous Mode” on page 272.

Table 27: ATM1 and ATM2 IQ Supported Features (*continued*)

Item	ATM1	ATM2 IQ	Comments
Cell-relay VP shaping	Supported	Supported	For ATM2 PICs, you can configure ATM CC cell relay promiscuous mode. VP promiscuous mode allows incoming traffic on all VCIs under the VPI to be bundled and directed to an LSP. Port promiscuous mode allows all traffic coming in on the entire VPI/VCI range to be forwarded to an LSP. In both modes, traffic shaping is not permitted. The ATM2 PIC supports traffic shaping in VP promiscuous mode and cell relay VC mode.
Cell-relay VCI mode: All cells in a VCI are sent to or received from an LSP.	Supported	Supported	For ATM1 PICs, nonpromiscuous cell-relay VCI, VPI, and port modes are supported on the same PIC with ATM AAL5 PVCs or ATM AAL5 CCC.
Cell-relay VPI mode: All cells in the VCI range (0 through <i>maximum-vc</i> s) of a single VPI are sent to or received from an LSP.	Supported	Not supported	For ATM2 IQ PICs, nonpromiscuous cell-relay VCI mode is supported on the same PIC with ATM AAL5 PVCs or ATM AAL5 CCC. See “Configuring ATM Interface Encapsulation” on page 306.
Cell-relay port mode: All cells in the VCI range (0 through <i>maximum-vc</i> s) of all VPIs (0 through 255) are sent to or received from an LSP.	Supported	Not supported	—
Ethernet over ATM encapsulation: Allows ATM interfaces to connect to devices that support only bridged-mode protocol data units (PDUs).	Supported	Supported	See “Configuring ATM Interface Encapsulation” on page 306.
Layer 2 circuit cell-relay, Layer 2 circuit AAL5, and Layer 2 circuit trunk transport modes: Allow you to send ATM cells or AAL5 PDUs between ATM2 IQ interfaces across a Layer 2 circuit-enabled network. Layer 2 circuits are designed to transport Layer 2 frames between provider edge (PE) routing platforms across a Label Distribution Protocol (LDP)-signaled Multiprotocol Label Switching (MPLS) backbone.	Not supported	Supported	Transport mode is per PIC, not per port. If you configure Layer 2 circuit cell-relay, Layer 2 circuit AAL5, or Layer 2 circuit trunk transport mode, the entire ATM2 IQ PIC uses the configured transport mode. Layer 2 circuit cell-relay mode supports both VP- and port-promiscuous modes. See “Configuring Layer 2 Circuit Transport Mode” on page 276.
Layer 2 VPN cell relay and Layer 2 VPN AAL5: Allow you to carry ATM cells or AAL5 PDUs over an MPLS backbone.	Supported	Supported	See the <i>JUNOS VPNs Configuration Guide</i> .

Table 27: ATM1 and ATM2 IQ Supported Features (continued)

Item	ATM1	ATM2 IQ	Comments
Point-to-Point Protocol (PPP) over ATM encapsulation: Associates a PPP link with an ATM AAL5 PVC.	Not supported	Supported	<p>For ATM2 IQ interfaces, the JUNOS software supports three PPP over ATM encapsulation types:</p> <ul style="list-style-type: none"> ■ <code>atm-ppp-llc</code>—PPP over AAL5 logical link control (LLC). ■ <code>atm-ppp-vc-mux</code>—PPP over AAL5 multiplex. ■ <code>atm-mlppp-llc</code>—Multilink PPP over AAL5 LLC. Requires a Link Services or Voice Services PIC. <p>See “Configuring PPP over ATM2 Encapsulation” on page 310.</p>
Other ATM Attributes			
EPD (early packet discard) threshold: Limits the queue size in ATM cells of a particular VC or forwarding class configured over a VC when using VC tunnel class of service (CoS). When the first ATM cell of a new packet is received, the VC’s queue depth is checked against the EPD threshold. If the VC’s queue depth exceeds the EPD threshold, the first and all subsequent ATM cells in the packet are discarded.	Not supported	Supported	<p>If you are using VC tunnel CoS, the EPD threshold configured at the logical unit level has no effect. You should configure each forwarding class for congestion management using either an individual EPD threshold (in other words, tail drop) or weighted random early detection (WRED) profile.</p> <p>See “Configuring the ATM2 IQ EPD Threshold” on page 302 and “Configuring ATM2 IQ VC Tunnel CoS Components” on page 315.</p>
OAM F4 cell flows: Identify and report virtual path connection (VPC) defects and failures.	Not supported	Supported	See “Configuring the OAM F4 Cell Flows” on page 291.
OAM F5 loopback cell responses	Supported	Supported	<p>For ATM1 interfaces, when an OAM F5 loopback request is received, the response cell is sent by the PIC. The request and response cells are not counted in the VC, logical interface, or physical interface statistics.</p> <p>For ATM2 IQ interfaces, when an OAM F5 loopback request is received, the response is sent by the routing engine. The OAM, VC, logical interface, and physical interface statistics are incremented.</p> <p>See “Defining the ATM OAM F5 Loopback Cell Period” on page 305 and “Configuring the ATM OAM F5 Loopback Cell Threshold” on page 305.</p>
Passive monitoring mode	Supported	Supported	See “Enabling Passive Monitoring on ATM Interfaces” on page 269.
PIC type	Supported	Supported	<p>For ATM1 interfaces, you can include the <code>pic-type atm1</code> statement.</p> <p>For ATM2 IQ interfaces, you can include the <code>pic-type atm2</code> statement.</p> <p>See “Configuring the ATM PIC Type” on page 271.</p>

Table 27: ATM1 and ATM2 IQ Supported Features (continued)

Item	ATM1	ATM2 IQ	Comments
Ping	Supported	Supported	<p>For ATM1 and ATM2 IQ interfaces, when you issue the ATM ping command, you must include a logical unit number in the interface name, as shown in the following example:</p> <pre>ping atm interface at-1/0/0.5 vci 0.123 count 3</pre> <p>The logical unit number is 5 on physical interface at-1/0/0.</p> <p>See the <i>JUNOS Interfaces Command Reference</i>.</p>
Queue length: Limits the queue size in packets of a particular VC.	Supported	Not supported	See “Configuring the ATM1 Queue Length” on page 301.
Real-time variable bit rate (VBR): Supports VBR data traffic with average and peak traffic parameters.	Not supported	Supported	<p>Compared to non-real-time VBR, real-time VBR data is serviced at a higher priority. Real-time VBR is suitable for carrying packetized video and audio.</p> <p>See “Configuring ATM2 IQ Real-Time VBR” on page 296.</p>
Shaping rates: Peak and sustained rates of traffic.	Supported	Supported	<p>For ATM1 OC3 interfaces, the rate can be from 33 kilobits per second (Kbps) through 135.6 megabits per second (Mbps); for ATM1 OC12 interfaces, the rate can be from 33 Kbps through 276 Mbps.</p> <p>For ATM2 IQ OC3 interfaces, the rate can be from 33 Kbps through 135,600,000 bits per second (bps). For ATM2 IQ OC12 interfaces, the rate can be from 33 Kbps through 271,273,396 bps (up to 50 percent of the line rate).</p> <p>For ATM2 IQ OC48 interfaces, the rate can be from 33 Kbps through 2,170,107,168 bits per second (bps).</p> <p>For ATM2 IQ DS3 and E3 interfaces, the rate can be from 33 Kbps to the maximum rate. The maximum rate varies depending on the ATM encapsulation and framing you configure:</p> <ul style="list-style-type: none"> ■ For DS3 interfaces with direct ATM encapsulation, the maximum rate is 40,038,968 bps. ■ For DS3 interfaces with Physical Layer Convergence Protocol (PLCP) ATM encapsulation, the maximum rate is 36,864,000 bps. ■ For E3 interfaces with g.751 framing and direct ATM encapsulation, the maximum rate is 30,801,509 bps. ■ For E3 interfaces with g.751 framing PLCP ATM encapsulation, the maximum rate is 27,648,000 bps. ■ For E3 interfaces with g.832 framing, the maximum rate is 30,720,000 bps. <p>See “Defining the ATM Traffic-Shaping Profile” on page 295.</p>

Table 27: ATM1 and ATM2 IQ Supported Features (continued)

Item	ATM1	ATM2 IQ	Comments
VC tunnel CoS: Allows VCs to be opened as VC tunnels.	Not supported	Supported	<p>On M-series platforms (except the M320 and M120 routers), a VC tunnel can support four CoS queues. On the M320, M120, and T-series platforms, a VC tunnel can support eight CoS queues. Within the VC tunnel, the class-based weighted fair queuing algorithm is used to schedule packet transmission from each queue. You can configure the queue admission policies, such as EPD or WRED, to control the queue size during congestion.</p> <p>See “Configuring ATM2 IQ VC Tunnel CoS Components” on page 315.</p>
VCI management	Supported	Supported	<p>For ATM1 interfaces, you must specify the maximum number of VCIs by including the <code>maximum-vcs</code> statement in the configuration. This restricts VCIs to the range 0 through <code>maximum-vcs</code>. See “Configuring the Maximum Number of ATM1 VCs on a VP” on page 276.</p> <p>For ATM2 interfaces, you must not include the <code>maximum-vcs</code> statement in the configuration. All ATM2 IQ interfaces support VCI numbers from 0 through 65,535. The total number of VCIs that you can open on an ATM2 IQ port depends on two factors:</p> <ul style="list-style-type: none"> ■ Number of tunnels ■ Sparseness of VCI numbers (the more sparse, the fewer VCIs supported) <p>For ATM1 and ATM2 IQ interfaces with promiscuous mode, the allowable maximum number of VCIs is 65,535.</p>
VCI statistics	Supported	Supported	<p>For ATM1 interfaces, multipoint VCI statistics are collected from indirect sources.</p> <p>For ATM2 IQ interfaces, multipoint VCI statistics are collected directly from the PIC.</p> <p>For ATM1 and ATM2 IQ interfaces, point-to-point VCI statistics are the same as logical interface statistics.</p>

Configuring Communication with Directly Attached ATM Switches and Routers

For ATM1 and ATM2 IQ interfaces, you can configure communication with directly attached ATM switches and routers to enable querying of the IP addresses and switch port numbers. You query the switch or router by entering the following `show` command:

```
user@host> show ilmi interface interface-name
```

The routing platform uses VC 0.16 to communicate with the ATM switch or router.

To configure communication between the routing platform and its directly attached ATM switches and routers, include the `ilmi` statement at the `[edit interfaces interface-name atm-options]` hierarchy level:

```
[edit interfaces interface-name atm-options]
ilmi;
```

Example: Configuring Communication with Directly Attached ATM Switches and Routers

Enable an interface to communicate directly with an ATM switch or router:

```
[edit interfaces]
at-0/1/0 {
  atm-options {
    vpi 0;
    ilmi;
  }
  unit 0 {
    vci 0.120;
    family inet {
      address 10.33.33.1/30;
    }
  }
}
```

Enabling ILMI for Cell Relay

The JUNOS software supports standard AAL5 and three Layer 2 circuit transport modes: Layer 2 circuit AAL5, Layer 2 circuit cell-relay, and Layer 2 circuit trunk transport mode.

Integrated local management interface (ILMI) is supported on standard AAL5 interfaces, regardless of encapsulation. To enable ILMI on interfaces with cell-relay encapsulation, you must configure an ATM2 IQ PIC to use Layer 2 circuit trunk transport mode. ILMI is not supported with cell-relay encapsulation when the ATM2 IQ PIC is configured with Layer 2 AAL5 or Layer 2 circuit cell-relay transport mode, as shown in as shown in Table 28 on page 268.

Layer 2 circuit cell-relay trunk mode is not supported on ATM OC48 PICs.

Table 28: ILMI Support by Encapsulation Type

Encapsulation Type	ILMI Support
Standard AAL5, with any encapsulation type	Yes
Layer 2 circuit AAL5 mode	No
Layer 2 circuit cell-relay mode	No
Layer 2 circuit trunk mode	Yes

For more information about Layer 2 circuit transport modes, see “Configuring Layer 2 Circuit Transport Mode” on page 276.

To configure ILMI on an interface with cell-relay encapsulation, include the following statements:

```
[edit chassis fpc slot-number pic pic-number]
atm-l2circuit-mode trunk trunk;
[edit interfaces at-fpc/pic/port]
encapsulation atm-ccc-cell-relay;
atm-options {
    ilmi;
    pic-type atm2;
}
unit logical-unit-number {
    trunk-id number;
}
```

For more information about ILMI, see “Configuring Communication with Directly Attached ATM Switches and Routers” on page 267.

Example: Enabling ILMI for Cell Relay

On an ATM2 IQ PIC with Layer 2 circuit trunk transport mode, enable ILMI on an interface with cell-relay encapsulation:

```
[edit chassis]
fpc 0 {
    pic 1 {
        atm-l2circuit-mode trunk uni;
    }
}
[edit interfaces]
at-0/0/0 {
    encapsulation atm-ccc-cell-relay;
    atm-options {
        pic-type atm2;
        ilmi;
    }
}
```

Enabling Passive Monitoring on ATM Interfaces

The Monitoring Services I and Monitoring Services II PICs are designed to enable IP services. If you have a Monitoring Services PIC and an ATM PIC installed in an M160, M40e, or T-series routing platform, you can monitor IP version 4 (IPv4) traffic from another routing platform.

On ATM interfaces, you enable packet flow monitoring by including the `passive-monitor-mode` statement at the `[edit interfaces at-fpc/pic/port]` hierarchy level:

```
[edit interfaces at-fpc/pic/port]
passive-monitor-mode;
```

If you include the **passive-monitor-mode** statement in the configuration, the ATM interface is always up, and the interface does not receive or transmit incoming control packets, such as OAM cell and ILMI.

On monitoring services interfaces, you enable packet flow monitoring by including the **family** statement at the [edit interfaces *mo-fpc/pic/port* unit *logical-unit-number*] hierarchy level, specifying the **inet** option:

```
[edit interfaces mo-fpc/pic/port unit logical-unit-number]
family inet;
```

For conformity with cflowd record structure, you must include the **receive-options-packets** and **receive-ttl-exceeded** statements at the [edit interfaces *mo-fpc/pic/port* unit *logical-unit-number* family inet] hierarchy level:

```
[edit interfaces mo-fpc/pic/port unit logical-unit-number family inet]
receive-options-packets;
receive-ttl-exceeded;
```

For the monitoring services interface, you can configure multiservice physical interface properties. For more information, see “Configuring Multiservice Physical Interface Properties” on page 129 and the *JUNOS Services Interfaces Configuration Guide*.

Removing MPLS Labels from Incoming Packets

The JUNOS software can forward only IPv4 packets to a Monitoring Services PIC. IPv4 packets with MPLS labels cannot be forwarded to a Monitoring Services PIC. By default, if packets with MPLS labels are forwarded to the Monitoring Services PIC, they are discarded. To monitor packets with MPLS labels, you must remove the MPLS labels as the packets arrive on the interface.

You can remove up to two MPLS labels from an incoming packet by including the **pop-all-labels** statement at the [edit interfaces *interface-name* atm-options mpls] hierarchy level:

```
[edit interfaces interface-name atm-options mpls]
pop-all-labels {
    required-depth number;
}
```

By default, the **pop-all-labels** statement takes effect for incoming packets with one or two labels. You can specify the number of MPLS labels an incoming packet must have for the **pop-all-labels** statement to take effect by including the **required-depth** statement at the [edit interfaces *interface-name* atm-options mpls pop-all-labels] hierarchy level:

```
[edit interfaces interface-name atm-options mpls pop-all-labels]
required-depth number;
```

The required depth can be 1, 2, or [1 2]. If you include the **required-depth 1** statement, the **pop-all-labels** statement takes effect for incoming packets with one label only. If you include the **required-depth 2** statement, the **pop-all-labels** statement takes effect for incoming packets with two labels only. If you include the **required-depth**

[1 2] statement, the **pop-all-labels** statement takes effect for incoming packets with one or two labels. A required depth of [1 2] is equivalent to the default behavior of the **pop-all-labels** statement.

When you remove MPLS labels from incoming packets, note the following:

- The **pop-all-labels** statement has no effect on IP packets with three or more MPLS labels.
- When you enable MPLS label removal, you must configure all ports on a PIC with the same label popping mode and required depth.
- You use the **pop-all-labels** statement to enable passive monitoring applications, not active monitoring.
- You cannot apply MPLS filters or accounting to the MPLS labels because the labels are removed as soon as the packet arrives on the interface.
- The following ATM encapsulation types are not supported on interfaces with MPLS label removal:
 - atm-ccc-cell-relay
 - atm-ccc-vc-mux
 - atm-mlppp-llc
 - atm-tcc-snap
 - atm-tcc-vc-mux
 - ether-over-atm-llc
 - ether-vpls-over-atm-llc

Configuring the ATM PIC Type

For ATM1 and ATM2 IQ interfaces, the JUNOS software does not determine from the interface name *at- fpc/pic/port* whether your routing platform has an ATM1 or ATM2 IQ PIC installed. You can configure the PIC type as ATM1 or ATM2 IQ by including the **pic-type** statement at the [edit interfaces *interface-name* atm-options] hierarchy level:

```
[edit interfaces interface-name atm-options]
pic-type (atm1 | atm2);
```

The following guidelines apply to configuring the ATM PIC type:

- If you include the **pic-type** statement in the configuration, and you include other statements at the [edit interfaces *interface-name* atm-options] hierarchy level that do not match the configured PIC type, the configuration does not commit. For example, you cannot commit a configuration that includes the **pic-type atm2** statement and the **maximum-vcs** statement.
- If you do not include the **pic-type** statement and you do include the **maximum-vcs** statement in the configuration, the JUNOS software assumes you are configuring an ATM1 interface, and sets the PIC type option accordingly. If you do not include

the `maximum-vcs` statement in the configuration, the JUNOS software assumes you are configuring an ATM2 IQ interface, and sets the PIC type option accordingly.

- If you include the `promiscuous-mode` statement in the configuration of an ATM2 interface, you must also include the `pic-type atm2` statement.

Example: Configuring the ATM PIC Type

Configure the PIC type on an ATM1 and an ATM2 interface.

On an ATM1 Interface

```
[edit interfaces]
at-1/0/0 {
  atm-options {
    pic-type atm1;
    vpi 0 maximum-vcs 256;
    vpi 1 maximum-vcs 512;
  }
  ...
}
```

On an ATM2 IQ Interface

```
[edit interfaces]
at-1/1/0 {
  atm-options {
    pic-type atm2;
    vpi 0;
    vpi 2 {
      oam-period 6;
    }
  }
  ...
}
```

Configuring ATM Cell-Relay Promiscuous Mode

For ATM1 and ATM2 IQ interfaces with `atm-ccc-cell-relay` encapsulation, you can map all incoming cells from either an interface port or a virtual path (VP) to a single LSP without restricting the VCI number. Promiscuous mode allows you to map traffic from all 65,535 VCIs to a single LSP, or from all 256 VPIs to a single LSP.

To map incoming traffic from a port or VC to an LSP, include the `promiscuous-mode` statement at the `[edit interfaces interface-name atm-options]` hierarchy level:

```
[edit interfaces interface-name]
atm-options {
  promiscuous-mode {
    vpi vpi-identifier;
  }
}
```

You can include multiple `vpi` statements in the configuration.

To enable all VCIs in a VPI to open in ATM CCC cell-relay mode, you must also map the logical interface to a VPI by including the `vpi` statement in the logical interface configuration:

```
vpi vpi-identifier;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

Also, note the following:

- For promiscuous mode, you must configure the port with `atm-ccc-cell-relay encapsulation`.
- For ATM1 and ATM2 IQ PICs, changing modes between promiscuous and nonpromiscuous causes all physical interfaces to be deleted and re-added.
- For ATM1 and ATM2 IQ PICs, when you configure promiscuous mode, you cannot configure VCIs.
- For ATM1 PICs, if you configure one port in port mode, all ports on the PIC operate in port mode. Likewise if you configure one logical interface in VPI mode, all logical interfaces on the PIC must operate in VPI mode.
- For ATM2 IQ PICs, you can configure one or more logical interfaces in VPI promiscuous mode, and the other logical interfaces with any ATM encapsulation.
- For ATM2 IQ PICs, when you configure promiscuous mode, you must also include the `pic-type atm2` statement. For more information, see “Configuring the ATM PIC Type” on page 271.
- For ATM2 IQ multiport PICs, you can configure one or more ports in port promiscuous mode, and the other ports with any ATM encapsulation.
- For interfaces that are configured for cell-relay promiscuous virtual path identifier (VPI) mode, the `show interfaces` command output does not show OAM F4 cell statistics.

Examples: Configuring ATM Cell-Relay Promiscuous Mode

This section includes the following examples:

Configuring Port-Promiscuous Mode

```
[edit interfaces]
at-0/2/1 {
  encapsulation atm-ccc-cell-relay; # at the physical interface level only
  atm-options {
    pic-type atm2;
    promiscuous-mode;
  }
  unit 0 {
    allow-any-vci;
  }
}
```

**Configuring
VP-Promiscuous Mode**

```
[edit interfaces]
at-0/2/0 {
  atm-options {
    pic-type atm2;
    promiscuous-mode {
      vpi 0;
      vpi 1;
    }
    vpi 2;
    vpi 3;
  }
  unit 0 {
    encapsulation atm-ccc-cell-relay; # at the logical interface level only
    vpi 0;
  }
  unit 1 {
    encapsulation atm-ccc-cell-relay;
    vpi 1;
  }
  unit 2 {
    encapsulation atm-snap;
    vci 2.100;
  }
  unit 3 {
    encapsulation atm-vc-mux;
    vci 3.100;
  }
}
```

To map incoming traffic from a port to an LSP, include the **allow-any-vci** statement at the [edit interfaces *interface-name* unit 0] hierarchy level. When you include the **allow-any-vci** statement, you cannot configure other logical interfaces in the same physical interface. Next, you must map unit 0 to an LSP using the CCC connection.

**Mapping Incoming
Traffic from a Port to an
LSP**

```
[edit interfaces at-1/2/0]
encapsulation atm-ccc-cell-relay;
atm-options {
  promiscuous-mode;
}
unit 0 {
  allow-any-vci;
}
```

**Mapping Unit 0 to an
LSP**

```
protocols {
  connections {
    remote-interface-switch router-a-router-c {
      interface at-1/2/0.0;
    }
    lsp-switch router-a-router-c {
      transmit-lsp lsp1
      receive-lsp lsp2;
    }
  }
}
```

To map a VPI to an LSP, you must define the allowed VPIs. You can configure one or more logical interfaces, each mapped to a different VPI. You can then route traffic from each of these interfaces to different LSPs.

Mapping a VPI to an LSP

```
[edit interfaces at-1/1/0]
encapsulation atm-ccc-cell-relay;
atm-options {
  pic-type atm1;
  promiscuous-mode {
    vpi 10;
    vpi 20;
  }
}
unit 0 {
  encapsulation atm-ccc-cell-relay;
  vpi 10;
}
unit 1 {
  encapsulation atm-ccc-cell-relay;
  vpi 20;
}
[edit interfaces at-3/1/0]
encapsulation atm-ccc-cell-relay;
atm-options {
  pic-type atm2;
  promiscuous-mode {
    vpi 10;
    vpi 20;
  }
}
unit 0 {
  encapsulation atm-ccc-cell-relay;
  vpi 10;
}
unit 1 {
  encapsulation atm-ccc-cell-relay;
  vpi 20;
}
[edit protocols]
mpls {
  connections {
    interface-switch router-a-router-c {
      interface at-1/1/0.0;
      interface at-3/1/0.0;
    }
    interface-switch router-a-router-d {
      interface at-1/1/0.1;
      interface at-3/1/0.1;
    }
  }
}
```

Configuring the Maximum Number of ATM1 VCs on a VP

For ATM1 interfaces, you must configure the maximum number of virtual circuits (VCs) allowed on a virtual path (VP) so that sufficient memory on the ATM1 PIC can be allocated for each VC.

To configure the highest-numbered VCs on a VP, include the `maximum-vcs` and `vpi` statements at the `[edit interfaces interface-name atm-options]` hierarchy level:

```
[edit interfaces interface-name atm-options]
vpi vpi-identifier {
    maximum-vcs maximum-vcs;
}
```

The VP identifier can be a value from 0 through 255. For most interfaces, you can define a maximum of 4090 VCs per interface, and some interfaces have higher limits. Promiscuous mode removes these limits. For more information, see “Configuring ATM Cell-Relay Promiscuous Mode” on page 272.

All VPIs that you configure in the `atm-options` statement are stored in a single table. If you modify the VPIs—for example, by editing them in configuration mode or by issuing a `load override` command—all VCs on the interface are closed and then reopened, resulting in a temporary loss of connectivity for all the VCs on the interface.

You can also include some of the statements in the `sonet-options` statement to set SONET/SDH parameters on ATM interfaces, as described in “Configuring SONET/SDH Parameters on ATM Interfaces” on page 314.

Configuring Layer 2 Circuit Transport Mode

On ATM2 IQ interfaces only, you can configure Layer 2 circuit cell-relay, Layer 2 circuit AAL5, or Layer 2 circuit trunk transport mode.

Layer 2 circuit cell-relay and Layer 2 circuit AAL5 are defined in Internet draft *draft-martini-l2circuit-encap-mpls-07.txt*, *Encapsulation Methods for Transport of Layer 2 Frames Over IP and MPLS Networks* (expires December 2004).

Layer 2 circuit cell-relay and Layer 2 circuit AAL5 transport modes allow you to send ATM cells between ATM2 IQ interfaces across a Layer 2 circuit-enabled network. Layer 2 circuits are designed to transport Layer 2 frames between PE routing platforms across an LDP-signaled MPLS backbone. You use Layer 2 circuit AAL5 transport mode to send AAL5 segmentation and reassembly protocol data units (SAR-PDUs) over the Layer 2 circuit.

A trunk is a collection of ATM VPs. Layer 2 circuit trunk transport mode allows you to send ATM cells over MPLS trunking.

By default, ATM2 IQ PICs are in standard AAL5 transport mode. Standard AAL5 allows multiple applications to tunnel the protocol data units of their Layer 2 protocols over an ATM virtual circuit. Encapsulation of these Layer 2 protocol data units allows a number of these emulated virtual circuits to be carried in a single tunnel. Protocol data units are segmented at one end of the tunnel and reassembled at the other end.

The ingress routing platform reassembles the protocol data units received from the incoming VC and transports each PDU as a single packet.

In contrast, Layer 2 circuit cell-relay and Layer 2 circuit AAL5 transport modes accept a stream of ATM cells, convert these to an encapsulated Layer 2 format, then tunnel them over an MPLS or IP backbone, where a similarly configured routing platform segments these packets back into a stream of ATM cells, to be forwarded to the virtual circuit configured for the far-end routing platform.

In Layer 2 circuit cell-relay transport mode, ATM cells are bundled together and transported in packet form to the far-end routing platform, where they are segmented back into individual ATM cells and forwarded to the ATM virtual circuit configured for the far-end routing platform.

The uses for the four transport modes are defined as follows:

- To tunnel IP packets over an ATM backbone, use the default standard AAL5 transport mode.
- To tunnel a stream of AAL5-encoded ATM SAR-PDUs over an MPLS or IP backbone, use Layer 2 circuit AAL5 transport mode.
- To tunnel a stream of ATM cells over an MPLS or IP backbone, use Layer 2 circuit cell-relay transport mode.
- To transport ATM cells over an MPLS core network that is implemented between other vendors' switches or routers, use Layer 2 circuit trunk transport mode.



NOTE: You can transport AAL5-encoded traffic with Layer 2 circuit cell-relay transport mode, because Layer 2 circuit cell-relay transport mode ignores the encoding of the cell data presented to the ingress interface.

When you configure AAL5 mode Layer 2 circuits, the control word carries cell loss priority (CLP) information by default.

The Layer 2 circuit trunk transport mode is not supported on the ATM2 IQ OC48c/STM16 PIC.

To configure Layer 2 circuit AAL5, Layer 2 circuit cell-relay, or Layer 2 circuit trunk mode, you must perform the following tasks:

1. Identify the interface as an ATM2 IQ interface by including the **pic-type atm2** statement at the [edit interfaces *at-fpc/pic/port* atm-options] hierarchy level:

```
[edit interfaces at-fpc/pic/port atm-options]
pic-type atm2;
```

2. Include the **atm-l2circuit-mode** statement at the [edit chassis *fpc slot-number* *pic pic-number*] hierarchy level, specifying **aal5**, **cell**, or **trunk**:

```
[edit chassis fpc slot-number pic pic-number]
atm-l2circuit-mode (aal5 | cell | trunk trunk );
```

By default, the trunk mode uses user-to-network interface (UNI) mode. The trunk option can be UNI or network-to-network interface (NNI). For more information about UNI and NNI, see the *JUNOS VPNs Configuration Guide* and the *JUNOS Feature Guide*.

Transport mode is per PIC, not per port. If you do not include the **atm-l2circuit-mode** statement in the configuration, the ATM2 IQ PIC uses standard AAL5 transport mode. If you configure Layer 2 circuit cell-relay, Layer 2 circuit AAL5 transport mode, or Layer 2 circuit trunk mode, the entire ATM2 PIC uses the configured transport mode.

3. For Layer 2 circuit trunk mode only, you must also configure a trunk identification number by including the **trunk-id** statement:

```
trunk-id number;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

The trunk identification number can be from 0 through 31; each trunk on an interface must have a unique trunk ID. When you associate a trunk ID number with a logical interface, you are in effect specifying the interfaces that are allowed to send ATM traffic over an LSP. For UNI mode, the trunk ID range is from 0 through 7. For NNI mode, the trunk ID range is from 0 through 31. Trunk IDs on connecting trunks do not need to be the same.

For information about proportional bandwidth sharing in trunk mode, see “Configuring Layer 2 Circuit Trunk Mode Scheduling” on page 285.

4. For Layer 2 circuit AAL5 mode, configure logical interface encapsulation by including the **encapsulation** statement, specifying the **atm-ccc-vc-mux** encapsulation type:

```
encapsulation atm-ccc-vc-mux;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

5. For Layer 2 circuit cell-relay and Layer 2 circuit trunk modes, configure physical interface encapsulation by including the **encapsulation** statement at the [edit interfaces *interface-name*] hierarchy level, specifying the **atm-ccc-cell-relay** encapsulation type:

```
[edit interfaces interface-name]  
encapsulation atm-ccc-cell-relay;
```


For more information about Layer 2 circuits, see the *JUNOS VPNs Configuration Guide* and the *JUNOS Routing Protocols Configuration Guide*. For a comprehensive example, see the *JUNOS Feature Guide*.

Examples: Configuring IQ Layer 2 Circuit Transport Mode

This section includes the following configuration examples:

Configure Layer 2 circuit AAL5 transport mode and cell-relay transport mode.

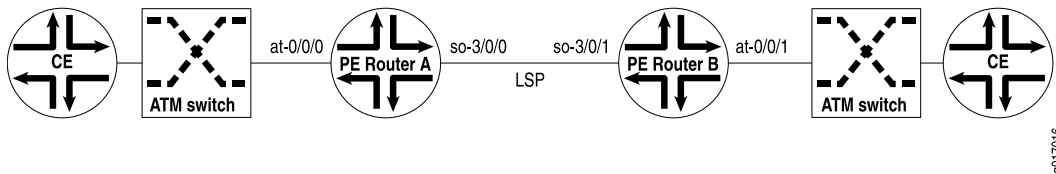
Configuring Layer 2 Circuit AAL5 Transport Mode	<pre>[edit chassis] fpc 0 { pic 1 { atm-l2circuit-mode aal5; } } [edit interfaces] at-0/1/0 { atm-options { pic-type atm2; vpi 0; } unit 0 { encapsulation atm-ccc-vc-mux; point-to-point; vci 0.32; } }</pre>
Configuring Layer 2 Circuit Cell-Relay Transport Mode	<pre>[edit chassis] fpc 0 { pic 1 { atm-l2circuit-mode cell; } } [edit interfaces] at-0/1/0 { encapsulation atm-ccc-cell-relay; atm-options { pic-type atm2; vpi 0; } unit 0 { encapsulation atm-ccc-cell-relay; point-to-point; vci 0.32; } }</pre>

Configuring Layer 2 Circuit Trunk Transport Mode

In Figure 18 on page 280, Router A is a local PE routing platform. Router B is a remote PE router. Both Juniper Networks routing platforms have Layer 2 circuit cell-relay capability. You configure an ATM physical interface on Router A in Layer 2 circuit trunk mode and specify trunks that are allowed to send traffic over the LSP. As a cell is received on this interface, it is classified using the CoS bits in the cell header, and encapsulated as a labeled packet. It is then queued on one of the outgoing queues according to its classification and sent over the LSP to Router B. At Router B, the packet label is removed and the raw cell is put on one of the queues of the ATM interface and forwarded to the second ATM switch. To carry the CoS information and CLP of the cell over the network, the CoS and CLP bits are copied into the EXP bits of the MPLS label. This CoS information is used to select the output queues. Using EPD profiles, the CLP is used to determine whether the cell should be dropped.

For more information about ATM CoS capability, see “Configuring ATM2 IQ VC Tunnel CoS Components” on page 315.

Figure 18: Layer 2 Circuit Trunk Topology



```

On Router A
[edit chassis]
fpc 0 {
  pic 1 {
    atm-l2circuit-mode trunk uni;
  }
}
[edit interfaces]
at-0/0/0 {
  encapsulation atm-ccc-cell-relay;
  atm-options {
    pic-type atm2;
    ilmi;
  }
  unit 0 {
    trunk-id 0;
    epd-threshold 10240;
  }
  unit 1 {
    trunk-id 1;
    epd-threshold 10240;
  }
  unit 2 {
    trunk-id 2;
    epd-threshold 10240;
  }
  unit 3 {
    trunk-id 3;
    epd-threshold 10240;
  }
  unit 4 {

```

```

        trunk-id 4;
        epd-threshold 10240;
    }
    unit 5 {
        trunk-id 5;
        epd-threshold 10240;
    }
    unit 6 {
        trunk-id 6;
        epd-threshold 10240;
    }
    unit 7 {
        trunk-id 7;
        epd-threshold 10240;
    }
}
so-3/0/0 {
    mtu 9192;
    unit 0 {
        family inet {
            address 10.0.1.1/24;
        }
        family mpls;
    }
}
lo0 {
    unit 0 {
        family inet {
            address 172.16.0.1/32;
            address 10.255.245.1/32;
        }
    }
}
[edit protocols]
rsvp {
    interface all;
}
mpls {
    interface all;
}
ldp {
    interface all;
}
ospf {
    traffic-engineering;
    reference-bandwidth 4g;
    area 0.0.0.0 {
        interface all;
        interface fxp0.0 {
            disable;
        }
    }
}
l2circuit {
    neighbor 10.255.245.2 {
        interface at-0/1/0.0 {

```

```

        virtual-circuit-id 100;
    }
    interface at-0/1/0.1 {
        virtual-circuit-id 101;
    }
    interface at-0/1/0.2 {
        virtual-circuit-id 102;
    }
    interface at-0/1/0.3 {
        virtual-circuit-id 103;
    }
    interface at-0/1/0.4 {
        virtual-circuit-id 104;
    }
    interface at-0/1/0.5 {
        virtual-circuit-id 105;
    }
    interface at-0/1/0.6 {
        virtual-circuit-id 106;
    }
    interface at-0/1/0.7 {
        virtual-circuit-id 107;
    }
}
}

```

On Router B

```

[edit chassis]
fpc 0 {
    pic 1 {
        atm-l2circuit-mode trunk uni;
    }
}
[edit interfaces]
at-0/0/1 {
    encapsulation atm-ccc-cell-relay;
    atm-options {
        pic-type atm2;
    }
    unit 0 {
        trunk-id 0;
        epd-threshold 10240;
    }
    unit 1 {
        trunk-id 1;
        epd-threshold 10240;
    }
    unit 2 {
        trunk-id 2;
        epd-threshold 10240;
    }
    unit 3 {
        trunk-id 3;
        epd-threshold 10240;
    }
    unit 4 {

```

```

        trunk-id 4;
        epd-threshold 10240;
    }
    unit 5 {
        trunk-id 5;
        epd-threshold 10240;
    }
    unit 6 {
        trunk-id 6;
        epd-threshold 10240;
    }
    unit 7 {
        trunk-id 7;
        epd-threshold 10240;
    }
}
so-3/0/1 {
    mtu 9192;
    unit 0 {
        family inet {
            address 10.0.1.2/24;
        }
        family mpls;
    }
}
lo0 {
    unit 0 {
        family inet {
            address 172.16.0.1/32;
            address 10.255.245.2/32;
        }
    }
}
[edit protocols]
rsvp {
    interface all;
}
mpls {
    interface all;
}
ldp {
    interface all;
}
ospf {
    traffic-engineering;
    reference-bandwidth 4g;
    area 0.0.0.0 {
        interface all;
        interface fxp0.0 {
            disable;
        }
    }
}
l2circuit {
    neighbor 10.255.245.1 {
        interface at-0/1/0.0 {

```

```

        virtual-circuit-id 100;
    }
    interface at-0/1/0.1 {
        virtual-circuit-id 101;
    }
    interface at-0/1/0.2 {
        virtual-circuit-id 102;
    }
    interface at-0/1/0.3 {
        virtual-circuit-id 103;
    }
    interface at-0/1/0.4 {
        virtual-circuit-id 104;
    }
    interface at-0/1/0.5 {
        virtual-circuit-id 105;
    }
    interface at-0/1/0.6 {
        virtual-circuit-id 106;
    }
    interface at-0/1/0.7 {
        virtual-circuit-id 107;
    }
}
}

```

Configuring Layer 2 Circuit Cell-Relay Promiscuous Mode

By default, all incoming cells are mapped from a single VC to an external LSP. For ATM interfaces with Layer 2 circuit cell-relay transport mode and `atm-ccc-cell-relay` encapsulation, you can configure promiscuous mode. Promiscuous mode allows you to map all incoming cells from either an interface port or a VP to a single LSP without restricting the VCI number. You can map traffic from all 65,535 VCIs to a single LSP, or from all 256 VPIs to a single LSP. For promiscuous-mode configuration guidelines, see “Configuring ATM Cell-Relay Promiscuous Mode” on page 272.

Example: Configuring Layer 2 Circuit Cell-Relay Promiscuous Mode

Configure Layer 2 circuit cell-relay VP- and port-promiscuous mode:

```

VP-Promiscuous Mode    [edit interfaces]
                           at-0/1/0 {
                           encapsulation atm-ccc-cell-relay;
                           atm-options {
                           pic-type atm2;
                           cell-bundle-size 4;
                           promiscuous-mode {
                           vpi 0;
                           }
                           }
                           unit 0 {
                           encapsulation atm-ccc-cell-relay;
                           point-to-point;

```

```

        vci 0.32;
    }
}

```

Port-Promiscuous Mode

```

[edit interfaces]
at-0/1/0 {
  encapsulation atm-ccc-cell-relay;
  atm-options {
    pic-type atm2;
    promiscuous-mode;
  }
  unit 0 {
    allow-any-vci;
  }
}

```

Configuring Layer 2 Circuit Trunk Mode Scheduling

For ATM2 IQ interfaces configured to use Layer 2 circuit trunk mode, you can share a scheduler among 32 trunks on an ATM port. A weighted round robin scheduling algorithm ensures each trunk receives a proportional share of the bandwidth when all trunks are active, and redistributes bandwidth that would have otherwise been reserved by an inactive trunk, thus minimizing the latency on each trunk. For general information about Layer 2 circuit trunk mode, see “Configuring Layer 2 Circuit Transport Mode” on page 276. For general information about ATM CoS scheduling, see “Configuring ATM2 IQ VC Tunnel CoS Components” on page 315.

Each trunk is associated with a trunk bandwidth. The trunk bandwidth is the maximum bandwidth used each time a trunk is serviced. We recommend configuring trunk bandwidths so that the ratio between the minimum and maximum bandwidths does not exceed 1:500.

To minimize latency, the JUNOS software does not shape the trunks. As cells are received, they are immediately transmitted.

To configure trunk bandwidth, include the **trunk-bandwidth** statement:

```
trunk-bandwidth rate;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit/*logical-unit-number*]

The trunk bandwidth can be from 1,000,000 through 542,526,792 bps. You can specify the rate in bits per second or cells per second (cps). You can specify a bits-per-second value either as a complete decimal number or as a decimal number followed by the abbreviation k (1000), m (1,000,000), or g (1,000,000,000). You can specify a cells-per-second value by entering a decimal number followed by the abbreviation c; values expressed in cells per second are converted to bits per second by means of the formula 1 cps = 384 bps.

The JUNOS software rounds off the configured value. Therefore, we recommend that you configure a minimum trunk bandwidth of 1m. From 1m, configure values in increments of 500k.

Example: Configuring Layer 2 Circuit Trunk Mode Scheduling

Configure two logical interfaces to use Layer 2 circuit trunk mode, ATM CoS scheduling, and proportional bandwidth sharing:

```
[edit interface]
at-1/1/0 {
  encapsulation atm-ccc-cell-relay;
  atm-options {
    pic-type atm2;
    ilmi;
    scheduler-maps {
      trunk-map {
        vc-cos-mode strict;
        forwarding-class cbr-class {
          priority high;
          transmit-weight percent 40;
          epd-threshold 100;
        }
        forwarding-class rtvbr-class {
          priority low;
          transmit-weight percent 30;
          epd-threshold 100;
        }
        forwarding-class nrtvbr-class {
          priority low;
          transmit-weight percent 20;
          epd-threshold 100;
        }
        forwarding-class ubr-class {
          priority low;
          transmit-weight percent 10;
          epd-threshold 100;
        }
      }
    }
  }
}
unit 0 {
  encapsulation atm-ccc-cell-relay;
  trunk-id 1;
  trunk-bandwidth 10m;
  atm-scheduler-map trunk-map;
  family ccc {
    filter {
      output atm-trunk-01;
    }
  }
}
unit 1 {
  encapsulation atm-ccc-cell-relay;
  trunk-id 3;
```



```

        trunk-bandwidth 30m;
        atm-scheduler-map trunk-map;
    }
}

```

Configuring CoS Queues in Layer 2 Circuit Trunk Mode

On ATM2 IQ interfaces, you can configure ATM CoS scheduling for AAL5 mode and Layer 2 circuit trunk mode. For general information about ATM CoS, see “Configuring ATM2 IQ VC Tunnel CoS Components” on page 315.

When you configure CoS scheduling in Layer 2 circuit trunk mode, the trunk is defined on the logical interface, and four CoS queues are opened in the trunk. For each CoS queue, you specify a priority and a transmit weight. CoS queues are serviced using a weighted round robin (WRR) algorithm. One queue is serviced with strictly high priority and the remaining queues are serviced with the WRR.

For Layer 2 circuit trunk mode, only strict mode is supported. Alternate mode is not supported.

To configure CoS queues in Layer 2 circuit trunk mode, perform the following tasks:

1. Include the `encapsulation atm-ccc-cell-relay` statement at the [edit interfaces *at-fpc/pic/port*] hierarchy level:

```

[edit interfaces at-fpc/pic/port]
encapsulation atm-ccc-cell-relay;

```

2. Include the `scheduler-maps` statement at the [edit interfaces *at-fpc/pic/port* *atm-options*] hierarchy level:

```

[edit interfaces at-fpc/pic/port atm-options]
scheduler-maps map-name {
    forwarding-class (class-name | assured-forwarding | best-effort |
        expedited-forwarding | network-control);
    vc-cos-mode strict;
}

```

3. Include the `atm-scheduler-map`, `trunk-bandwidth`, and `trunk-id` statements at the [edit interfaces *at-fpc/pic/port* unit *logical-unit-number*] hierarchy level:

```

[edit interfaces at-fpc/pic/port unit logical-unit-number]
atm-scheduler-map (map-name | default);
trunk-bandwidth rate;
trunk-id number;

```

For information about ATM scheduler maps, see “Configuring an ATM Scheduler Map” on page 317.

For information about trunk identification numbers, see “Configuring Layer 2 Circuit Transport Mode” on page 276. For information about trunk bandwidths, see “Configuring Layer 2 Circuit Trunk Mode Scheduling” on page 285.

Strict mode CoS queue priority works as follows:

- **Scheduling**—One queue has strictly high priority and is always serviced before the remaining queues are serviced by a weighted round robin. This means the packets in a **high** priority queue are sent first until the queue is empty. Then **low** priority queues send packets until their weight quota becomes zero or negative.
- **Latency**—Each trunk is associated with a trunk bandwidth. The trunk bandwidth is the maximum bandwidth used each time a trunk is serviced. In the scheduling process, each trunk is serviced in a WRR. The maximum latency for any trunk to begin transmitting is equal to the sum of the weights of all previously queued trunks. Trunks without data do not affect output scheduling. As long as all the trunks have data, the exact weight proportions are maintained. If a trunk runs out of data during its turn, it is no longer included in the WRR. When the trunk gets more data, the trunk is placed at the end of the queue. For more information, see “Configuring Layer 2 Circuit Trunk Mode Scheduling” on page 285.

Within a single trunk, the maximum latency of a **high** priority queue is the time it takes to transmit one ATM cell. The latency of a **low** priority queue is the sum of **high** priority queue burst time and the transmission time of the remaining **low** priority queues’ weight.

- **Bandwidth distribution**—Trunks are serviced in a WRR based on the trunk bandwidth.

Within a single trunk, the **high** priority queue consumes the bandwidth first regardless of its weight. The remaining bandwidth is distributed to the **low** priority queues in proportion to their weights.

Consider the following example:

- You configure a trunk with weights of 10 percent, 20 percent, 30 percent, and 40 percent for queues 0, 1, 2, and 3, respectively.
- You configure queue 0 to be a high priority queue.
- Queue 0 does not have cells to transmit.

In this scenario, queues 1, 2 and 3 receive 2/9, 3/9, and 4/9 of the bandwidth, respectively.



NOTE: Constant bit rate (CBR) traffic always enters the strictly **high** priority queue.

For more information about strict and alternate modes, see “Configuring VC CoS Mode” on page 324.

For general information about Layer 2 circuit trunk mode, see “Configuring Layer 2 Circuit Transport Mode” on page 276.

For interfaces configured in trunk mode, you can also configure dual EPD thresholds depending on packet loss priorities (PLPs). For more information, see “Configuring Two EPD Thresholds per Queue” on page 304.

Example: Configuring CoS Queues in Layer 2 Circuit Trunk Mode

Configure a scheduler map and trunk bandwidth:

```
[edit interfaces]
at-6/1/0 {
  encapsulation atm-ccc-cell-relay;
  atm-options {
    pic-type atm2;
    scheduler-maps {
      cos0 {
        vc-cos-mode strict;
        forwarding-class cbr-class {
          priority high;
          transmit-weight percent 10;
        }
        forwarding-class rtvbr-class {
          priority low;
          transmit-weight percent 20;
        }
        forwarding-class nrtvbr-class {
          priority low;
          transmit-weight percent 30;
        }
        forwarding-class ubr-class {
          priority low;
          transmit-weight percent 40;
        }
      }
    }
  }
}
unit 0 {
  trunk-id 0;
  trunk-bandwidth 10m;
  atm-scheduler-map cos0;
}
```

Configuring the Layer 2 Circuit Cell-Relay Cell Maximum

By default, each frame contains one cell. For ATM interfaces with Layer 2 circuit cell-relay transport mode configured, you can configure the maximum number of ATM cells per frame on the physical or logical interface. To set the maximum number of cells per frame, include the `cell-bundle-size` statement:

```
cell-bundle-size cells;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* atm-options]
- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

The cell bundle size can be from 1 through 176.

After 125 microseconds, cell bundling times out. This means that after 125 microseconds if the frame does not contain the configured value, the frame is transmitted anyway.

If you include the `cell-bundle-size` statement at the [edit interfaces *interface-name* atm-options] hierarchy level, then the configured value becomes the default for all the logical interface units configured for that physical interface. If you include the `cell-bundle-size` statement for a logical interface, the logical interface configuration overrides the value configured at the physical interface level.

The transmit rates you configure on the routing platforms at each end of the connection must be the same value.

Class-Based Cell Bundling

For Layer 2 circuit trunk mode only, cell bundling is enhanced by a set of CoS and traffic shaping rules, as follows:

- CBR and real-time variable bit rate (RTVBR) cells are not bundled. They are always sent as single-cell packets.
- Cells with the same CLP bits are bundled together. This means all the cells in a bundle contain the same CLP value.
- Cells with the same CoS bits are bundled together. This means all the cells in a bundle belong to the same class of service.
- As alluded to in the previous rules, several triggers cause early packet transmission, meaning that the packet is transmitted before the number of cells received is equal to the value configured with the `cell-bundle-size` statement. These triggers are as follows:
 - The next cell is of type CBR or RTVBR.
 - The next cell has a different CLP bit.
 - The next cell has different CoS bits.
 - The 125-microsecond timer expires.

CoS-based cell bundling optimizes the release of a bundle by sending out the cell that triggers early packet transmission as a single-cell packet. This means that when a cell triggers early packet transmission, that cell is not bundled. Consequently, certain input data patterns might cause primarily single-cell packets to be transmitted. For example, say the output interface receives a steady pattern of two cells from a non-RTVBR queue, followed by two cells from a UBR queue. In this case, all transmitted packets contain a single cell because the first cell triggers a transition and is transmitted by itself. The second cell is also transmitted by itself because the third cell triggers another transition, and so on. This effect might not be dramatic with a mix of traffic; it is most evident with steady traffic patterns, as generated by ATM test equipment programmed to emit regular sequences of CoS queue transitions.

Configuring the OAM F4 Cell Flows

For ATM2 IQ interfaces, the F4 flow cell is used for management of the VP level. If your routing platform is equipped with an ATM2 IQ PIC, you can configure OAM F4 cell flows to identify and report VPC defects and failures. The JUNOS software supports three types of OAM F4 cells in end-to-end F4 flows:

- Virtual Path Alarm Indication Signal (VP-AIS)
- Virtual Path Remote Defect Indication (VP-RDI)
- Virtual Path Loopback

The JUNOS software does not support segment F4 flows, VPC continuity check, or VP performance management functions.

On each VP, you can configure an interval during which to transmit loopback cells by including the **oam-period** statement at the [edit interfaces *interface-name* atm-options vpi *vpi-identifier*] hierarchy level:

```
[edit interfaces interface-name atm-options vpi vpi-identifier]
oam-period (disable | seconds);
```

When you add a VPI at the **atm-options** hierarchy, an end-to-end F4 VCI is automatically opened to send and receive OAM F4, VP-AIS, and VP-RDI cells. If you enable OAM by including the **oam-period** statement in the configuration, the routing platform sends and receives OAM F4 loopback cells.

If the physical ATM interface is configured with encapsulation type **atm-ccc-cell-relay**, then F4 VCIs are not created, and F4 OAM processing is not performed for the VPIs configured on that interface.

To modify OAM liveness values on a VP, include the **oam-liveness** statement at the [edit interfaces *interface-name* atm-options vpi *vpi-identifier*] hierarchy level:

```
[edit interfaces interface-name atm-options vpi vpi-identifier]
oam-liveness {
  up-count cells;
  down-count cells;
}
```

up-count is the minimum number of consecutive OAM F4 loopback cells received on a VPI before it is declared up.

down-count is the minimum number of consecutive OAM F4 loopback cells lost before a VPI is declared down.

When a VP-AIS or VP-RDI cell is received, the VPI is marked down. When a VP-AIS cell is received on a VPI, a VP-RDI is generated and transmitted on the same VPI. When an OAM F4 loopback request cell is received, the routing platform sends a loopback reply cell, even if the **oam-period** statement is not included in the configuration of the VPI.

When a VPI is marked down because the VPI receives VP-AIS, VP-RDI, VC-AIS, or VC-RDI cells, or because the VPI does not receive down-count consecutive OAM F4

loopback replies, all the VCIs that belong to the VPI are marked down. When a VPI is marked up, all the VCIs that belong to the VPI are marked up. The status of logical interfaces is also changed when the status of the last VCI on that interface is changed.

For a configuration example, see “Example: Configuring ATM2 IQ Interfaces” on page 328.



NOTE: For interfaces that are configured for cell-relay promiscuous virtual path identifier (VPI) mode, the **show interfaces** command output does not show (OAM) F4 cell statistics.

Defining Virtual Path Tunnels

For ATM2 IQ interfaces, you can configure shaping on a VPI. When you do this, the VPI is called a VP tunnel. If your routing platform is equipped with an ATM2 IQ PIC, you can configure VP tunnels and a weight for each VC. Each VC is serviced in WRR mode. When VCs have data to send, they send the number of cells equal to their weight before passing control to the next active VC. This allows proportional bandwidth sharing between multiple VCs within a rate-shaped VP tunnel. VP tunnels are not supported on point-to-multipoint interfaces.

If you change or delete VP tunnel traffic shaping, all logical interfaces on a VP are deleted and re-added.

All VPIs you configure on logical interfaces must also be configured on the physical interface, at the **[edit interfaces *interface-name* atm-options]** hierarchy level.

When you configure a VPI without shaping parameters, the VPI is a regular VPI; no shaping is attached. VCIs that belong to non-shaped VPIs can have VCI shaping.

For point-to-point interfaces, include the **shaping** statement at the **[edit interfaces *interface-name* atm-options vpi *vpi-identifier*]** hierarchy level:

```
[edit interfaces interface-name atm-options vpi vpi-identifier]
shaping {
  (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained rate
  burst length);
  queue-length number;
}
```

For **cbr**, **vbr**, and **burst** statement usage guidelines, see “Defining the ATM Traffic-Shaping Profile” on page 295. For information about ATM2 IQ shaping values, see “Specifying ATM2 IQ Shaping Values” on page 301.

Configuring a Point-to-Point ATM1 or ATM2 IQ Connection

When you use ATM encapsulation on an interface, you must map each logical interface to a VCI. You can optionally map logical interfaces to a VPI.

For ATM1 and ATM2 IQ interfaces, you can configure a VCI and a VPI on a point-to-point ATM interface by including the `vci` statement:

```
vci vpi-identifier.vci-identifier;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

For each VCI, configure the VCI and VPI identifiers. The default VPI identifier is 0. For ATM1 interfaces, the VCI identifier cannot exceed the highest-numbered VC configured for the interface with the `vpi` statement, as described in “Configuring the Maximum Number of ATM1 VCs on a VP” on page 276.

VCIs 0 through 31 are reserved for specific ATM values designated by the ATM Forum.

ATM2 IQ interfaces support only one invalid VC counter for all ports. The invalid VC counter is recorded at port 0 only.

When you are configuring point-to-point connections, the maximum transmission unit (MTU) sizes on both sides of the connections must be the same.

Configuring a Point-to-Multipoint ATM1 or ATM2 IQ Connection

An ATM interface can be a point-to-point interface or a point-to-multipoint (also called a multipoint nonbroadcast multiaccess [NBMA]) connection.

For ATM1 and ATM2 IQ interfaces, you can configure an NBMA ATM connection by including the following statements:

```

multipoint-destination address {
  epd-threshold cells;
  inverse-arp;
  oam-liveness {
    up-count cells;
    down-count cells;
  }
  oam-period (disable | seconds);
  shaping {
    (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained
     rate burst length);
    queue-length number;
  }
  vci vpi-identifier.vci-identifier;
}

```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* family inet address *address*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family inet address *address*]

address is the interface's address. The address must include the destination prefix (for example, /24).

For each destination, include one **multipoint-destination** statement. *address* is the address of the remote side of the connection, and *vci-identifier* and *vpi-identifier* are the VCI and optional VPI identifiers for the connection.

When you configure point-to-multipoint connections, all interfaces in the subnet must use the same MTU size.

Configuring a Multicast-Capable ATM1 or ATM2 IQ Connection

For ATM1 and ATM2 IQ interfaces, you can configure a multicast-capable connection. By default, ATM connections assume unicast traffic. If your ATM switch performs multicast replication, you can configure the connection to support multicast traffic by including the **multipoint-vci** statement:

```
multipoint-vci vpi-identifier.vci-identifier;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

vci-identifier and *vpi-identifier* are the VCI and VPI identifiers, which define the ATM VCI over which the switch is expecting to receive multicast packets for replication.

You can configure multicast support only on point-to-multipoint ATM connections.

Configuring Inverse ATM1 or ATM2 ARP

For ATM1 and ATM2 IQ interfaces, you can configure inverse ATM Address Resolution Protocol (ARP), as described in RFC 2225, *Classical IP and ARP over ATM*. When inverse ATM ARP is enabled, the routing platform responds to received inverse ATM ARP requests by providing IP address information to the requesting ATM device.

The routing platform does not initiate inverse ATM ARP requests.

By default, inverse ATM ARP is disabled. To configure a VC to respond to inverse ATM ARP requests, include the **inverse-arp** statement:

```
inverse-arp;
```

For a list of hierarchy levels at which you can include this statement, see **inverse-arp**.

You must configure ATM LLC subnetwork attachment point (SNAP) encapsulation on the logical interface to support inverse ARP. No other ATM encapsulation types are allowed. For more information, see “Configuring ATM Interface Encapsulation” on page 306.

Defining the ATM Traffic-Shaping Profile

When you use an ATM encapsulation on ATM1 and ATM2 IQ interfaces, you can define bandwidth utilization, which consists of either a constant rate or a peak cell rate, with sustained cell rate and burst tolerance.

These values are used in the ATM generic cell-rate algorithm, which is a leaky bucket algorithm that defines the short-term burst rate for ATM cells, the maximum number of cells that can be included in a burst, and the long-term sustained ATM cell traffic rate.

If your routing platform is equipped with an ATM2 IQ PIC, each VC can have independent shaping parameters. For more information, see “Defining Virtual Path Tunnels” on page 292.



NOTE: When the DS3 or E3 port parameters are not identical on all ports of a multiport ATM DS3 or E3 PIC, the ATM PIC driver might not always use the minimum port shaping rate (of all the ports on a multiport ATM DS3 or E3 PIC) selected for cell transmission shaping. The PIC's shaping rate is always updated to conform to the last port setting updated by the PIC software driver, rather than use the minimum port (shaping) rate. There is no syslog message to inform the user of the shaping rate decision applied by the software driver.

By default, the bandwidth utilization is unlimited; that is, unspecified bit rate (UBR) is used. Also, by default, buffer usage by VCs is unregulated.

To define limits to bandwidth utilization, include the **shaping** statement:

```
shaping {
  (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained rate
  burst length);
  queue-length number;
}
```

For a list of hierarchy levels at which you can include this statement, see **shaping**.

The **rtvbr** statement is supported on ATM2 IQ PICs only. The **queue-length** statement is supported on ATM1 PICs only.

To configure VP tunnels on ATM2 IQ interfaces, include the **shaping** statement at the [edit interfaces *interface-name* atm-options vpi *vpi-identifier*] hierarchy level:

```
[edit interfaces interface-name atm-options vpi vpi-identifier]
shaping {
  (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained rate
  burst length);
}
```

When configuring ATM traffic shaping, you can do the following:

- Configuring ATM CBR on page 296
- Configuring ATM2 IQ Real-Time VBR on page 296

- Configuring ATM VBR on page 297
- Specifying ATM1 Shaping Values on page 297
- Specifying ATM2 IQ Shaping Values on page 301

Configuring ATM CBR

For traffic that does not require the ability to periodically burst to a higher rate, you can specify a constant bit rate (CBR).

To specify a CBR on ATM1 and ATM2 IQ interfaces, include the **cbr** statement:

```
cbr rate;
```

For a list of hierarchy levels at which you can include this statement, see **cbr**. On J-Series Services Routers, ATM CBR shaping is not supported.

For ATM1 OC3 interfaces, the rate can be from 33 Kbps through 135.6 Mbps; for ATM1 OC12 interfaces, the rate can be from 33 Kbps through 276 Mbps.

For ATM2 IQ OC3 and OC12 interfaces, the rate can be from 33 Kbps through 542,526,792 bps.

For ATM2 IQ OC48 interfaces, the rate can be from 33 Kbps through 2,170,107,168 bps.

For ATM2 IQ DS3 and E3 interfaces, the rate can be from 33 Kbps to the maximum rate. The maximum rate varies depending on the ATM encapsulation and framing you configure, as shown in Table 29 on page 296.

Table 29: Shaping Rate Range by Interface Type

Interface Type	Maximum Rate
DS3 with direct ATM encapsulation	40,038,968 bps
DS3 with PLCP ATM encapsulation	36,864,000 bps
E3 with g.751 framing and direct ATM encapsulation	30,801,509 bps
E3 with g.751 framing PLCP ATM encapsulation	27,648,000 bps
E3 with g.832 framing	30,720,000 bps

Configuring ATM2 IQ Real-Time VBR

By default, ATM interfaces use UBR; that is, bandwidth utilization is unlimited. For ATM2 IQ interfaces only, you can configure RTVBR, which supports variable bit rate data traffic with average and peak traffic parameters. Compared to non-real-time VBR, RTVBR data is serviced at a higher priority with a relatively small sustainable

cell rate (SCR) limit to minimize the delay. Real-time VBR is suitable for carrying packetized video and audio.

To configure RTVBR, include the **rtvbr** statement:

```
rtvbr peak rate sustained rate burst length;
```

For a list of hierarchy levels at which you can include this statement, see **rtvbr**.

When configuring RTVBR, you can define the following shaping properties:

- Peak rate—Top rate at which traffic can burst.
- Sustained rate—Normal traffic rate averaged over time.
- Burst length—Maximum number of cells that a burst of traffic can contain. It can be a value from 1 through 4000 cells.

The peak and sustained rates can be from 33 Kbps through 542,526,792 bps.

Configuring ATM VBR

By default, ATM interfaces use UBR; that is, bandwidth utilization is unlimited. For ATM1 and ATM2 IQ interfaces, you can configure non-real-time VBR, which supports variable bit rate data traffic with average and peak traffic parameters. Compared to RTVBR, non-real-time VBR is scheduled with a lower priority and with a larger SCR limit, allowing it to recover bandwidth if it falls behind. Non-real-time VBR is suitable for packet data transfers.

To define VBR on ATM1 and ATM2 IQ interfaces, include the **vbr** statement:

```
vbr peak rate sustained rate burst length;
```

For a list of hierarchy levels at which you can include this statement, see **vbr**.

When configuring VBR, you can define the following shaping properties:

- Peak rate—Top rate at which traffic can burst.
- Sustained rate—Normal traffic rate averaged over time.
- Burst length—Maximum number of cells that a burst of traffic can contain. It can be a value from 1 through 4000 cells.

Specifying ATM1 Shaping Values

For ATM1 interfaces, you can specify the rates in bits per second or cells per second. For OC3c interfaces, the highest rate is 135,631,698 bps (353,207.55 cps), which corresponds to 100 percent of the available line rate. For OC12c interfaces, the highest rate is 271,263,396 bps (706,415.09 cps), which corresponds to 50 percent of the available line rate. Table 30 on page 299 lists some of the other rates you can specify. If you specify a rate that is not listed, it is rounded to the nearest rate.

The exact number of values differs between OC12c and OC3c interfaces. OC12c interfaces have about four times as many value increments as OC3c interfaces.

For OC12c rates between 1/2 of the line rate and 1/128 of the line rate, there are 128 steps between each $1/n$ value. This means that there is 128 steps between the 1/2 and 1/3 line rate values, and another 128 steps between 1/3 and 1/4 and so on. For rates smaller than 1/127, there are (16,384 minus 127) or 16,257 values. The reason for this is that fractional shaping is ignored at rates below 1/127. This results in a total of about 32,384 distinct rates for OC12c. When n is larger than or equal to 127, the steps are $1/n$.

For OC3c, the starting point is full line rate, the fraction/integer breakpoint is about 1/31, and there is a maximum of 4096 scheduler slots for use after 1/31 of line rate, producing about 8032 total distinct rates. When n is larger than or equal to 31, the steps are $1/n$.

For ATM1 interfaces, the following formula can be used to predict the actual shaping rate:

- OC3 shaping settings between 135,631,698 bps (OC3 ATM cell line rate) and 4,375,216 bps (1/31 of OC3 ATM cell line rate).
- OC12 shaping settings between 271,263,396 bps (half OC12 ATM cell line rate – the highest rate supported) and 4,271,864 bps (1/127 of OC12 ATM cell line rate).

$$\text{actual-rate} = (128 * \text{line-rate}) / (\text{trunc} ((128 * \text{line-rate}) / \text{desired-rate}))$$

line-rate is the maximum available rate on the interface (in bits per second) after factoring out the overhead for SONET/SDH and ATM (per-cell) overheads. For OC3c interfaces, the line rate is calculated as follows:

$$\text{line-rate} = 155,520,000 \text{ bps} \times (26/27) \times (48/53) = 135,631,698.1 \text{ bps}$$

For OC12c interfaces, the line rate is calculated as follows:

$$\text{line-rate} = 622,080,000 \text{ bps} \times (26/27) \times (48/53) = 542,526,792.45 \text{ bps}$$

desired-rate is the rate you enter in the **vbr** statement, in bits per second.

The **trunc** operator indicates that all digits to the right of the decimal point should be dropped.

For shaping settings smaller than 1/31 of OC3 ATM cell line rate (4,375,216 bps) and 1/127 of OC12 ATM cell line rate (4,271,864 bps), you can predict the actual shaping rate using the following formula:

$$\text{actual-rate} = (1 / (\text{trunc} (\text{line-rate} / \text{desired-rate}) + 1)) * \text{line-rate}$$

For example, for OC12 interfaces, the actual rates for shaping below 4,271,864 bps are calculated as follows:

$$\begin{aligned} 1 / 127 * 542,526,792.45 \text{ bps} &= 4,271,864 \text{ bps (11124 cells/second)} \\ 1 / 128 * 542,526,792.45 \text{ bps} &= 4,238,490 \text{ bps (11038 cells/second)} \\ 1 / 129 * 542,526,792.45 \text{ bps} &= 4,205,634 \text{ bps (10952 cells/second)} \\ &\dots \end{aligned}$$

Buffers are shared among all VCs, and by default, there is no limit to the buffer size for a VC. If a VC is particularly slow, it might use all the buffer resources.

Table 30 on page 299 shows ATM1 traffic-shaping rates.

Table 30: ATM1 Traffic-Shaping Rates

Interface Type	Line Rate (bps)	Line Rate (cps)	Percentage of Total Line Rate
OC3			
	135,600,000	353,125	100.00
	134,542,320	350,370.66	99.22
	133,511,760	347,686.88	98.46
	132,494,760	345,038.44	97.71
	131,491,320	342,425.31	96.97
	130,501,440	339,847.5	96.24
	129,525,120	337,305	95.52
	128,562,360	334,797.81	94.81
	127,626,720	332,361.25	94.12
	126,691,080	329,924.69	93.43
OC12			
	271,263,396	706,415.09	50.00
	270,207,897	703,666.40	49.81
	269,160,579	700,939.01	49.61
	268,121,349	698,232.68	49.42
	267,090,113	695,547.17	49.23
	266,066,779	692,882.24	49.04
	265,051,257	690,237.65	48.85
	264,043,458	687,613.17	48.67
	263,043,293	685,008.58	48.48
	262,050,677	682,423.64	48.30

Example: Specifying ATM1 Shaping Values

Determine the actual rate in ATM1 interfaces when the desired rate is 80 percent of the maximum rate:

- OC3c:

$$135,600,000 \text{ bps} * 0.8 = 108,480,000 \text{ bps}$$

Because 108,480,000 bps is greater than 1/31 of OC3 ATM cell line rate:

$$\begin{aligned} \text{actual-rate} &= (128 * 135,600,000.1) / (\text{trunc} ((128 * 135,600,000.1) / \\ &\quad 108,480,000)) \\ \text{actual-rate} &= 17,356,800,013 / (\text{trunc} (17,356,800,013 / 108,480,000)) \\ \text{actual-rate} &= 17,356,800,013 / 160 \\ \text{actual-rate} &= 108,480,000 \text{ bps} \end{aligned}$$

- OC12c:

$$271,263,396 \text{ bps} * 0.8 = 217,010,716.8 \text{ bps}$$

Because 217,010,716.8 bps is greater than 1/127 of OC12 ATM cell line rate:

$$\begin{aligned} \text{actual-rate} &= (128 * 542,526,792.45) / (\text{trunc} ((128 * \\ &\quad 542,526,792.45) / 217,010,716.8)) \\ \text{actual-rate} &= 69,443,429,434 / (\text{trunc} (69,443,429,434 / 217,010,716.8)) \\ \text{actual-rate} &= 69,443,429,434 / 320 \\ \text{actual-rate} &= 217,010,717 \text{ bps} \end{aligned}$$

Determine the actual rate in ATM1 interfaces when the desired rate is 3,000,000 bps:

- OC3c:

Because 3,000,000 bps is smaller than 1/31 of OC3 ATM cell line rate:

$$\begin{aligned} \text{actual-rate} &= (1 / (\text{trunc} (\text{line-rate} / \text{desired-rate}) + 1)) * \text{line-rate} \\ \text{actual-rate} &= (1 / (\text{trunc} (135,631,698 / 3,000,000) + 1)) * 135,631,698 \\ \text{actual-rate} &= (1 / (45 + 1)) * 135,631,698 \\ \text{actual-rate} &= (1 / 46) * 135,631,698 \\ \text{actual-rate} &= 2,948,515 \text{ bps} \end{aligned}$$

- OC12c:

Because 3,000,000 bps is smaller than 1/127 of OC12 ATM cell line rate:

$$\begin{aligned} \text{actual-rate} &= (1 / (\text{trunc} (\text{line-rate} / \text{desired-rate}) + 1)) * \text{line-rate} \\ \text{actual-rate} &= (1 / (\text{trunc} (542,526,792 / 3,000,000) + 1)) * 542,526,792 \\ \text{actual-rate} &= (1 / (180 + 1)) * 542,526,792 \\ \text{actual-rate} &= (1 / 181) * 542,526,792 \\ \text{actual-rate} &= 2,997,386 \text{ bps} \end{aligned}$$

Specifying ATM2 IQ Shaping Values

For ATM2 IQ OC3c interfaces, the maximum available rate is 100 percent of line rate, or 135,600,000 bps. For ATM2 IQ OC12c interfaces, the maximum available rate is 50 percent of line rate, or 271,273,396 bps. You can specify the rates in bits per second or cells per second. Fractional shaping is accurate within 0.5 percent of the desired rate.

Configuring the ATM1 Queue Length

ATM1 PICs contain a transmit buffer pool of 16,382 buffers, which are shared by all the PVCs that you configure on the PIC. Even multiple-port ATM PICs have a single buffer pool shared by all the ports.

By default, the ATM1 PIC allows PVCs to consume all the buffers they require. If the sustained traffic rate for a PVC exceeds its shaped rate, buffers are consumed. Eventually, all buffers on the PIC are consumed, and the other PVCs are underserved. This results in head-of-line blocking.

For each PVC, you prevent this situation by configuring the queue length of the PVC. The queue length is a limit on the number of transmit packets that can be queued. Packets that exceed the limit are dropped.

To limit the queue size of a PVC, include the **queue-length** statement:

```
queue-length number;
```

For a list of hierarchy levels at which you can include this statement, see **queue-length**.

The length can be from 1 through 16,383 packets. The default is 16,383 packets. You should include the **queue-length** statement in the configuration of all the PVCs that you configure on an ATM1 PIC. The **queue-length** statement performs two functions:

- It prevents head-of-line blocking because it limits the number of packets and therefore buffers that can be consumed by each configured PVC.
- It sets the maximum lifetime that can be sustained by packets over the PVC when traffic has oversubscribed the configured shaping contract.

The total value of all the queue lengths must not exceed the total number of packets that can be held in the buffer space available on the PIC. The total number of packets the buffers can hold depends on the size of the physical interface MTU, including all encapsulation overhead. You can use the following formula to calculate the total number of packets the buffer space can hold:

$$16,382 / (\text{Round Up} (\text{MTU} / 480))$$

For example, assuming default MTU settings for all ATM1 interfaces on a PIC, the total number of packets that can be held is:

$$16,382 / (\text{Round Up} (4482 / 480)) = 1638 \text{ packets}$$

Thus, you can configure up to 1638 for the combined queue length of all the PVCs on an ATM1 PIC that uses default MTU settings for all interfaces.

If you set a queue length to a very low value, small bursts in packets transiting the PVC might not be buffered.

The maximum lifetime that packets can sustain while transiting a PVC depends on the shaping rate you configure for the PVC, the setting for the `queue-length` statement, and the physical interface MTU. You can use the following formula to calculate the maximum lifetime that packets can sustain while transiting a PVC:

$$(\text{PVC queue-length in packets} \times \text{MTU}) / (\text{PVC shaping in bps} / 8)$$

For example, if you configure a PVC on an ATM1 interface with the default MTU, a CBR shaping rate of 3,840,000 bps (10,000 cps), and a queue length of 25 packets. The maximum lifetime is:

$$(25 \times 4482) / (3,840,000 / 8) = 233 \text{ ms}$$

This is the worst-case lifetime assuming all packets in the queue are MTU sized, and the traffic using the PVC is oversubscribing its configured shaping contract.

In general, we recommend that you use a maximum lifetime under 500 ms.

If you add or change the queue-length setting on the VC, the logical interface associated with the VC is deleted and re-added.

Configuring the ATM2 IQ EPD Threshold

The EPD threshold is a limit on the number of transmit cells that can be queued. Cells that exceed the limit are discarded. When a beginning of packet (BOP) cell is received, the VC's queue depth is checked against the EPD threshold. If the VC's queue depth exceeds the EPD threshold, the BOP cell and all subsequent cells in the packet are discarded. This prevents a single queue from draining all the buffers on the PIC.

By default, for UBR the EPD threshold is approximately 1 percent of the available cell buffers. If shaping is enabled, the default EPD threshold is proportional to the shaping rate according to the following formula:

$$\text{default epd-threshold} = \text{number of buffers} * \text{shaping rate} / \text{line rate}$$

By default, the software estimates how much buffer space is needed for each PVC. However, you can configure the per-VC buffer space. In general, ATM PVCs need larger buffers for data traffic and smaller buffers for time-sensitive applications. Unnecessarily deep buffers might cause excessive delays on congested PVCs. Overly shallow buffers might cause premature random early detection (RED) or tail packet drops in bursty conditions.

The minimum EPD threshold value is 48 cells. If the default EPD threshold formula results in an EPD threshold of less than 48 cells, the result will be ignored, and the minimum value of 48 cells will be used.

To set the EPD threshold of a PVC, include the `epd-threshold` statement:

```
epd-threshold cells;
```

For a list of hierarchy levels at which you can include this statement, see `epd-threshold`.

The allowable range for EPD threshold varies by interface type, as shown in Table 31 on page 303.

Table 31: EPD Threshold Range by Interface Type

Interface Type	EPD Range
1-port OC48	48 through 425,984 cells
1-port and 2-port OC12	48 through 425,984 cells
2-port OC3, DS3, and E3	48 through 212,992 cells
4-port DS3 and E3	48 through 106,496 cells

You should include the `epd-threshold` statement in the configuration of all the PVCs that you configure on an ATM2 IQ PIC. The `epd-threshold` statement performs two functions:

- It prevents head-of-line blocking because it limits the number of packets and therefore buffers that can be consumed by each configured PVC.
- It sets the maximum lifetime that can be sustained by packets over the PVC when traffic has oversubscribed the configured shaping contract.

If you add or change the EPD threshold on the VC, the logical interface associated with the VC is deleted and re-added.

On ATM2 IQ DS3 and E3 interfaces, you might be able to enter an EPD threshold or shaping parameter that exceeds the maximum threshold for these interfaces. If the configuration commits, the physical interface might indicate that it is up, but the logical interface fails. As a workaround, configure shaping parameters and EPD thresholds that do not exceed the bandwidth of the interface.

For information about configuring dual EPD thresholds on interfaces configured to use Layer 2 circuit trunk mode, see “Configuring Two EPD Thresholds per Queue” on page 304.

Example: Configuring the ATM2 IQ EPD Threshold

Configure the EPD threshold for a point-to-point ATM2 interface and a point-to-multipoint ATM2 interface.

On a Point-to-Point ATM2 Interface

```
[edit interfaces at-1/0/0]
unit 0 {
  vci 0.123;
```

```

        epd-threshold 1300;
        ...
    }

On a Point-to-Multipoint  
ATM2 Interface
[edit interfaces at-1/0/1]
unit 0 {
    multipoint;
    family inet address 10.0.12.12/24 {
        multipoint-destination 10.0.12.14 vci 0.123 epd-threshold 1300;
        ...
    }
}

```

Configuring Two EPD Thresholds per Queue

For ATM2 IQ interfaces configured to use Layer 2 circuit trunk mode, you can set two EPD thresholds that depend on the PLPs of the packets. When you set a threshold with the `epd-threshold` statement, it applies to packets that have a PLP of 0. When you set a threshold with the `plp1` statement, it applies to packets that have a PLP of 1. If you include the `plp1` statement in the configuration, you must also include the `epd-threshold` statement.

To configure two EPD thresholds, include the `epd-threshold` and `plp1` statements:

```
epd-threshold cells plp1 cells;
```

You can include these statements at the following hierarchy levels:

- [edit interfaces *interface-name* atm-options scheduler-maps *map-name* forwarding-class *class-name*]
- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

The value you set with the `epd-threshold` statement (for PLP0) should be equal to or greater than the value you set with the `plp1` statement. EPD threshold ranges vary by interface type. See Table 31 on page 303.

For general information about EPD thresholds, see “Configuring the ATM2 IQ EPD Threshold” on page 302.

Configuring the ATM2 IQ Transmission Weight

For ATM2 IQ interfaces configured with VPI shaping, you can control the number of cells a VCI can send each time the VCI has a turn to transmit by including the `transmit-weight` statement:

```
transmit-weight cells;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

VPI traffic shaping is not supported on point-to-multipoint interfaces.

The number of cells can be from 1 through 32,000. For a configuration example, see “Example: Configuring ATM2 IQ Interfaces” on page 328.

Defining the ATM OAM F5 Loopback Cell Period

For ATM1 and ATM2 IQ interfaces with an ATM encapsulation, you can configure the OAM F5 loopback cell period on virtual circuits. This is the interval at which OAM F5 loopback cells are transmitted.

By default, no OAM F5 loopback cells are sent. To send OAM F5 loopback cells, include the `oam-period` statement:

```
oam-period (disable | seconds);
```

For a list of hierarchy levels at which you can include this statement, see `oam-period`.

The period can be from 1 through 900 seconds. You can also choose the `disable` option to disable the OAM loopback cell transmit feature.

OAM VC-AIS and VC-RDI defect indication cells are used for identifying and reporting VC defects end-to-end. When a physical link or interface failure occurs, intermediate nodes insert OAM AIS cells into all the downstream VCs affected by the failure. Upon receiving an AIS cell on a VC, the routing platform marks the logical interface down and sends an RDI cell on the same VC to notify the remote end of the error status. When an RDI cell is received on a VC, the routing platform sets the logical interface status to down. When no AIS or RDI cells are received for 3 seconds, the routing platform sets the logical interface status to up. You do not need to configure anything to enable defect indication.

Configuring the ATM OAM F5 Loopback Cell Threshold

For ATM1 and ATM2 IQ interfaces with an ATM encapsulation, you can configure the OAM F5 loopback cell threshold on VCs. This is the minimum number of consecutive OAM F5 loopback cells received before a VC is declared up, or the minimum number of consecutive OAM F5 loopback cells lost before a VC is declared down.

By default, when five consecutive OAM F5 loopback cells are received, the VC is considered to be up, and when five consecutive cells are lost, the VC is considered to be down. To modify these values, include the `oam-liveness` statement:

```
oam-liveness {
  up-count cells;
  down-count cells;
}
```

For a list of hierarchy levels at which you can include this statement, see [oam-liveness](#).

The cell count can be a value from 1 through 255.

Configuring ATM Interface Encapsulation

To configure ATM encapsulation on a physical interface, include the `encapsulation` statement at the `[edit interfaces interface-name]` hierarchy level:

```
[edit interfaces interface-name]  
encapsulation (atm-ccc-cell-relay | atm-pvc | ethernet-over-atm);
```

For ATM interfaces, the physical interface encapsulation can be one of the following:

- **ATM cell-relay**—This encapsulation connects two remote virtual circuits or ATM physical interfaces with an LSP. Traffic on the circuit is ATM cells.
- **ATM PVC**—ATM PVC encapsulation is defined in RFC 2684, *Multiprotocol Encapsulation over ATM Adaptation Layer 5*.
- **Ethernet over ATM**—As defined in RFC 1483 (the previous version of RFC 2684), this encapsulation type allows ATM interfaces to connect to devices that support only bridged-mode protocol data units (BPDUs). The JUNOS software does not completely support bridging, but accepts BPDU packets as a default gateway. If you use the router as an edge device, then the router acts as a default gateway. It accepts Ethernet LLC/SNAP frames with IP or ARP in the payload, and drops the rest. For packets destined to the Ethernet LAN, a route lookup is done using the destination IP address. If the route lookup yields a full address match, the packet is encapsulated with an LLC/SNAP and media access control (MAC) header, and the packet is forwarded to the ATM interface.

Generally, you configure an interface's encapsulation at the `[edit interfaces interface-name]` hierarchy level. However, for ATM encapsulations, you can also configure the encapsulation type that is used inside the ATM cell itself. To do this, include the `encapsulation` statement:

```
encapsulation (atm-ccc-cell-relay | atm-ccc-vc-mux | atm-cisco-nlpid | atm-mlppp-llc |  
atm-nlpid | atm-ppp-llc | atm-ppp-vc-mux | atm-snap | atm-tcc-snap | atm-vc-mux |  
atm-tcc-vc-mux | ether-over-atm-llc | ether-vpls-over-atm-llc);
```

You can include this statement at the following hierarchy levels:

- `[edit interfaces interface-name unit logical-unit-number]`
- `[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number]`

Table 32 on page 307 shows the logical interface encapsulation types for ATM interfaces.

Table 32: ATM Logical Interface Encapsulation Types

Encapsulation Types	Comments
ATM CCC cell relay	<p>This encapsulation type connects two remote virtual circuits or ATM physical interfaces with an LSP.</p> <p>This encapsulation type carries traffic in ATM cells.</p> <p>When you use this encapsulation type, you can configure the <code>ccc</code> family only.</p>
ATM CCC VC multiplex	<p>This encapsulation type is for CCC circuits.</p> <p>When you use this encapsulation type, you can configure the <code>ccc</code> family only.</p>
ATM network layer protocol identifier (NLPID)	When you use this encapsulation type, you can configure the <code>inet</code> family only.
ATM SNAP	
ATM SNAP encapsulation on translational cross-connect (TCC) circuits	When you use this encapsulation type, you can configure the <code>tcc</code> family only.
ATM VC multiplex	When you use this encapsulation type, you can configure the <code>inet</code> family only.
ATM VC multiplex on TCC circuits	When you use this encapsulation type, you can configure the <code>tcc</code> family only.
Cell-relay accumulation mode (CAM)	<p>In this mode, the incoming 1 to 8 cells are packaged into a single packet and forwarded to the LSP. To configure CAM, include the <code>atm-cell-relay-accumulation</code> statement at the <code>[edit chassis fpc slot-number pic pic-number]</code> hierarchy level.</p> <p>This encapsulation type is for ATM1 interfaces only.</p> <p>For more information about CAM, see the <i>JUNOS System Basics Configuration Guide</i>.</p>
Cisco ATM NLPID	When you use this encapsulation type, you can configure the <code>inet</code> family only.
Ethernet over ATM	<p>This encapsulation type is for interfaces that carry IPv4 traffic.</p> <p>When you use this encapsulation type, you cannot configure point-to-multipoint interfaces.</p>
Ethernet VPLS over ATM	<p>This encapsulation type enables a VPLS instance to support bridging between Ethernet interfaces and ATM interfaces, as described in RFC 2684.</p> <p>Use this encapsulation type to support IEEE 802.1p classification binding on ATM VCs.</p> <p>This encapsulation type is for ATM2 IQ interfaces only.</p> <p>When you use this encapsulation type, you cannot configure point-to-multipoint interfaces.</p>
Multilink PPP over AAL5 LLC	<p>This encapsulation type is for ATM2 IQ interfaces only.</p> <p>When you use this encapsulation type, your routing platform must be equipped with a Link Services or Voice Services PIC.</p>

Table 32: ATM Logical Interface Encapsulation Types (*continued*)

Encapsulation Types	Comments
PPP over AAL5 LLC	This encapsulation type is for ATM2 IQ interfaces only. When you use this encapsulation type, you cannot configure point-to-multipoint interfaces.
PPP over AAL5 multiplex	This encapsulation type is for ATM2 IQ interfaces only. When you use this encapsulation type, you cannot configure point-to-multipoint interfaces.

Configuring an ATM1 Cell-Relay Circuit

For ATM1 interfaces, you can create an ATM cell-relay circuit by configuring an entire ATM physical device or an individual VC. When you configure an entire device, only cell-relay encapsulation is allowed on the logical interfaces; for ATM1 PICs, you use the `atm-options` statement to control the number and location of VCs. The configuration of allowed VCs on both ingress and egress ATM interfaces should be the same. For most interfaces, you can define a maximum of 4090 VCs per interface. The highest-numbered VC value you can configure is 4089. Promiscuous mode removes these limits. For more information, see “Configuring ATM Cell-Relay Promiscuous Mode” on page 272.

For ATM1 interfaces, if you are dedicating the entire device to a cell-relay circuit, include the `allow-any-vci` statement in the configuration of `unit 0`:

```
allow-any-vci;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit 0]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit 0]

Once you include this statement, you cannot configure other logical interfaces in the same physical interface.



NOTE: When you use ATM CCC cell-relay encapsulation, you must configure the logical encapsulation as `atm-ccc-cell-relay`. You cannot mix different logical encapsulation types on an interface that you have configured with ATM CCC cell-relay physical encapsulation.

Example: Configuring an ATM1 Cell-Relay Circuit

Configure an ATM1 cell-relay circuit:

```
[edit interfaces at-1/2/0]
encapsulation atm-ccc-cell-relay;
```

	<pre> atm-options { pic-type atm1; vpi 0 maximum-vcs 256; } unit 0 { point-to-point; encapsulation atm-ccc-cell-relay; allow-any-vci; } </pre>
Configuring an Individual VC on a Logical Interface	<pre> [edit interfaces at-1/1/0] encapsulation atm-ccc-cell-relay; atm-options { pic-type atm1; vpi 0 maximum-vcs 256; } unit 120 { encapsulation atm-ccc-cell-relay; vci 0.120; } </pre>
Configuring Nonpromiscuous Port Mode	<pre> [edit interfaces at-0/0/1] encapsulation atm-ccc-cell-relay; atm-options { pic-type atm1; vpi 0 { maximum-vcs 100; } vpi 1 { maximum-vcs 300; } vpi 4 { maximum-vcs 200; } } unit 0 { encapsulation atm-ccc-cell-relay; allow-any-vci; } </pre>
Configuring Nonpromiscuous VPI Mode	<pre> [edit interfaces at-0/0/1] encapsulation atm-ccc-cell-relay; atm-options { pic-type atm1; vpi 0 { maximum-vcs 100; } } unit 0 { encapsulation atm-ccc-cell-relay; vpi 0; } </pre>

Configuring Nonpromiscuous VCI Mode	<pre>[edit interfaces at-0/0/1] encapsulation atm-ccc-cell-relay; atm-options { pic-type atm1; vpi 0 { maximum-vcs 100; } } unit 0 { encapsulation atm-ccc-cell-relay; vci 0.50 }</pre>
--	---

Configuring PPP over ATM2 Encapsulation

For ATM2 IQ interfaces, you can configure PPP over AAL5 encapsulation, as described in RFC 2364, *PPP over AAL5*. PPP over ATM encapsulation associates a PPP link with an ATM AAL5 PVC.

The JUNOS software supports three PPP over ATM encapsulation types:

- **atm-ppp-llc**—PPP over AAL5 LLC.
- **atm-ppp-vc-mux**—PPP over ATM AAL5 multiplex.
- **atm-mlppp-llc**—Multilink PPP over ATM AAL5 LLC. For this encapsulation type, your routing platform must be equipped with a Link Services or Voice Services PIC. MLPPP over ATM encapsulation is not supported on ATM2 IQ OC48 interfaces.

To enable PPP over ATM encapsulation, include the **encapsulation** statement, specifying the **atm-mlppp-llc**, **atm-ppp-llc**, or **atm-ppp-vc-mux** encapsulation type:

```
encapsulation (atm-mlppp-llc | atm-ppp-llc | atm-ppp-vc-mux);
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

When you configure PPP over ATM encapsulation, you can enable PPP Challenge Handshake Authentication Protocol (CHAP) and keepalives on the logical interface. For more information about PPP CHAP and keepalives, see “Configuring the PPP Challenge Handshake Authentication Protocol” on page 103 and “Configuring Keepalives” on page 118.



NOTE: When you use PPP over ATM encapsulation, we recommend that you not include the **oam-period** statement in the configuration. Instead, we recommend that you enable keepalives to detect connection failures.

Example: Configuring PPP over ATM2 IQ Encapsulation

Configure three logical interfaces with PPP over ATM encapsulation:

```
[edit interfaces]
at-0/1/0 {
  atm-options {
    pic-type atm2;
    vpi 0;
    vpi 2;
  }
  unit 0 {
    encapsulation atm-ppp-llc;
    ppp-options {
      chap {
        access-profile pe-B-ppp-clients;
        local-name "pe-A-at-0/1/0";
      }
    }
    keepalives interval 5 up-count 6 down-count 4;
    vci 0.120;
    family inet address 192.168.13.13/30;
  }
  unit 1 {
    encapsulation atm-ppp-vc-mux;
    vci 2.120;
    keepalives interval 6 up-count 6 down-count 4;
    family inet address 192.168.14.13/30;
  }
  unit 2 {
    encapsulation atm-ppp-vc-mux;
    ppp-options {
      chap {
        passive;
        access-profile pe-A-ppp-clients;
        local-name "pe-A-at-0/1/0";
      }
    }
    keepalives interval 5 up-count 6 down-count 4;
    vci 2.121;
    family inet address 192.168.15.13/30;
  }
}
```

**Configuring Multilink
PPP over ATM2 IQ
Encapsulation**

```
[edit interfaces]
at-0/0/0 {
  atm-options {
    pic-type atm2;
    vpi 10;
  }
  unit 0 {
    encapsulation atm-mlppp-llc;
    ppp-options {
      chap {
        access-profile pe-B-ppp-clients;
        local-name "pe-A-at-0/0/0";
      }
    }
  }
}
```

```

    }
  }
  keepalive interval 5 up-count 6 down-count 4;
  vci 10.120;
  family mlppp {
    bundle ls-0/3/0.0;
  }
}
}
at-0/0/1 {
  atm-options {
    pic-type atm2;
    vpi 11;
  }
  unit 1 {
    encapsulation atm-mlppp-llc;
    ppp-options {
      chap {
        access-profile pe-B-ppp-clients;
        local-name " pe-A-at-0/0/0";
      }
    }
    keepalive interval 5 up-count 6 down-count 4;
    vci 11.120;
    family mlppp {
      bundle ls-0/3/0.0;
    }
  }
}
}
at-1/2/3 {
  atm-options {
    pic-type atm2;
    vpi 12;
  }
  unit 2 {
    encapsulation atm-mlppp-llc;
    ppp-options {
      chap {
        access-profile pe-B-ppp-clients;
        local-name " pe-A-at-0/0/0";
      }
    }
    keepalive interval 5 up-count 6 down-count 4;
    vci 12.120;
    family mlppp {
      bundle ls-0/3/0.0;
    }
  }
}
}
...
ls-0/3/0 {
  encapsulation multilink-ppp;
  interleave-fragments;
  keepalive;
  unit 0 {
    mrru 4500;
  }
}

```

```

short-sequence;
fragment-threshold 16320;
drop-timeout 2000;
encapsulation multilink-ppp;
interleave-fragments;
minimum-links 8;
family inet {
    address 10.10.0.1/32 {
        destination 10.10.0.2;
    }
}
family iso;
family inet6 {
    address 8090::0:1/128 {
        destination 8090::0:2;
    }
}
}
...
}

```

Configuring E3 and T3 Parameters on ATM Interfaces

For ATM1 and ATM2 IQ interfaces, you can configure ATM E3 and T3 interfaces by including the following statements at the [edit interfaces *at-fpc/pic/port*] hierarchy level:

```

[edit interfaces at-fpc/pic/port]
e3-options {
    atm-encapsulation (direct | plcp);
    buildout feet;
    framing (g.751 | g.832);
    loopback (local | remote);
    (payload-scrambler | no-payload-scrambler);
}
t3-options {
    atm-encapsulation (direct | plcp);
    buildout feet;
    (cbit-parity | no-cbit-parity);
    loopback (local | payload | remote);
    (payload-scrambler | no-payload-scrambler);
}

```

The following options and default values differ from those described in the chapters “Configuring E3 Interfaces” on page 477 and “Configuring T3 Interfaces” on page 495:

- **atm-encapsulation**—PLCP is the default value. The E3 *line-format* option *g.832* supports the *direct* ATM-encapsulation option only.
- **buildout**—The default value is 10 feet. The number of feet can be any integer value. The range is from 0 through 450 feet (about 137 meters).
- **cbit-parity**—The default option is to enable cbit parity.

- **framing**—There is no default option for E3 interfaces; T3 interfaces use the **cbit-parity** statement in place of the **framing** statement.
- **loopback**—By default, loopback is disabled.
- **payload-scrambler**—The default option is to enable payload scrambling.

In addition, the ATM E3 and T3 PICs support the **clocking** statement at the interface level, as do the SONET/SDH PICs. For more information about E3- and T3-specific parameters, see “Configuring E3 Interfaces” on page 477 and “Configuring T3 Interfaces” on page 495.



NOTE: You must configure all the ports on an ATM E3 or T3 PIC with the same framing and encapsulation. Otherwise, the system will set all the ports on the PIC to the slowest framing and encapsulating configuration. For ATM T3, this is PLCP. For ATM E3, this is G.751 PLCP.

Configuring SONET/SDH Parameters on ATM Interfaces

When configuring ATM1 and ATM2 IQ SONET/SDH interfaces, you can also include the following statements in the **sonet-options** statement to set SONET/SDH parameters on ATM interfaces:

```
[edit interfaces at-fpc/pic/port]
sonet-options {
  aps {
    advertise-interval milliseconds;
    authentication-key key;
    force;
    hold-time milliseconds;
    lockout;
    neighbor address;
    paired-group group-name;
    protect-circuit group-name;
    request;
    revert-time seconds;
    working-circuit group-name;
  }
  bytes {
    e1-quiet value;
    f1 value;
    f2 value;
    s1 value;
    z3 value;
    z4 value;
  }
  loopback (local | remote);
  (payload-scrambler | no-payload-scrambler);
  rfc-2615;
  trigger {
    defect ignore {
      hold-time up milliseconds down milliseconds;
    }
  }
}
```

```

    }
  }
  (z0-increment | no-z0-increment);
}

```

For information about configuring specific SONET/SDH statements, see “Configuring SONET/SDH Interfaces” on page 679.

Configuring ATM2 IQ VC Tunnel CoS Components

The ATM2 IQ interface allows multiple IP queues into each VC. On M-series platforms (except the M320 and M120 router), a VC tunnel can support four CoS queues. On the M320, M120, and T-series platforms for all ATM2 IQ PICs except the OC48 PIC, a VC tunnel can support eight CoS queues. Within a VC tunnel, the WRR algorithm schedules the cell transmission of each queue. You can configure the queue admission policies, such as EPD or WRED, to control the queue size during congestion.

For information about CoS components that apply generally to all interfaces, see the *JUNOS Class of Service Configuration Guide*.

To configure ATM2 IQ VC tunnel CoS components, include the following statements at the [edit interfaces at-fpc/pic/port] hierarchy level:

```

[edit chassis fpc slot-number pic pic-number]
max-queues-per-interface number;
[edit interfaces at-fpc/pic/port]
atm-options {
  linear-red-profiles profile-name {
    high-plp-max-threshold percent;
    low-plp-max-threshold percent;
    queue-depth cells high-plp-threshold percent low-plp-threshold percent;
  }
  plp-to-clp;
  scheduler-maps map-name {
    forwarding-class class-name {
      epd-threshold cells plp1 cells;
      linear-red-profile profile-name;
      priority (high | low);
      transmit-weight (cells number | percent number);
    }
    vc-cos-mode (alternate | strict);
  }
}
unit 0 {
  atm-scheduler-map (map-name | default);
  family family {
    address address {
      destination address;
    }
  }
  plp-to-clp;
  shaping {
    (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained
    rate burst length);
  }
}

```

```

    }
    vci vpi-identifier.vci-identifier;
  }

```

This section contains the following topics:

- Configuring Linear RED Profiles on page 316
- Configuring an ATM Scheduler Map on page 317
- Enabling Eight Queues on ATM2 IQ Interfaces on page 318
- Configuring VC CoS Mode on page 324
- Enabling the PLP Setting to Be Copied to the CLP Bit on page 324
- Configuring ATM CoS on the Logical Interface on page 325
- Example: Configuring ATM2 IQ VC Tunnel CoS Components on page 325

Configuring Linear RED Profiles

Linear RED profiles define CoS virtual circuit drop profiles. You can configure up to 32 linear RED profiles per port. When a packet arrives, RED checks the queue fill level. If the fill level corresponds to a nonzero drop probability, the RED algorithm determines whether to drop the arriving packet.

To configure linear RED profiles, include the `linear-red-profiles` statement at the [edit interfaces *at-fpc/pic/port* atm-options] hierarchy level:

```

[edit interfaces at-fpc/pic/port atm-options]
linear-red-profiles profile-name {
    high-plp-max-threshold percent;
    low-plp-max-threshold percent;
    queue-depth cells high-plp-threshold percent low-plp-threshold percent;
}

```

The `queue-depth`, `high-plp-threshold`, and `low-plp-threshold` statements are mandatory.

You can define the following options for each RED profile:

- **high-plp-max-threshold**—Define the drop profile fill-level for the high PLP CoS VC. When the fill level exceeds the defined percentage, all packets with high PLP are dropped.
- **low-plp-max-threshold**—Define the drop profile fill-level for the low PLP CoS VC. When the fill level exceeds the defined percentage, all packets with low PLP are dropped.
- **queue-depth**—Define maximum queue depth in the CoS VC drop profile. Packets are always dropped beyond the defined maximum. The range you can configure is from 1 through 64,000 cells.

- **high-plp-threshold**—Define CoS VC drop profile fill-level percentage when linear RED is applied to cells with high PLP. When the fill level exceeds the defined percentage, packets with high PLP are randomly dropped by RED.
- **low-plp-threshold**—Define CoS VC drop profile fill-level percentage when linear RED is applied to cells with low PLP. When the fill level exceeds the defined percentage, packets with low PLP are randomly dropped by RED.

Configuring an ATM Scheduler Map

To define a scheduler map, you associate it with a forwarding class. Each class is associated with a specific queue, as follows:

- **best-effort**—Queue 0
- **expedited-forwarding**—Queue 1
- **assured-forwarding**—Queue 2
- **network-control**—Queue 3



NOTE: For M320, M120, and T-series platforms only, you can configure more than four forwarding classes and queues. For more information, see “Enabling Eight Queues on ATM2 IQ Interfaces” on page 318.

When you configure an ATM scheduler map, the JUNOS software creates these CoS queues for a VC. The JUNOS software prefixes each packet delivered to the VC with the next-hop rewrite data associated with each queue.

To configure an ATM scheduler map, include the **scheduler-maps** statement at the [edit interfaces *at-fpc/pic/port* atm-options] hierarchy level:

```
edit interfaces at-fpc/pic/port atm-options]
scheduler-maps map-name {
  forwarding-class class-name {
    epd-threshold cells plp1 cells;
    linear-red-profile profile-name;
    priority (high | low);
    transmit-weight (cells number | percent number);
  }
}
```

You can define the following options for each forwarding class:

- **epd-threshold** or **linear-red-profile**—An EPD threshold provides a queue of cells that can be stored with tail drop. When a BOP cell is received, the VC’s queue depth is checked against the EPD threshold. If the VC’s queue depth exceeds the EPD threshold, the BOP cell and all subsequent cells in the packet are discarded.

A linear RED profile defines the number of cells using the **queue-depth** statement within the RED profile. (You configure the **queue-depth** statement at the [edit interfaces *at-fpc/pic/port* atm-options linear-red-profiles *profile-name*] hierarchy level.)

By default, if you include the **scheduler-maps** statement at the [edit interfaces *at-fpc/pic/port atm-options*] hierarchy level, the interface uses an EPD threshold that is determined by the JUNOS software based on the available bandwidth and other parameters. You can override the default EPD threshold by setting an EPD threshold or a linear RED profile.

- **priority**—By default, queue 0 is high-priority, and the remaining queues are low-priority. You can configure high or low queuing priority for each queue.
- **transmit-weight**—By default, the transmit weight is 95 percent for queue 0, and 5 percent for queue 3. You can configure the transmission weight in number of cells or percentage. Each CoS queue is serviced in WRR mode. When CoS queues have data to send, they send the number of cells equal to their weight before passing control to the next active CoS queue. This allows proportional bandwidth sharing between multiple CoS queues within a rate-shaped VC tunnel. A CoS queue can send from 1 through 32,000 cells or from 5 through 100 percent of queued traffic before passing control to the next active CoS queue within a VC tunnel.

The AAL5 protocol prohibits cells from being interleaved on a VC; therefore, a complete packet is always sent. If a CoS queue sends more cells than its assigned weight because of the packet boundary, the deficit is carried over to the next time the queue is scheduled to transmit. If the queue is empty after the cells are sent, the deficit is waived, and the queue's assigned weight is reset.



NOTE: If you include the **scheduler-maps** statement at the [edit interfaces *at-fpc/pic/port atm-options*] hierarchy level, the **epd-threshold** statement at the [edit interfaces *interface-name unit logical-unit-number*] or [edit interfaces *interface-name unit logical-unit-number address address family family multipoint-destination address*] hierarchy level has no effect because either the default EPD threshold, the EPD threshold setting in the forwarding class, or the linear RED profile takes effect instead.

For more information about forwarding classes, see the *JUNOS Class of Service Configuration Guide*.

Enabling Eight Queues on ATM2 IQ Interfaces

By default, ATM2 IQ PICs on T-series, M120, and M320 platforms are restricted to a maximum of four egress queues per interface. You can enable eight egress queues on ATM2 IQ interfaces by including the **max-queues-per-interface** statement at the [edit chassis *fpc slot-number pic pic-number*] hierarchy level:

```
[edit chassis fpc slot-number pic pic-number]
max-queues-per-interface number;
```

The numerical value can be 4 or 8.

If you include the **max-queues-per-interface** statement, all ports on the ATM2 IQ PIC use the configured mode.

When you include the `max-queues-per-interface` statement and commit the configuration, all physical interfaces on the ATM2 IQ PIC are deleted and re-added. Also, the PIC is taken offline and then brought back online immediately. You do not need to manually take the PIC offline and online. You should change modes between four queues and eight queues, or vice versa, only when there is no active traffic going to the ATM2 IQ PIC.

To configure up to eight queues on the ATM2 IQ interface, you must also include the statements described in “Configuring ATM2 IQ VC Tunnel CoS Components” on page 315.

For general information about configuring up to eight forwarding classes and queues on PICs other than ATM2 IQ PICs, see the *JUNOS Class of Service Configuration Guide*.



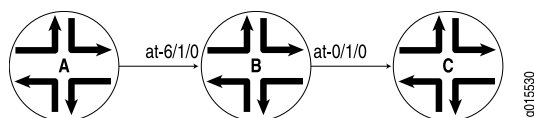
NOTE: When you are considering enabling eight queues on an ATM2 IQ interface, you should note the following:

- ATM2 IQ interfaces using Layer 2 circuit trunk transport mode support only four CoS queues.
- ATM2 IQ OC48 interfaces support only four CoS queues.
- ATM2 IQ interfaces with MLPPP encapsulation support only four CoS queues.
- You can configure only four RED profiles for the eight queues. Thus, queue 0 and queue 4 share a single RED profile, as do queue 1 and queue 5, queue 2 and queue 6, and queue 3 and queue 7. There is no restriction on EPD threshold per queue.
- The default chassis scheduler allocates resources for queue 0 through queue 3, with 25 percent of the bandwidth allocated to each queue. When you configure the chassis to use more than four queues, you must configure and apply a custom chassis scheduler to override the default. To apply a custom chassis scheduler, include the `scheduler-map-chassis` statement at the `[edit class-of-service interfaces at-fpc/pic/*]` hierarchy level. For more information about configuring and applying a custom chassis scheduler, see the *JUNOS Class of Service Configuration Guide*.

Example: Enabling Eight Queues on T-series, M120, and M320 Platforms

In Figure 19 on page 319, Router A generates IP packets with different IP precedence settings. Router B is an M320, M120, or T-series platform with two ATM2 IQ interfaces. On Router B, interface `at-6/1/0` receives traffic from Router A, while interface `at-0/1/0` sends traffic to Router C. This example shows the CoS configuration for Router B.

Figure 19: Example Topology for Router with Eight Queues



On Router B:

```

[edit chassis]
fpc 0 {
  pic 1 {
    max-queues-per-interface 8;
  }
}
fpc 6 {
  pic 1 {
    max-queues-per-interface 8;
  }
}
[edit interfaces]
at-0/1/0 {
  atm-options {
    linear-red-profiles {
      red_1 queue-depth 1k high-plp-threshold 50 low-plp-threshold 80;
      red_2 queue-depth 2k high-plp-threshold 40 low-plp-threshold 70;
      red_3 queue-depth 3k high-plp-threshold 30 low-plp-threshold 60;
      red_4 queue-depth 4k high-plp-threshold 20 low-plp-threshold 50;
    }
    scheduler-maps {
      sch_red {
        vc-cos-mode strict;
        forwarding-class fc_q0 {
          priority high;
          transmit-weight percent 5;
          linear-red-profile red_1;
        }
        forwarding-class fc_q1 {
          priority low;
          transmit-weight percent 10;
          linear-red-profile red_2;
        }
        forwarding-class fc_q2 {
          priority low;
          transmit-weight percent 15;
          linear-red-profile red_3;
        }
        forwarding-class fc_q3 {
          priority low;
          transmit-weight percent 20;
          linear-red-profile red_4;
        }
        forwarding-class fc_q4 {
          priority low;
          transmit-weight percent 5;
          linear-red-profile red_1;
        }
        forwarding-class fc_q5 {
          priority low;
          transmit-weight percent 10;
          linear-red-profile red_2;
        }
        forwarding-class fc_q6 {
          priority low;
          transmit-weight percent 15;
        }
      }
    }
  }
}

```

```

        linear-red-profile red_3;
    }
    forwarding-class fc_q7 {
        priority low;
        transmit-weight percent 20;
        linear-red-profile red_4;
    }
}
sch_epd {
    vc-cos-mode alternate;
    forwarding-class fc_q0 {
        priority high;
        transmit-weight percent 5;
        epd-threshold 1024;
    }
    forwarding-class fc_q1 {
        priority low;
        transmit-weight percent 10;
        epd-threshold 2048;
    }
    forwarding-class fc_q2 {
        priority low;
        transmit-weight percent 15;
        epd-threshold 3072;
    }
    forwarding-class fc_q3 {
        priority low;
        transmit-weight percent 20;
        epd-threshold 4096;
    }
    forwarding-class fc_q4 {
        priority low;
        transmit-weight percent 5;
        epd-threshold 2048;
    }
    forwarding-class fc_q5 {
        priority low;
        transmit-weight percent 10;
        epd-threshold 3072;
    }
    forwarding-class fc_q6 {
        priority low;
        transmit-weight percent 15;
        epd-threshold 4096;
    }
    forwarding-class fc_q7 {
        priority low;
        transmit-weight percent 20;
        epd-threshold 5120;
    }
}
}
}
atm-options {
    vpi 0;
}

```

```

unit 0 {
    vci 0.100;
    shaping {
        cbr 1920000;
    }
    atm-scheduler-map sch_red;
    family inet {
        address 172.16.0.1/24;
    }
}
unit 1 {
    vci 0.101;
    shaping {
        vbr peak 1m sustained 384k burst 256;
    }
    atm-scheduler-map sch_epd;
    family inet {
        address 172.16.1.1/24;
    }
}
}
at-6/1/0 {
    atm-options {
        vpi 0;
    }
    unit 0 {
        vci 0.100;
        family inet {
            address 10.10.0.1/24;
        }
    }
    unit 1 {
        vci 0.101;
        family inet {
            address 10.10.1.1/24;
        }
    }
}
[edit class-of-service]
classifiers {
    inet-precedence inet_classifier {
        forwarding-class fc_q0 {
            loss-priority low code-points 000;
        }
        forwarding-class fc_q1 {
            loss-priority low code-points 001;
        }
        forwarding-class fc_q2 {
            loss-priority low code-points 010;
        }
        forwarding-class fc_q3 {
            loss-priority low code-points 011;
        }
        forwarding-class fc_q4 {
            loss-priority low code-points 100;
        }
    }
}

```

```

        forwarding-class fc_q5 {
            loss-priority low code-points 101;
        }
        forwarding-class fc_q6 {
            loss-priority low code-points 110;
        }
        forwarding-class fc_q7 {
            loss-priority low code-points 111;
        }
    }
    forwarding-classes {
        queue 0 fc_q0;
        queue 1 fc_q1;
        queue 2 fc_q2;
        queue 3 fc_q3;
        queue 4 fc_q4;
        queue 5 fc_q5;
        queue 6 fc_q6;
        queue 7 fc_q7;
    }
    interfaces {
        at-6/1/0 {
            unit * {
                classifiers {
                    inet-precedence inet_classifier;
                }
            }
        }
    }
}
[edit routing-options]
static {
    route 10.10.20.2/32 {
        next-hop at-0/1/0.0;
        retain;
        no-readvertise;
    }
    route 10.10.1.2/32 {
        next-hop at-0/1/0.1;
        retain;
        no-readvertise;
    }
}
}

```

Verifying the Configuration

To see the results of this configuration, you can issue the following operational mode commands:

- `show interfaces at-0/1/0 extensive`
- `show interfaces queue at-0/1/0`
- `show class-of-service forwarding-class`

Configuring VC CoS Mode

VC CoS mode defines the CoS queue scheduling priority. By default, the VC CoS mode is alternate. When it is a queue's turn to transmit, the queue transmits up to its weight in cells as specified by the `transmit-weight` statement at the `[edit interfaces at-fpc/pic/port atm-options scheduler-maps map-name forwarding-class class-name]` hierarchy level. The number of cells transmitted can be slightly over the configured or default transmit weight, because the transmission always ends at a packet boundary.

To configure the VC CoS mode, include the `vc-cos-mode` statement at the `[edit interfaces at-fpc/pic/port atm-options scheduler-maps]` hierarchy level:

```
edit interfaces at-fpc/pic/port atm-options scheduler-maps]
vc-cos-mode (alternate | strict);
```

Two modes of CoS scheduling priority are supported:

- **alternate**—Assign high priority to one queue. The scheduling of the queues alternates between the high priority queue and the remaining queues. Every other scheduled packet is from the high priority queue.
- **strict**—Assign strictly high priority to one queue. A queue with strictly high priority is always scheduled before the remaining queues. The remaining queues are scheduled in round-robin fashion.

Enabling the PLP Setting to Be Copied to the CLP Bit

For a PE router with customer edge (CE)-facing, egress, ATM2 IQ interfaces configured with standard AAL5 encapsulation, you can enable the PLP setting to be copied into the CLP bit.



NOTE: This configuration setting is not applicable to Layer 2 circuit encapsulations because the control word captures and preserves CLP information. For more information about Layer 2 circuit encapsulations, see “Configuring Layer 2 Circuit Transport Mode” on page 276.

By default, at egress ATM2 IQ interfaces configured with standard AAL5 encapsulation, the PLP information is not copied to the CLP bit. This means the PLP information is not carried beyond the egress interface onto the CE router.

You can enable the PLP information to be copied into the CLP bit by including the `plp-to-clp` statement:

```
plp-to-clp;
```

You can include this statement at the following hierarchy levels:

- `[edit interfaces interface-name atm-options]`
- `[edit interfaces interface-name unit logical-unit-number]`

- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

Configuring ATM CoS on the Logical Interface

To apply the ATM scheduler map to a logical interface, include the `atm-scheduler-map` statement:

```
atm-scheduler-map (map-name | default);
```

For ATM CoS to take effect, you must configure the VCI and VPI identifiers and traffic shaping on each VC by including the following statements:

```
vci vpi-identifier.vci-identifier;
shaping {
  (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained rate burst length);
}
```

You can include these statements at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

For more information, see “Configuring a Point-to-Point ATM1 or ATM2 IQ Connection” on page 292 and “Defining the ATM Traffic-Shaping Profile” on page 295.

You can also apply a scheduler map to the chassis traffic that feeds the ATM interfaces. For more information, see the *JUNOS Class of Service Configuration Guide*.

Example: Configuring ATM2 IQ VC Tunnel CoS Components

Configure ATM2 IQ VC tunnel CoS components:

```
[edit interfaces]
at-1/2/0 {
  atm-options {
    vpi 0;
    linear-red-profiles red-profile-1 {
      queue-depth 35000 high-plp-threshold 75 low-plp-threshold 25;
    }
    scheduler-maps map-1 {
      vc-cos-mode strict;
      forwarding-class best-effort {
        priority low;
        transmit-weight percent 25;
        linear-red-profile red-profile-1;
      }
    }
  }
  unit 0 {
    vci 0.128;
```

```

    shaping {
        vbr peak 20m sustained 10m burst 20;
    }
    atm-scheduler-map map-1;
    family inet {
        address 192.168.0.100/32 {
            destination 192.168.0.101;
        }
    }
}

```

Example: Configuring ATM1 Interfaces

The following configuration is sufficient to get an ATM1 OC3 or OC12 interface up and running. By default, ATM interfaces use ATM PVC encapsulation.

```

[edit interfaces]
at-fpc/pic/port {
    atm-options {
        vpi vpi-identifier maximum-vcs maximum-vcs-value;
        unit 0 {    # one unit per VC
            vci vpi-identifier.vci-identifier;
            family inet {
                address local-address {
                    destination address;
                }
            }
        }
        unit 1 {# second VC
            ...
        }
    }
}

```

Complex Configuration Example

```

[edit interfaces]
at-0/0/0 {
    encapsulation atm-pvc;
    atm-options {
        vpi 0 maximum-vcs 1200;
    }
    unit 2 {
        encapsulation atm-snap;
        inverse-arp;
        vci 0.80;
        family inet {
            mtu 1500;
            address 192.168.0.3/32 {
                destination 192.168.0.1;
            }
        }
    }
    unit 3 {
        encapsulation atm-snap;
        vci 0.32;
        oam-period 60;
        family inet {

```



```

        mtu 1500;
        address 192.168.4.3/32 {
            destination 192.168.4.2;
        }
    }
}
at-0/2/0 {
    encapsulation atm-pvc;
    atm-options {
        vpi 0 maximum-vcs 1200;
    }
    unit 2 {
        encapsulation atm-snap;
        inverse-arp;
        vci 0.82;
        family inet {
            mtu 1500;
            address 192.168.5.3/32 {
                destination 192.168.5.2;
            }
        }
    }
}
at-0/3/0 {
    encapsulation atm-pvc;
    atm-options {
        vpi 0 maximum-vcs 1200;
    }
    unit 140 {
        encapsulation atm-snap;
        multipoint;
        family inet {
            address 192.168.7.4/24 {
                multipoint-destination 192.168.7.5;
                vci 0.100;
                inverse-arp;
            }
        }
    }
}
at-7/3/0 {
    encapsulation atm-pvc;
    atm-options {
        vpi 0 maximum-vcs 1200;
    }
    unit 0 {
        encapsulation atm-snap;
        vci 0.32;
        family inet {
            address 192.168.12.3/32 {
                destination 192.168.12.2;
            }
        }
    }
}

```

Example: Configuring ATM2 IQ Interfaces

Configure VP tunnel-shaping and OAM F4 on an ATM2 IQ interface:

```

interfaces {
  at-5/2/0 {
    atm-options {
      vpi 0 {
        shaping {
          vbr peak 10m sustained 6m burst 12;
        }
        oam-period 10;
        oam-liveness {
          up-count 6;
          down-count 5;
        }
      }
      vpi 4 {
        shaping {
          vbr peak 7m sustained 4m burst 24;
        }
      }
      vpi 5 {
        oam-period 10;
        oam-liveness {
          up-count 6;
          down-count 5;
        }
      }
      vpi 6;
    }
    unit 0 {
      vci 0.128;
      transmit-weight 20;
      family inet {
        address 192.168.9.225/32 {
          destination 192.168.9.224;
        }
      }
    }
    unit 1 {
      vci 0.129;
      transmit-weight 30;
      family inet {
        address 192.168.9.226/32 {
          destination 192.168.9.227;
        }
      }
    }
    unit 2 {
      vci 5.123;
      shaping {
        vbr peak 60m sustained 4m burst 24;
      }
      family inet {

```

```
        address 192.168.9.227/32 {  
            destination 192.168.9.230;  
        }  
    }  
}
```


Chapter 14

Configuring ATM-over-ADSL Interfaces

This chapter includes the following topics:

- ATM-over-ADSL Overview on page 331
- Configuring Physical ATM Interfaces and Logical Interface Properties for ADSL on page 332
- Configuring the ATM-over-ADSL Virtual Path Identifier on page 332
- Configuring the ATM-over-ADSL Physical Interface Operating Mode on page 333
- Configuring the ATM-over-ADSL Physical Interface Encapsulation Type on page 334
- Configuring the ATM-over-ADSL Logical Interface Encapsulation Type on page 334
- Configuring the ATM-over-ADSL Protocol Family on page 335
- Configuring the ATM-over-ADSL Virtual Channel Identifier on page 336

ATM-over-ADSL Overview

J4300 and J6300 Services Routers with asymmetrical DSL (ADSL) Annex A or Annex B PIMs can use an ATM interface to send network traffic through a point-to-point connection to a DSLAM. ATM-over-ADSL interfaces are not supported on J2300 Services Routers.



NOTE: You can configure J4300 and J6300 Services Routers with ADSL PIMs for connections through DSL only, not for direct ATM connections.

You configure the underlying ADSL as an ATM interface with an interface name of **at-pim/0/port**. Multiple encapsulation types are supported on both the physical and logical ATM-over-ADSL interface.

You can configure Point-to-Point Protocol over Ethernet (PPPoE) over ATM to connect through DSL lines. For PPPoE on an ATM-over-ADSL interface, you must configure encapsulation on both the physical and logical interfaces. To configure encapsulation on an ATM-over-ADSL physical interface, use Ethernet over ATM encapsulation. To configure encapsulation on an ATM-over-ADSL logical interface, use the PPPoE over AAL5 LLC encapsulation. LLC encapsulation allows a single ATM virtual connection to transport multiple protocols.



NOTE: PPPoE encapsulation is not supported on an M120 router with ATM2 PICs.

When you configure a point-to-point encapsulation such as PPP on a physical interface, the physical interface can have only one logical interface (only one **unit** statement) associated with it.

For more information about configuring PPPoE, see “Configuring PPPoE” on page 641.

Configuring Physical ATM Interfaces and Logical Interface Properties for ADSL

To configure physical ATM interfaces for ADSL, include the **vpi 0** statement at the [edit interfaces *at-pim/0/port* atm-options] hierarchy level, the **operating-mode** statement at the [edit interfaces *at-pim/0/port* dsl-options] hierarchy level, and the **encapsulation** statement at the [edit interfaces *at-pim/0/port*] hierarchy level:

```
[edit interfaces at-pim/0/port]
atm-options {
  vpi 0;
  dsl-options;
  operating-mode (adsl2plus | ansi-dmt | auto | etsi | itu-annexb-ur2 | itu-annexb-non-ir2 |
    itu-dmt | itu-dmt-bis);
}
encapsulation (atm-pvc | ethernet-over-atm);
```

Configure logical interface properties by including the **encapsulation** statement, **family** statement, and **vci** statement:

```
unit logical-unit-number {
  encapsulation (atm-vc-mux | atm-nlpd | atm-cisco-nlpd | atm-snap | atm-ppp-vc-mux |
    atm-ppp-llc | ether-over-atm-llc | ppp-over-ether-over-atm-llc);
  family inet {
    vci vpi-identifier.vci-identifier;
  }
}
```

You can include these statements at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

Configuring the ATM-over-ADSL Virtual Path Identifier

Set the ATM virtual path identifier (VPI) to 0 (zero) by including the **vpi 0** statement at the [edit interfaces *at-pim/0/port* atm-options] hierarchy level:

```
[edit interfaces at-pim/0/port atm-options]
vpi 0;
```

Configuring the ATM-over-ADSL Physical Interface Operating Mode

Configure the ADSL operating mode on the physical ATM interface by including the `operating-mode` statement at the `[edit interfaces at-pim/0/port dsl-options]` hierarchy level:

```
[edit interfaces at-pim/0/port dsl-options]
operating-mode mode;
```

By default, the mode is `auto`, which means the ADSL line autonegotiates the setting to match the setting of the DSLAM located at the central office.

Table 33 on page 333 shows the Annex A PIM and Annex B PIM operational modes for ATM-over-ADSL interfaces.

Table 33: ATM-over-ADSL Operational Modes

Encapsulation Types	Comments
Annex A PIMs	
adsl2plus	Set the ADSL line to train in the ITU G.992.5 mode.
ansi-dmt	Set the ADSL line to train in the ANSI T1.413 Issue 2 mode.
auto	Set the ADSL line to autonegotiate the setting to match the setting of the DSLAM located at the central office. The ADSL line trains in the ANSI T1.413 Issue 2 (<code>ansi-dmt</code>) or ITU G.992.1 (<code>itu-dmt</code>) mode.
itu-dmt	Set the ADSL line to train in the ITU G.992.1 mode.
itu-dmt-bis	Set the ADSL line to train in the ITU G.992.3 mode.
itu-lite	Set the ADSL line to train in the G.992.2 mode.
itu-lite-bis	Set the ADSL line to train in the G.992.4 mode.
Annex B PIMs	
adsl2plus	Set the ADSL line to train in the ITU G.992.5 mode.
auto	Set the ADSL line after autonegotiating the setting to match the setting of the DSLAM located at the central office.
etsi	Set the ADSL line to train in the ETSI TS 101 388 V1.3.1 mode.
itu-dmt	Set the ADSL line to train in the ITU G.992.1 mode.
itu-dmt-bis	Set the ADSL line to train in the ITU G.992.3 mode.
itu-annexb-ur2	Set the ADSL line to train in the ITU G.992.1 Deutsche Telekom UR-2 mode.

Table 33: ATM-over-ADSL Operational Modes (*continued*)

Encapsulation Types	Comments
itu-annexb-non-ur2	Set the ADSL line to train in the ITU G.992.1 non-UR-2 mode.
itu-dmt	Set the ADSL line to train in the ITU G.992.1 mode.

Configuring the ATM-over-ADSL Physical Interface Encapsulation Type

Configure the physical interface encapsulation type by including the `encapsulation` statement at the `[edit interfaces at-pim/O/port]` hierarchy level:

```
[edit interfaces at-pim/O/port]
encapsulation type;
```

Table 34 on page 334 shows the physical interface encapsulation types for ATM-over-ADSL interfaces.

Configuring the ATM-over-ADSL Logical Interface Encapsulation Type

Configure the logical interface encapsulation type by including the `encapsulation` statement:

```
[edit interfaces at-pim/O/port unit logical-unit-number]
encapsulation type;
```

You can include this statement at the following hierarchy levels:

```
[edit interfaces interface-name unit logical-unit-number]
```

```
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number]
```

Table 34 on page 334 shows the logical interface encapsulation types for ATM-over-ADSL interfaces.

Table 34: ATM-over-ADSL Encapsulation Types

Encapsulation Types	Comments
Physical Interface	
ether-over-atm	Ethernet over ATM encapsulation.
	Use this type of encapsulation for interfaces that carry IPv4 traffic.
atm-pvc	ATM permanent virtual circuits (PVCs).
Logical Interface	

Table 34: ATM-over-ADSL Encapsulation Types (*continued*)

Encapsulation Types	Comments
atm-vc-mux	Use ATM VC multiplex encapsulation. You can only configure the <code>inet</code> family when you use this type of encapsulation.
atm-nlpd	Use ATM network layer protocol ID (NLPD) encapsulation. You can only configure the <code>inet</code> family when you use this type of encapsulation.
atm-cisco-nlpd	Use Cisco NLPD encapsulation. You can only configure the <code>inet</code> family when you use this type of encapsulation.
atm-snap	Use ATM subnetwork attachment point (SNAP) encapsulation.
atm-ppp-vc-mux	Use PPP over ATM AAL5 multiplex encapsulation.
atm-ppp-llc	Use ATM PPP over AAL5 logical link control (LLC) encapsulation.
ether-over-atm-llc	Use Ethernet over LLC encapsulation for interfaces that carry IPv4 traffic. You cannot configure multipoint interfaces if you use this type of encapsulation.
ppp-over-ether-over-atm-llc	Use PPP over Ethernet over ATM LLC encapsulation. You cannot configure the interface address when you use this encapsulation type. Instead, you configure the interface address on the PPP interface.

Configuring the ATM-over-ADSL Protocol Family

Configure the protocol family type by including the `family` statement:

```
[edit interfaces at-pim/0/port unit logical-unit-number]
family family;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

Configuring the ATM-over-ADSL Virtual Channel Identifier

Configure the virtual channel identifier (VCI) type and value by including the `vci` statement:

```
[edit interfaces at-pim/0/port unit logical-unit-number]  
vci vpi-identifier.vci-identifier;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

Chapter 15

Configuring ATM-over-SHDSL Interfaces

This chapter includes the following topics:

- ATM-overSHDSL on page 337
- Configuring ATM Mode for SHDSL Overview on page 338
- Configuring ATM Mode on the PIM on page 339
- Configuring SHDSL Operating Mode on an ATM Physical Interface on page 340
- Configuring Encapsulation on the ATM Physical Interface on page 341
- Configuring Logical Interface Properties on page 341
- Example: Configuring an ATM-over-SHDSL Interface on page 342
- Verifying an ATM-over-SHDSL Interface Configuration on page 343

ATM-overSHDSL

The symmetric high-speed digital subscriber line (SHDSL) Physical Interface Module (PIM) is available for J-series Services Routers. The PIM supports multi-rate, high-speed, symmetrical digital subscriber line technology for data transfer between a single customer premises equipment (CPE) subscriber and a central office (CO). Unlike ADSL, which was designed for delivering more bandwidth downstream than upstream, SHDSL is symmetrical and delivers a bandwidth of 2.3 Mbps in both directions. The SHDSL PIM has 2 ports and supports ATM-over-SHDSL mode only.

SHDSL is defined in the following specifications from the ITU and the Internet Engineering Task Force (IETF):

- ITU G.991.2, *Single-pair High-speed Digital Subscriber Line (SHDSL) Transceiver*
- ITU G.994.1, *Handshake Procedures for Digital Subscriber Line (DSL) Transceivers*
- ITU G.997.1, *Physical Layer Management for Digital Subscriber Line (DSL) Transceivers*
- RFC 3276, *Definitions of Managed Objects for High Bit-Rate DSL - 2nd generation (HDSL2) and Single-Pair High-Speed Digital Subscriber Line (SHDSL) Lines*

J-series Services Routers with SHDSL Annex A or Annex B PIMs act as a primary WAN link. They use an ATM interface to send network traffic through a point-to-point connection to a DSL-access multiplexer (DSLAM). You can configure Point-to-Point Protocol over Ethernet (PPPoE) over ATM to connect through DSL lines. For more information about configuring PPPoE, see “Configuring PPPoE” on page 641.

ATM-over-SHDSL interfaces are not supported on J2300 Services Routers.



NOTE: You can configure J-series Services Routers with SHDSL PIMs for connections through SHDSL only, not for direct ATM connections.

Configuring ATM Mode for SHDSL Overview

To configure the ATM mode for SHDSL, include the `pic-mode` statement at the [edit chassis `fpc fpc-number` pic 0 shdsl] hierarchy level:

```
[edit chassis]
fpc fpc-number {
  pic 0 {
    shdsl {
      pic-mode (1-port-atm | 2-port-atm);
    }
  }
}
```

For more information about configuring the ATM mode, see the *JUNOS System Basics Configuration Guide* and the *J-series Services Router Advanced WAN Access Configuration Guide*.

To configure SHDSL operating mode on the physical ATM interface and set the encapsulation, include the `shdsl-options` statement and the `encapsulation` statement at the [edit interfaces `at-pim/0/ port`] hierarchy level:

```
[edit interfaces at-pim/0/port]
shdsl-options {
  annex (annex-a | annex-b);
  line-rate line-rate;
  loopback (local remote);
  snr-margin {
    current margin;
    snext margin;
  }
  encapsulation (atm-pvc | ethernet-over-atm)
}
```

To configure ATM virtual path identifier (VPI) options for the interface, include the `vpi` statement at the [edit interfaces `interface-name` atm-options] hierarchy level:

```
[edit interfaces interface-name]
atm-options {
  vpi vpi-identifier {
    maximum-vcs maximum-vcs;
    oam-liveness {
      up-count cells;
      down-count cells;
    }
    oam-period (disable | seconds);
  }
}
```

```
}
```

For more information about configuring ATM VPI options, see “Configuring the Maximum Number of ATM1 VCs on a VP” on page 276.

To configure logical interface properties, include the **encapsulation** statement, **family** statement, and **vci** statement:

```
unit logical-unit-number {
  encapsulation type;
  family inet {
    vci vpi-identifier.vci-identifier;
  }
}
```

You can include these statements at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

Configuring ATM Mode on the PIM

The J-series Services Routers with an SHDSL PIM installed support the 2-port, two-wire mode (Annex A or Annex B). You can configure only one mode on each 2-port SHDSL PIM.



NOTE: G.SHDSL interfaces on a J-series Services Router only support 2-port, two-wire mode. This is enabled by default. The 1-port, 4-wire mode is not supported.

The two-wire mode supports autodetection of the line rate or fixed line rate and network speeds from 192 Kbps to 2.3 Kbps in 64-Kbps increments.

For information about configuring Annex A or Annex B, see “Configuring SHDSL Operating Mode on an ATM Physical Interface” on page 340.

To configure the ATM mode for SHDSL, include the **pic-mode** statement at the [edit chassis *fpc fpc-number* pic 0 shdsl] hierarchy level:

```
[edit chassis]
fpc fpc-number {
  pic 0 {
    shdsl {
      pic-mode 2-port-atm;
    }
  }
}
```

The default is 2-wire mode. If nothing is configured, the SHDSL interface will be configured in 2-wire mode (2-port-atm).

For more information about configuring the `pic-mode` statement, see the *JUNOS System Basics Configuration Guide*. For information about configuring the ATM mode, see the *J-series Services Router Basic LAN and WAN Access Configuration Guide*.

Configuring SHDSL Operating Mode on an ATM Physical Interface

To configure the SHDSL operating mode on the physical ATM interface, include the `shdsl-options` statement at the `[edit interfaces at-pim/0/port]` hierarchy level:

```
[edit interfaces at-pim/0/port]
shdsl-options {
  annex (annex-a | annex-b);
  line-rate line-rate;
  loopback (local | remote);
  snr-margin {
    current margin;
    snext margin;
  }
}
```

Configure the following SHDSL options:

- **annex**—The type of annex:
 - **annex-a**—Use for North American SHDSL network implementations.
 - **annex-b**—Use for European SHDSL network implementations.
- **line-rate**—The SHDSL line rate. The default for 2-wire mode is auto. The default for 4-wire mode is 4608 Kbps.
- **loopback**—A loopback connection, **local** or **remote**.
 - **local**—Use to troubleshoot physical PIC errors. A local loopback loops packets, including both data and timing information, back on the local routing platform's PIM.
 - **remote**—Use to troubleshoot physical circuit problems between the local router and the remote router. A remote loopback loops packets, including both data and timing information, back on the remote routing platform's PIC.
- **snr-margin**— The SHDSL signal-to-noise ratio (SNR) margin, **current** or **snext**. The SNR margin is the difference between the desired SNR and the actual SNR.
 - **current**—Current SNR is the difference between desired SNR and the actual SNR. When configured, the line trains at higher than current noise margin plus SNR threshold.
 - **snext**—Self-near-end crosstalk (SNEXT) SNR margin line trains the line at higher than SNEXT threshold.

Configuring Encapsulation on the ATM Physical Interface

To configure the type of encapsulation for the physical ATM interface, include the `encapsulation` statement at the `[edit interfaces at-pim /O/port]` hierarchy level:

```
[edit interfaces at-pim/O/port]  
encapsulation (atm-pvc | ether-over-atm);
```

Configure one of the following:

- **atm-pvc**—ATM permanent virtual circuits (PVCs), used for PPP over ATM over SHDSL interfaces. This is the default encapsulation.
- **ether-over-atm**—Ethernet over ATM encapsulation. For interfaces that carry IPv4 traffic, use this type of encapsulation.

Configuring Logical Interface Properties

To configure logical interface properties, include the `encapsulation` statement, `family` statement, and `vci` statement:

```
unit logical-unit-number {  
    encapsulation type;  
    family inet {  
        vci vpi-identifier.vci-identifier;  
    }  
}
```

You can include these statements at the following hierarchy levels:

- `[edit interfaces interface-name unit logical-unit-number]`
- `[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number]`

To configure the logical link-layer encapsulation type, include the `encapsulation` statement.

ATM-over-SHDSL interfaces that use `inet` (IP) protocols support the following encapsulations on the logical interface:

- **atm-vc-mux**—Use ATM VC multiplex encapsulation. You can only configure the `inet` family when you use this type of encapsulation.
- **atm-nlpd**—Use ATM network layer protocol ID (NLPD) encapsulation. You can only configure the `inet` family when you use this type of encapsulation.
- **atm-cisco-nlpd**—Use Cisco NLPD encapsulation. You can only configure the `inet` family when you use this type of encapsulation.

ATM-over-SHDSL for PPP over ATM interfaces support the following encapsulations on the logical interface:

- **atm-ppp-llc**—Use ATM PPP over AAL5 logical link control (LLC) encapsulation.

- **atm-ppp-vc-mux**—Use PPP over ATM AAL5 multiplex encapsulation.

ATM-over-SHDSL interfaces also support the following encapsulations on the logical interface:

- **atm-snap**—Use ATM subnetwork attachment point (SNAP) encapsulation.
- **atm-mlppp-llc**—For ATM2 IQ interfaces only, use Multilink PPP (MLPPP) over AAL5 LLC. For this encapsulation type, your routing platform must be equipped with a Link Services or Voice Services PIC. MLPPP over ATM encapsulation is not supported on ATM2 IQ OC48 interfaces.
- **ppp-over-ether-over-atm-llc**—Use PPP over Ethernet over ATM LLC encapsulation. When you use this encapsulation type, you cannot configure the interface address. Instead, you configure the interface address on the PPP interface.
- **family**—The family protocol type.
- **vci**—The virtual channel identifier (VCI) type and value.
- **vci-identifier**—ATM virtual circuit identifier. Unless you configure the interface to use promiscuous mode, this value cannot exceed the largest numbered VC configured for the interface with the **maximum-vc**s option of the **vpi** statement. Specify a VCI identifier from 0 through 4089 or 0 through 65,535 with promiscuous mode. VCIs from 0 through 31 are reserved.
- **vpi-identifier**—ATM virtual path identifier. Specify a VPI from 0 through 255. The default is 0.

Example: Configuring an ATM-over-SHDSL Interface

The following example illustrates an ATM-over-SHDSL interface configuration.

Configuration for the ATM Mode on the PIM

```
[edit chassis]
fpc 6 {
  pic 0 {
    shdsl {
      pic-mode 2-port-atm;
    }
  }
}
```

Configuration for the SHDSL Operating Mode on the Physical ATM Interface

```
[edit interfaces at-6/0/0/0]
shdsl-options {
  annex annex-b;
  line-rate 192;
  loopback local;
  snr-margin {
    current 1;
    snext 2;
  }
}
```


Configuration for the Encapsulation on the Physical ATM Interface

```
[edit interfaces at-6/0/0/0]  
encapsulation ethernet-over-atm;
```

Configuration for the Logical Interface

```
[edit interfaces at-6/0/0/0 unit 3]  
encapsulation atm-nlpid;  
family inet {  
    vci 25;  
}
```

Verifying an ATM-over-SHDSL Interface Configuration

To verify an ATM-over-SHDSL interface configuration, you can issue the following operational mode command:

```
user@host> show interfaces at-pim/0/port extensive
```


Part 5

Configuring Frame Relay Interfaces

- Configuring Frame Relay Interfaces on page 347

Chapter 16

Configuring Frame Relay Interfaces

This chapter discusses configuration of the following Frame Relay properties:

- Overview of Frame Relay Interfaces on page 347
- Configuring Frame Relay Interface Encapsulation on page 348
- Configuring Frame Relay Control Bit Translation on page 351
- Configuring the Media MTU on page 353
- Setting the Protocol MTU on page 353
- Configuring Frame Relay Keepalives on page 353
- Configuring Inverse Frame Relay ARP on page 355
- Configuring the Router as a DCE on page 356
- Configuring Frame Relay DLCIs on page 356

Overview of Frame Relay Interfaces

The Frame Relay protocol allows network designers to reduce costs by using shared facilities that are managed by a Frame Relay service provider. Users pay fixed charges for the local connections from each site in the Frame Relay network to the first point of presence (POP) in which the provider maintains a Frame Relay switch. The portion of the network between the endpoint switches is shared by all the customers of the service provider, and individual data-link connection identifiers (DLCIs) are assigned to ensure each customer receives only their own traffic.

Users contract with their providers for a specific minimum portion of the shared bandwidth Committed Information Rate (CIR) and for a maximum allowable peak rate, Burst Information Rate (BIR). Depending on the terms of the contract, traffic exceeding the CIR can be marked as eligible for discard, in the event of network congestion, or a best effort term can apply up to the BIR rate.

Frame Relay does not require private and permanently connected wide area network facilities, unlike some older WAN protocols.

Frame Relay was developed as a replacement for the older and much slower X.25 protocol. It scales to much higher data rates because it does not require explicit acknowledgment of each frame of data.

You can configure the Frame Relay protocol on SONET/SDH, E1/E3, and T1/T3 physical routing platform interfaces, and on the channelized DS3, channelized OC12,

channelized T3 intelligent queuing (IQ), channelized OC12 IQ, and channelized E1 IQ interfaces.

Configuring Frame Relay Interface Encapsulation

Point-to-Point Protocol (PPP) encapsulation is the default encapsulation type for physical interfaces. You need not configure encapsulation for any physical interfaces that support PPP encapsulation. If you do not configure encapsulation, PPP is used by default. For physical interfaces that do not support PPP encapsulation, you must configure an encapsulation to use for packets transmitted on the interface. You can optionally configure an encapsulation on a logical interface, which is the encapsulation used within certain packet types.

For more information, see the following sections:

- Configuring the Frame Relay Encapsulation on a Physical Interface on page 348
- Configuring the Frame Relay Encapsulation on a Logical Interface on page 351

Configuring the Frame Relay Encapsulation on a Physical Interface

For Frame Relay interfaces, configure Frame Relay encapsulation on the physical interface. This encapsulation is defined in RFC 1490, *Multiprotocol Interconnect over Frame Relay*. SONET/SDH and T3 interfaces can use Frame Relay encapsulation.

To configure Frame Relay encapsulation on a physical interface, include the encapsulation statement at the [edit interfaces *interface-name*] hierarchy level:

```
[edit interfaces interface-name]  
encapsulation type;
```

When you configure a multipoint encapsulation (such as Frame Relay), the physical interface can have multiple logical units, and the units can be either point-to-point or multipoint.

The encapsulation type can be one of the following:

- Flexible Frame Relay (**flexible-frame-relay**)—IQ interfaces can use flexible Frame Relay encapsulation. You use flexible Frame Relay encapsulation when you want to configure multiple per-unit Frame Relay encapsulations. This encapsulation type allows you to configure any combination of TCC, CCC, and standard Frame Relay encapsulations on a single physical port. Also, each logical interface can have any DLCI value from 1 through 1022.
- Frame Relay (**frame-relay**)—Defined in RFC 1490. E1, E3, link services, SONET/SDH, T1, T3, and voice services interfaces can use Frame Relay encapsulation. Five related versions are supported:

- Circuit cross-connect (CCC) version (**frame-relay-ccc**)—The same as standard Frame Relay for DLCIs 0 through 511. DLCIs 512 through 1022 are dedicated to CCC. The logical interface must also have **frame-relay-ccc** encapsulation. When you use this encapsulation type, you can configure the **ccc** family only.
- Translational cross-connect (TCC) version (**frame-relay-tcc**)—Similar to Frame Relay CCC and has the same configuration restrictions, but used for circuits with different media on either side of the connection.
- Extended CCC version (**extended-frame-relay-ccc**)—This encapsulation type allows you to dedicate DLCIs 1 through 1022 to CCC. The logical interface must have **frame-relay-ccc** encapsulation. When you use this encapsulation type, you can configure the **ccc** family only.
- Extended TCC version (**extended-frame-relay-tcc**)—Similar to extended Frame Relay CCC, this encapsulation type allows you to dedicate DLCIs 1 through 1022 to TCC, which is used for circuits with different media on either side of the connection.
- Port CCC version (**frame-relay-port-ccc**)—Defined in the Internet Engineering Task Force (IETF) document, *Frame Relay Encapsulation over Pseudo-Wires* (expired December 2002). This encapsulation type allows you to transparently carry all the DLCIs between two customer edge (CE) routers without explicitly configuring each DLCI on the two provider edge (PE) routers with Frame Relay transport. The connection between the two CE routers can be either user-to-network interface (UNI) or network-to-network interface (NNI); this is completely transparent to the PE routers. The logical interface does not require an encapsulation statement. When you use this encapsulation type, you can configure the **ccc** family only.
- Frame Relay Ether Type (**frame-relay-ether-type**)—Physical interfaces can use Frame Relay ether type encapsulation for compatibility with Cisco Frame Relay. IETF frame relay encapsulation identifies the payload format using NLPID and SNAP formats. Cisco-compatible Frame Relay encapsulation uses the Ethernet type to identify the type of payload. Two related versions are supported:
 - TCC version (**frame-relay-ether-type-tcc**)—Cisco-compatible Frame Relay for DLCIs 0 through 511. DLCIs 512 through 1022 are dedicated to TCC. This numbering restriction does not apply to IQ interfaces. This encapsulation is used for circuits with different media on either side of the connection.
 - Extended TCC version (**extended-frame-relay-ether-type-tcc**)—This encapsulation allows you to dedicate Cisco-compatible Frame Relay TCC for DLCIs 1 through 1022. This encapsulation is used for circuits with different media on either side of the connection. Extended Frame Relay ether type TCC encapsulation is supported on the same PICs as extended Frame Relay TCC encapsulation.



NOTE: When the encapsulation type is set to Cisco-compatible Frame Relay encapsulation, ensure that the LMI type is set to ANSI or Q933-A.

Support for extended Frame Relay and flexible Frame Relay differs by PIC type, as shown in Table 35 on page 350.

Table 35: PIC Support for Enhanced Frame Relay Encapsulation Types

PIC Type	Extended Frame Relay CCC	Extended Frame Relay TCC	Flexible Frame Relay
Intelligent Queuing			
1-port Channelized CHOC12 IQ	Yes	Yes	Yes
4-port Channelized DS3 IQ	Yes	Yes	Yes
10-port Channelized E1 IQ	Yes	Yes	Yes
4-port E3 IQ	Yes	Yes	Yes
1-port Channelized STM1 IQ	Yes	Yes	Yes
SONET/SDH			
1-port OC12	Yes	Yes	No
2-port OC3	Yes	Yes	No
1-port OC48	Yes	Yes	No
1-port OC192	Yes	Yes	No
1-port STM16 SDH, SMSR	Yes	Yes	No
Others			
4-port E1	No	No	No
4-port T1	No	No	No
4-port T3	No	No	No
10-port Channelized E1	No	No	No
2-port Channelized DS3	No	No	No
1-port Channelized OC12, SMIR	No	No	No
4-port Channelized DS3	No	No	No
1-port Channelized STM1, SMIR	No	No	No
2-port Serial	No	No	No

Example: Configuring the Encapsulation on a Physical Interface

Configure Frame Relay encapsulation on a SONET/SDH interface. The second and third family statements allow Intermediate System-to-Intermediate System (IS-IS) and Multiprotocol Label Switching (MPLS) to run on the interface.

```
[edit interfaces]
so-7/0/0 {
```



```

encapsulation frame-relay;
unit 0 {
    point-to-point;
    family inet {
        address 192.168.1.113/32 {
            destination 192.168.1.114;
        }
    }
    family iso;
    family mpls;
}
}

```

Configuring the Frame Relay Encapsulation on a Logical Interface

Generally, you configure an interface's encapsulation at the [edit interfaces *interface-name*] hierarchy level. However, for Frame Relay encapsulation, you can also configure the encapsulation type that is used inside the Frame Relay packet itself. To do this, include the `encapsulation` statement, specifying the `frame-relay-ccc`, `frame-relay-ppp`, `frame-relay-tcc`, `frame-relay-ether-type`, or `frame-relay-ether-type-tcc` option:

```

encapsulation (frame-relay-ccc | frame-relay-ppp | frame-relay-tcc | frame-relay-ether-type
| frame-relay-ether-type-tcc);

```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

Configuring Frame Relay Control Bit Translation

On interfaces with Frame Relay CCC encapsulation, you can configure Frame Relay control bit translation, as defined in the IETF documents:

- Internet draft draft-martini-frame-encap-mpls-00.txt, *Frame Relay Encapsulation over Pseudo-Wires* (expired December 2002)
- Internet draft draft-martini-l2circuit-encap-mpls-07.txt, *Encapsulation Methods for Transport of Layer 2 Frames Over IP and MPLS Networks* (expired December 2004)

To support Frame Relay services over IP and MPLS backbones using Layer 2 VPNs and Layer 2 circuits, you can configure translation of the Frame Relay control bits. When you configure translation of Frame Relay control bits, the bits are mapped into the Layer 2 circuit control word and preserved across the IP or MPLS backbone.

The JUNOS software allows you to translate the following Frame Relay control bits:

- Discard eligibility (DE)—A header bit used to identify lower priority traffic that can be dropped during periods of congestion.

- Forward explicit congestion notification (FECN)—A header bit transmitted by the source routing platform requesting that the destination routing platform slow down its requests for data.
- Backward explicit congestion notification (BECN)—A header bit transmitted by the destination routing platform requesting that the source routing platform send data more slowly.

By default, translation of Frame Relay control bits is disabled. If you enable Frame Relay control bit translation, the bits are translated in both directions (CE to PE and PE to CE):

- From CE to PE—At ingress, the DE, FECN, and BECN header bits from the incoming Frame Relay header are mapped to the control word.
- From PE to CE—At egress, the DE, FECN, and BECN header bits from the control word are mapped to the outgoing Frame Relay header.

The Frame Relay control bits do not map to MPLS EXP labels, and do not affect class-of-service (CoS) behavior inside the provider network.

You enable or explicitly disable translation of Frame Relay control bits by including the `translate-discard-eligible` and `translate-fecn-and-becn` statements:

```
(translate-discard-eligible | no-translate-discard-eligible);
(translate-fecn-and-becn | no-translate-fecn-and-becn);
```

You can include these statements at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* family ccc]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family ccc]

If you enable or disable Frame Relay control bit translation on one CE-facing interface, you must configure the same Frame Relay control bit translation settings on the other CE-facing interface.

If you change the Frame Relay control bit translation settings, the circuit goes down and comes back up, which might result in traffic loss for a few seconds.

If you enable Frame Relay control bit translation, the number of supportable Layer 2 virtual private networks (VPNs) and Layer 2 circuits is reduced to one eighth of what the routing platform can support without Frame Relay control bit translation enabled.

For ATM2 IQ interfaces, the control word contains a field to carry ATM cell loss priority (CLP) information by default. For more information, see “Configuring Layer 2 Circuit Transport Mode” on page 276.

For more information about Layer 2 circuits, see the *JUNOS VPNs Configuration Guide* and the *JUNOS Routing Protocols Configuration Guide*. For a comprehensive example, see the *JUNOS Feature Guide*.

Configuring the Media MTU

For Frame Relay interfaces, the default media maximum transmission unit (MTU) is 4482 bytes. (For a complete list of MTU values, see “Configuring the Media MTU” on page 89.)

To modify the default media MTU size for a physical interface, include the `mtu` statement at the `[edit interfaces interface-name]` hierarchy level:

```
[edit interfaces interface-name]  
mtu bytes;
```

If you change the size of the media MTU, you must ensure that the size is equal to or greater than the sum of the protocol MTU and the encapsulation overhead. You can include the `mtu` statement at the following hierarchy levels:

- `[edit interfaces interface-name unit logical-unit-number family family]`
- `[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number family family]`

For more information, see “Setting the Protocol MTU” on page 353.

Setting the Protocol MTU

For each interface, you can configure an interface-specific MTU by including the `mtu` statement at the `[edit interfaces interface interface-name]` hierarchy level. If you need to modify this MTU for a particular protocol family, include the `mtu` statement:

```
mtu mtu;
```

You can include this statement at the following hierarchy levels:

- `[edit interfaces interface-name unit logical-unit-number family family]`
- `[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number family family]`

For Frame Relay encapsulation, the default protocol MTU is 4470 bytes.

If you increase the size of the protocol MTU, you must ensure that the size of the media MTU is equal to or greater than the sum of the protocol MTU and the encapsulation overhead. (You configure the media MTU by including the `mtu` statement at the `[edit interfaces interface-name]` hierarchy level, as discussed in “Configuring the Media MTU” on page 353.)

When the family is `mpls`, the default protocol MTU is 1488 bytes. MPLS packets are 1500 bytes and have 4 to 12 bytes of overhead.

Configuring Frame Relay Keepalives

By default, physical interfaces configured with Cisco High-level Data Link Control (HDLC) or Point-to-Point Protocol (PPP) encapsulation send keepalive packets at

10-second intervals. The Frame Relay term for keepalives is Local Management Interface (LMI) packets; note that the JUNOS software supports both ANSI T1.617 Annex D LMIs and ITU Q933 Annex A LMIs.

To disable the sending of keepalives on a physical interface, include the `no-keepalives` statement at the `[edit interfaces interface-name]` hierarchy level:

```
[edit interfaces interface-name]
no-keepalives;
```

For back-to-back Frame Relay connections, either disable the sending of keepalives on both sides of the connection, or configure one side of the connection as a data terminal equipment (DTE) (the default JUNOS configuration) and the other as a data circuit-terminating equipment (DCE).

If keepalives are enabled, the number of possible DLCI configurations on a multipoint or multicast connection is limited by the MTU size selected for the interface. To calculate the available DLCIs, use the formula $(MTU - 12) / 5$. To increase the number of possible DLCIs, disable keepalives.

Configuring Tunable Keepalives for Frame Relay LMI

On interfaces configured with Frame Relay connections, you can tune the keepalive settings by using the `lmi` statement. A Frame Relay interface can be either DCE or DTE (the default JUNOS configuration). DTE acts as a master, requesting status from the DCE part of the link.

By default, the JUNOS software uses ANSI T1.617 Annex D LMIs. To change to ITU Q933 Annex A LMIs, include the `lmi-type itu` statement at the `[edit interfaces interface-name lmi]` hierarchy level:

```
[edit interfaces interface-name lmi]
lmi-type itu;
```

To configure Frame Relay keepalive parameters, include the `lmi` statement at the `[edit interfaces interface-name]` hierarchy level:

```
[edit interfaces interface-name]
lmi {
  lmi-type (ansi | itu);
  n391dte number;
  n392dce number;
  n392dte number;
  n393dce number;
  n393dte number;
  t391dte seconds;
  t392dce seconds;
}
```

You can include the following statements:

- **n391dte**—DTE full status polling interval. The DTE sends a status inquiry to the DCE at the interval specified by **t391dte**. **n391dte** specifies the frequency at which these inquiries expect a full status report; for example, a **n391dte** value of 10 would specify a full status report in response to every tenth inquiry. The intermediate inquiries ask for a keepalive exchange only. The range is from 1 through 255, with a default value of 6.
- **n392dce**—DCE error threshold. The number of errors required to bring down the link, within the event-count specified by **n393dce**. The range is from 1 through 10, with a default value of 3.
- **n392dte**—DTE error threshold. The number of errors required to bring down the link, within the event-count specified by **n393dte**. The range is from 1 through 10, with a default value of 3.
- **n393dce**—DCE monitored event-count. The range is from 1 through 10, with a default value of 4.
- **n393dte**—DTE monitored event-count. The range is from 1 through 10, with a default value of 4.
- **t391dte**—DTE keepalive timer. Period at which the DTE sends out a keepalive response request to the DCE and updates status depending on the DTE error threshold value. The range is from 5 through 30 seconds, with a default value of 10 seconds.
- **t392dce**—DCE keepalive timer. Period at which the DCE checks for keepalive responses from the DTE and updates status depending on the DCE error threshold value. The range is from 5 through 30 seconds, with a default value of 15 seconds.

Configuring Inverse Frame Relay ARP

Frame Relay interfaces support inverse Frame Relay ARP, as described in RFC 2390, *Inverse Address Resolution Protocol*. When inverse Frame Relay ARP is enabled, the routing platform responds to received inverse Frame Relay ARP requests by providing IP address information to the requesting routing platform on the other end of the Frame permanent virtual circuit (PVC).

The routing platform does not initiate inverse Frame Relay ARP requests.

By default, inverse Frame Relay ARP is disabled. To configure a routing platform to respond to inverse Frame Relay ARP requests, include the **inverse-arp** statement:

```
inverse-arp;
```

For a list of hierarchy levels at which you can include this statement, see **inverse-arp**.

You must configure Frame Relay encapsulation on the logical interface to support inverse ARP. For more information, see “Configuring Frame Relay Interface Encapsulation” on page 348.

Configuring the Router as a DCE

By default, when you configure an interface with Frame Relay encapsulation, the routing platform is assumed to be DTE. That is, the routing platform is assumed to be at a terminal point on the network. To configure the routing platform to be DCE, include the `dce` statement at the `[edit interfaces interface-name]` hierarchy level:

```
[edit interfaces interface-name]  
dce;
```

When you configure the routing platform to be a DCE, keepalives are disabled by default.

For back-to-back Frame Relay connections, either disable the sending of keepalives on both sides of the connection, or configure one side of the connection as a DCE and the other as a DTE by removing the `dce` statement from the configuration (the default JUNOS configuration).

Configuring Frame Relay DLCIs

When you are using Frame Relay encapsulation on an interface, each logical interface corresponds to one or more permanent virtual circuits (PVCs) or switched virtual circuits (SVCs). For each PVC or SVC, you must configure one data-link connection identifier (DLCI).

A Frame Relay interface can be a point-to-point interface or a point-to-multipoint (also called a multipoint nonbroadcast multiaccess [NBMA]) connection.

To configure Frame Relay DLCIs, you can do the following:

- Configuring a Point-to-Point Frame Relay Connection on page 356
- Configuring a Point-to-Multipoint Frame Relay Connection on page 357
- Configuring a Multicast-Capable Frame Relay Connection on page 357

Configuring a Point-to-Point Frame Relay Connection

To configure a point-to-point Frame Relay connection, include the `dlci` statement:

```
dlci dlci-identifier;
```

You can include this statement at the following hierarchy levels:

- `[edit interfaces interface-name unit logical-unit-number]`
- `[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number]`

The DLCI identifier is a value from 16 through 1022. Numbers 1 through 15 are reserved for future use. A point-to-point interface can have one DLCI.



NOTE: For information about Frame Relay DLCI limitations for channelized interfaces, see “Data-Link Connection Identifiers on Channelized Interfaces” on page 362.

You configure the routing platform to use DLCI sparse mode by including the **sparse-dlcis** statement at the `[edit chassis fpc slot-number pic pic-number]` hierarchy level. For more information about DLCI sparse mode, see the *JUNOS System Basics Configuration Guide*.

For more information about Frame Relay DLCIs, see “Configuring a Point-to-Point Frame Relay Connection” on page 356.

When you are configuring point-to-point connections, the MTU sizes on both sides of the connection must be the same.

Configuring a Point-to-Multipoint Frame Relay Connection

To configure a point-to-multipoint Frame Relay connection (also called a multipoint NBMA connection), include the **multipoint-destination** statement:

```
multipoint-destination address dlci dlci-identifier;
```

You can include this statement at the following hierarchy levels:

- `[edit interfaces interface-name unit logical-unit-number family family address address]`
- `[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number family family address address]`

For each destination, include one **multipoint-destination** statement. **address** is the address of the remote side of the connection, and **dlci-identifier** is the DLCI identifier for the connection.

When you are configuring point-to-multipoint connections, all interfaces in the subnet must use the same MTU size.

If keepalives are enabled, causing the interface to send LMI messages during idle times, the number of possible DLCI configurations is limited by the MTU selected for the interface. For more information, see “Configuring Frame Relay Keepalives” on page 353.

Configuring a Multicast-Capable Frame Relay Connection

By default, Frame Relay connections assume unicast traffic. If your Frame Relay switch performs multicast replication, you can configure the connection to support multicast traffic by including the **multicast-dlci** statement:

```
multicast-dlci dlci-identifier;
```

You can include this statement at the following hierarchy levels:

- `[edit interfaces interface-name unit logical-unit-number]`

- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

The DLCI identifier is a value from 16 through 1022 that defines the Frame Relay DLCI over which the switch expects to receive multicast packets for replication.

You can configure multicast support only on point-to-multipoint Frame Relay connections.

If keepalives are enabled, causing the interface to send LMI messages during idle times, the number of possible DLCI configurations is limited by the MTU selected for the interface. For more information, see “Configuring Frame Relay Keepalives” on page 353.

Part 6

Configuring Channelized Interfaces

- Configuring Channelized Interfaces on page 361
- Configuring Channelized E1 Interfaces on page 377
- Configuring Channelized E1 PRI and T1 PRI Interfaces on page 385
- Configuring Channelized OC3 IQ and IQE Interfaces on page 393
- Configuring Channelized OC12 Interfaces on page 401
- Configuring Channelized STM1 Interfaces on page 423
- Configuring Channelized T1 IQ Interfaces on page 437
- Configuring Channelized T3 Interfaces on page 443

Chapter 17

Configuring Channelized Interfaces

This chapter provides a high-level overview of channelized interfaces, focusing mainly on the capabilities, properties, and structure of channelized IQ and IQE interfaces:

- Overview of Channelized Interfaces on page 361
- Channelized Interface Capabilities on page 361
- Data-Link Connection Identifiers on Channelized Interfaces on page 362
- Clock Sources on Channelized Interfaces on page 364
- Channelized E1 and T1 PIM Properties on page 366
- Channelized IQ and IQE Interfaces Properties on page 367
- Structure of Channelized IQ and Channelized IQE PICs on page 369

Overview of Channelized Interfaces

Channelized interfaces enable you to configure a number of individual channels that subdivide the bandwidth of a larger interface and minimize the number of Physical Interface Cards (PICs) that an installation requires.



NOTE: Channelized intelligent queuing (IQ) and channelized enhanced intelligent queuing (IQE) interfaces require M-series Enhanced Flexible PIC Concentrators (FPCs).

Wherever JUNOS configuration guides refer to channelized interfaces and PICs without the “intelligent queuing IQ”, or “IQE” descriptor, they are referring to the original channelized interfaces and PICs.

For SONET/SDH interfaces you configure on Channelized OC3 IQ, Channelized OC3 IQE, Channelized OC12 IQ, Channelized OC12 IQE, Channelized STM1 IQ, and Channelized STM1 IQE PICs, aggregated SONET is not supported.

For channelized IQ and IQE logical interfaces, you can configure class of service (CoS). For more information, see the *JUNOS Class of Service Configuration Guide*.

Channelized Interface Capabilities

You can configure each port of a channelized IQ or IQE PIC as a single interface that uses the entire available bandwidth, or partition each port into smaller data channels.

In either case, you start with a channelized interface (designated by a **c** in the interface name, as in **coc12**). From the channelized interfaces, you configure data channels. Following are the channelized interface names and data-channel interface names associated with channelized IQ and IQE PICs.

Channelized Interface Names

This section lists the channelized interface names.

- **coc12-fpc/pic/port**—Channelized OC12 interface. Configure on a Channelized OC12 IQ or IQE PIC.
- **coc1-fpc/pic/port:channel**—Channelized OC1 interface. Configure on a Channelized OC3 IQ or IQE PIC or Channelized OC12 IQ or IQE PIC.
- **ct3-fpc/pic/port:channel**—Channelized T3 interface. Configure on a Channelized OC3 IQ or IQE, Channelized OC12 IQ or IQE, or Channelized DS3 IQ or IQE PIC.
- **cstm1-fpc/pic/port**—Channelized STM1 interface. Configure on a Channelized STM1 IQ or IQE PIC.
- **cau4-fpc/pic/port:channel**—Channelized AU-4 IQ interface. Configure on a Channelized STM1 IQ or IQE PIC.
- **ct1-fpc/pic/port:channel**—Channelized T1 interface. Configure on a Channelized OC3 IQ or IQE, Channelized OC12 IQ or IQE, Channelized T1 IQ, or Channelized DS3 IQ or IQE PIC.
- **ce1-fpc/pic/port:channel**—Channelized E1 interface. Configure on a Channelized E1 IQ or a Channelized STM1 IQ or IQE PIC.

Data-Channel Interface Names

This section lists the data-channel interface names.

- **e1-fpc/pic/port:channel**—E1 channel. Configure on a Channelized E1 IQ or a Channelized STM1 IQ or IQE PIC.
- **ds-fpc/pic/port:channel**—NxDS0 channel. Configure on a Channelized OC3 IQ or IQE, Channelized OC12 IQ or IQE, Channelized STM1 IQ or IQE, Channelized DS3 IQ or IQE, or Channelized E1 IQ PIC.
- **so-fpc/pic/port:channel**—SONET/SDH channel. Configure one OC3 channel on a Channelized OC3 IQ or IQE, four OC3 channels on a Channelized OC12 IQ or IQE, one OC12 channel on a Channelized OC12 IQ or IQE, or one STM1 channel on a Channelized STM1 IQ or IQE PIC.
- **t1-fpc/pic/port:channel**—T1 channel. Configure on a Channelized OC3 IQ or IQE, Channelized OC12 IQ or IQE, or Channelized DS3 IQ or IQE PIC.
- **t3-fpc/pic/port:channel**—T3 channel. Configure on a Channelized OC3 IQ or IQE, Channelized OC12 IQ or IQE, or Channelized DS3 IQ or IQE PIC.

Data-Link Connection Identifiers on Channelized Interfaces

If you use Frame Relay encapsulation on a channelized interface, see Table 36 on page 363 for the maximum number of data-link connection identifiers (DLCIs) per channel that you can configure at each channel level for various channelized PICs.



NOTE: The actual number of DLCIs you can configure for each channel is determined by the capabilities of your system, such as the number and types of PICs installed. If the number of DLCIs in the configuration exceeds the capabilities of your system, the routing platform might not be able to support the maximum DLCI values shown in Table 36 on page 363. To determine the capabilities of your system, please contact Juniper Networks customer support.

Table 36: Frame Relay DLCI Limitations for Channelized Interfaces

PIC Types	Number of DLCIs per Level	Range
Original Channelized PICs		
DS0 level channels	■ 3 for sparse mode	■ 1–1022 for sparse mode (0 is reserved for the Local Management Interface [LMI])
T3 and T1 level channels	■ 63 for regular mode ■ 3 for sparse mode	■ 1–63 for regular mode ■ 1–1022 for sparse mode (0 is reserved for the LMI)
Channelized IQ and IQE PICs		
DS0 level channels (Channelized DS3 IQ or IQE, Channelized STM1 IQ or IQE, Channelized E1 IQ, Channelized OC3 IQ or IQE, or Channelized OC12 IQ or IQE PICs)	■ 16	■ 1–1022 (0 is reserved for the LMI)
E1 level channels (Channelized E1 IQ PIC)	■ 64	■ 1–1022 (0 is reserved for the LMI)
E1 level channels (Channelized STM1 IQ or IQE PIC)	■ 64	■ 1–1022 (0 is reserved for the LMI)
OC3 level channels (Channelized OC3 IQ or IQE, or Channelized OC12 IQ or IQE PIC)	■ 1023	■ 1–1022 (0 is reserved for the LMI)
OC12 level channels (Channelized OC12 IQ or IQE PIC)	■ 1023	■ 1–1022 (0 is reserved for the LMI)
STM1 level channel (Channelized STM1 IQ or IQE PIC)	■ 1023	■ 1–1022 (0 is reserved for the LMI)
T1 level channels (Channelized DS3 IQ or IQE PIC)	■ 64	■ 1–1022 (0 is reserved for the LMI)
T1 level channels (Channelized OC3 IQ or IQE, or Channelized OC12 IQ or IQE PIC)	■ 64	■ 1–1022 (0 is reserved for the LMI)
T3 level channel (Channelized DS3 IQ or IQE, Channelized OC3 IQ or IQE, or Channelized OC12 IQ or IQE PIC)	■ 256	■ 1–1022 (0 is reserved for the LMI)

Clock Sources on Channelized Interfaces

Channelized interfaces and channelized IQ and IQE interfaces have different clocking capabilities. For channelized IQ and IQE interfaces, you can configure clocking on each interface independently by including the **clocking** (**internal** | **external**) statement at the [edit interfaces *interface-name*] hierarchy level.

For channelized IQ and IQE interfaces, clocking is provided as follows:

- For all channelized IQ and IQE PICs, the **clocking** statement is supported on all channels. To configure SONET/SDH or DS3-level clocking, include the **loop-timing** statement at the [edit interfaces *cstm1-fpc/pic/port* **sonet-options**] or [edit interfaces *ct3-fpc/pic/port* **t3-options**] hierarchy level. To configure clocking on individual interfaces, include the **clocking** statement at the [edit interfaces *type-fpc/pic/port:channel*] hierarchy level. If you do not include the **clocking** statement, the individual interfaces use internal clocking by default.
- SONET/SDH-level clocking is provided at the [edit interfaces *coc3-fpc/pic/port*], [edit interfaces *coc12-fpc/pic/port*], and [edit interfaces *cstm1-fpc/pic/port*] hierarchy levels.
- Configure T3-level clocking by including the **loop-timing** statement at the [edit interfaces *ct3-fpc/pic/port* **t3-options**] hierarchy level.
- Configure T1-level clocking by including the **clocking** statement at the [edit interfaces *t1-fpc/pic/port:channel*] hierarchy level.
- Configure E1-level clocking by including the **clocking** statement at the [edit interfaces *ce1-fpc/pic/port*] hierarchy level.
- Configure clocking for all NxDS0 channels by including the **clocking** statement at the [edit interfaces *ct1-fpc/pic/port:channel*] or [edit interfaces *ce1-fpc/pic/port*] hierarchy level.
- The **clocking** statement is ignored if you include it at the [edit interfaces *coc1-fpc/pic/port:channel*] or [edit interfaces *cau4-fpc/pic/port:channel*] hierarchy level.
- If you include the **clocking** statement at both the channelized and interface levels—[edit interfaces *coc12-fpc/pic/port*] and [edit interfaces *so-fpc/pic/port*], for example—the clocking configuration at the channelized level ([edit interfaces *coc12-fpc/pic/port*] in this example) takes precedence.

For non-IQ and non-IQE channelized interfaces, clocking at each channel level is provided as follows:

- For Channelized OC12, DS3, and E1 PICs, the **clocking** statement is supported only for channel 0; it is ignored if included in the configuration of other channels. The clock source configured for channel 0 applies to all channels on these channelized interfaces.
- For the Channelized STM1 PIC, the **clocking** statement is supported on channels 0 through 62. To configure clocking on the STM1 interface, include the **loop-timing** statement at the [edit interfaces *e1-fpc/pic/port :0* **sonet-options**] hierarchy level. To configure clocking on individual E1 interfaces, include the **clocking** statement at the [edit interfaces *e1-fpc/pic/port:channel*] hierarchy level. The channel number

can be 0 through 62. If you do not include the **clocking** statement, the individual E1 interfaces use internal clocking by default.

- For channelized STM1 interfaces, you should configure the clock source at one side of the connection to be internal and configure the other side of the connection to be external.
- When you configure the clock source for a channelized interface—**t3-fpc/pic/port:0**, for example—you must also include the **channel-group** statement at the [edit chassis] hierarchy level, and specify channel group 0.

Table 37 on page 365 lists the clocking capabilities for each channelized PIC.

Table 37: Clocking Capabilities by Channelized PIC Type

PIC Type	SONET/SDH Level	DS3 Level	DS1/E1 Level
Channelized PICs			
Channelized DS3 and Multichannel DS3	Not applicable.	The loop-timing statement is supported at the [edit interfaces t1-fpc/pic/port:0 t3-options] or [edit interfaces fpc/pic/port:0:0 t3-options] hierarchy level.	The clocking statement is supported at the [edit interfaces t1-fpc/pic/port:0] or [edit interfaces ds-fpc/pic/port:0:0] hierarchy level.
Channelized E1	Not applicable.	Not applicable.	The clocking statement is supported at the [edit interfaces e1-fpc/pic/port:0] or [edit interfaces ds-fpc/pic/port:0] hierarchy level.
Channelized OC12	Not configurable.	The clocking statement is supported at the [edit interfaces t3-fpc/pic/port:0] hierarchy level.	Not applicable.
Channelized STM1	Not configurable.	Not applicable.	The clocking statement is supported at the [edit interfaces e1-fpc/pic/port:[0-62]] hierarchy level.
Channelized IQ and IQE PICs			
Channelized DS3 IQ or IQE	Not applicable.	<p>The clocking statement is supported at the [edit interfaces ct3-fpc/pic/port] hierarchy level.</p> <p>The clocking statement is ignored if you include it at the [edit interfaces t3-fpc/pic/port] hierarchy level.</p>	<p>For T1 channels, the clocking statement is supported at the [edit interfaces t1-fpc/pic/port:[1-28]] hierarchy level.</p> <p>For NxDS0 channels, the clocking statement is supported at the [edit interfaces ct1-fpc/pic/port:[1-28]] hierarchy level.</p>

Table 37: Clocking Capabilities by Channelized PIC Type (*continued*)

PIC Type	SONET/SDH Level	DS3 Level	DS1/E1 Level
Channelized E1 IQ	Not applicable.	Not applicable.	For E1 and NxDS0 channels, the clocking statement is supported at the [edit interfaces ce1-fpc/pic/port] hierarchy level. The clocking statement is ignored if you include it at the [edit interfaces e1-fpc/pic/port] hierarchy level.
Channelized OC3 IQ or IQE	The clocking statement is supported at the [edit interfaces coc3-fpc/pic/port] hierarchy level. The clocking statement is ignored if you include it at the [edit interfaces so-fpc/pic/port] hierarchy level.	The clocking statement is supported at the [edit interfaces t3-fpc/pic/port:[1-12]] hierarchy level. The clocking statement is ignored if you include it at the [edit interfaces coc1-fpc/pic/port:channel] hierarchy level.	The clocking statement is supported at the [edit interfaces ct1-fpc/pic/port:[1-12]:[1-28]] and [edit interfaces t1-fpc/pic/port:[1-12]:[1-28]] hierarchy levels.
Channelized OC12 IQ or IQE	The clocking statement is supported at the [edit interfaces coc12-fpc/pic/port] hierarchy level. The clocking statement is ignored if you include it at the [edit interfaces so-fpc/pic/port] hierarchy level.	The clocking statement is supported at the [edit interfaces t3-fpc/pic/port:[1-12]] hierarchy level. The clocking statement is ignored if you include it at the [edit interfaces coc1-fpc/pic/port:channel] hierarchy level.	The clocking statement is supported at the [edit interfaces ct1-fpc/pic/port:[1-12]:[1-28]] and [edit interfaces t1-fpc/pic/port:[1-12]:[1-28]] hierarchy levels.
Channelized STM1 IQ or IQE	The clocking statement is supported at the [edit interfaces cstm1-fpc/pic/port] hierarchy level. The clocking statement is ignored if you include it at the [edit interfaces cau4-fpc/pic/port:channel] or [edit interfaces so-fpc/pic/port] hierarchy level.	Not applicable.	For E1 and NxDS0 channels, the clocking statement is supported at the [edit interfaces ce1-fpc/pic/port[1-63]] hierarchy level. The clocking statement is ignored if you include it at the [edit interfaces e1-fpc/pic/port] hierarchy level.

Channelized E1 and T1 PIM Properties

Channelized E1 and T1 PIMs on J-series Services Routers provide support for ISDN Primary Rate Interface (PRI) connectivity for dial-in and callback and for use as primary or backup network connections. You can configure up to 30 channelized E1 time slots (**ce1-pim/0/port**) or 23 channelized T1 time slots (**ct1-pim/0/port**) as an ISDN PRI group, with the 16th E1 time slot or the 24th T1 time slot operating as the D-channel to control the group of time slots as B-channels. These B-channels can

operate unconfigured. The encapsulation type **multilink-ppp**, **cisco-hdlc**, or **ppp** is configured under the dialer interface.

For more information about configuring the dialer interface, see “Configuring ISDN Logical Interface Properties” on page 661.

E1 and T1 time slots unused by ISDN PRI can operate normally as DS0 interfaces. PRI B-channels run at 64 Kbps, but do not support the 56-Kbps line rate.

For more information about Channelized E1 PIMs, ISDN PRI connectivity, and the ISDN features they support, see the *J-series Services Router Basic LAN and WAN Access Configuration Guide*.

Channelized IQ and IQE Interfaces Properties

On channelized IQ and IQE interfaces, you can specify options that are globally applied to all interface types associated with channelized IQ and IQE interfaces. For example, **e1-options** statements that you include at the **[edit interfaces ce1-fpc/pic/port]** hierarchy level apply globally to all E1 and NxDS0 interfaces that you create by partitioning **ce1-fpc/pic/port**. Likewise, **t3-options** statements that you include at the **[edit interfaces ct3-fpc/pic/port]** hierarchy level apply globally to all T1 and NxDS0 interfaces that you create by partitioning **ct3-fpc/pic/port**.

You can also apply interface options at the channel level. For example, you can include **t1-options** statements at the **[edit interfaces t1-fpc/pic/port <:channel>]** hierarchy level, and **ds0-options** statements at the **[edit interfaces ds-0/1/1<:channel>]** hierarchy level.

Only a subset of the interface options is valid on each type of channelized IQ interface. You configure all HDLC information at the end-data channel level, not at the parent level. For example, configure HDLC information at the **[edit interfaces ds-fpc/pic/port<:channel>]** hierarchy level, not at the **[edit interfaces ct1-fpc/pic/port<:channel>]** hierarchy level.

Automatic Protection Switching (APS) is supported on channelized STM1 IQ interfaces and channelized OC12 IQ interfaces. To configure APS, include the **aps** statement with options at the **[edit interfaces interface-name sonet-options]** hierarchy level. For information about configuring APS, see “Configuring APS and MSP” on page 694.

In interchassis and intrachassis redundant LSQ configurations that use MLPPP and SONET APS, you can inhibit a router from sending PPP termination-request messages to the remote host if the link PIC fails. To inhibit the router from sending PPP termination-request messages to the remote host if the link PIC fails, include the **no-termination-request** statement at the **[edit interfaces interface-name ppp-options]** hierarchy level.

The **no-termination-request** statement is supported only with MLPPP and SONET APS configurations and works with PPP, PPP over Frame Relay, and MLPPP interfaces only. The supported PIC types are as follows:

- Channelized OC3 IQ and IQE PICs
- Channelized OC12 IQ and IQE PICs

- Channelized STM1 IQ and IQE PICs
- Channelized STM4 IQ and IQE PICs

Channelized IQ and IQE interfaces do not support receive buckets or transmit buckets.

For channelized IQ and IQE interfaces, there are some limitations on where you place certain statements in the configuration. When you configure clocking, bit error rate testing (BERT), C-bit parity, and loopback statements on T3, T1, or DS0 channels, you must follow these guidelines:

- For T3 IQ interfaces, you can include the `loopback payload` statement at the `[edit interfaces ct3-fpc/pic/port]` and `[edit interfaces t3-fpc/pic/port:channel]` hierarchy levels. For T1 interfaces, you can include the `loopback payload` statement at the `[edit interfaces t1-fpc/pic/port:channel]` hierarchy level; it is ignored if included at the `[edit interfaces ct1-fpc/pic/port]` hierarchy level. For NxDS0 interfaces, payload and remote loopback are the same. If you configure one, the other is ignored. NxDS0 IQ interfaces do not support local loopback.
- If you include clocking, BERT, and C-bit parity configurations at both the `[edit interfaces ct3-fpc/pic/port<:channel> t3-options]` and `[edit interfaces t3-fpc/pic/port<:channel> t3-options]` hierarchy levels, the channelized T3-level statements are valid, and the T3-level statements are ignored.
- If you include clocking, BERT, and C-bit parity configurations at both the `[edit interfaces ct3-fpc/pic/port<:channel> t3-options]` and `[edit interfaces t1-fpc/pic/port<:channel> t1-options]` hierarchy levels, the channelized T3-level statements are operational for the T3 connections and the T1-level statements are operational for the T1 connections.
- Because DS0 channels do not have clocking capability, you must configure clocking at the `[edit interfaces ct1-fpc/pic/port<:channel> t1-options]` or `[edit interfaces ce1-fpc/pic/port<:channel> e1-options]` hierarchy level for channelized NxDS0 IQ interfaces.
- You can set BERT at the `[edit interfaces t3-fpc/pic/port<:channel> t3-options]` hierarchy level or on any partitioned channel of the channelized T3 interface. There are twelve BERT patterns available for NxDS0 channels and twenty-eight BERT patterns for T1, channelized T1, T3, and channelized T3 interfaces within channelized IQ interfaces.
- For channelized interfaces that use Frame Relay encapsulation, the number of configurable DLCIs varies by channelized interface type.
- For channelized interfaces, you can configure class of service (CoS) on channels, but not at the controller level.
- For original Channelized OC12 PICs, limited CoS functionality is supported. For more information, contact Juniper Networks customer support.
- CoS is not configurable on the following channelized interfaces:
 - `cau4`—Channelized STM1 IQ interface (configured on the Channelized STM1 IQ and IQE PICs).
 - `coc1`—Channelized OC1 IQ interface (configured on the Channelized OC12 IQ and IQE PICs).

- **coc12**—Channelized OC12 IQ interface (configured on the Channelized OC12 IQ and IQE PICs).
- **cstm1**—Channelized STM1 IQ interface (configured on the Channelized STM1 IQ and IQE PICs).
- **ct1**—Channelized T1 IQ interface (configured on the Channelized DS3 IQ and IQE PIC or Channelized OC12 IQ and IQE PICs).
- **ct3**—Channelized T3 IQ interface (configured on the Channelized DS3 IQ and IQE PICs or Channelized OC12 IQ and IQE PICs).
- **ce1**—Channelized E1 IQ interface (configured on the Channelized E1 IQ and IQE PICs or Channelized STM1 IQ and IQE PICs).

Structure of Channelized IQ and Channellized IQE PICs

Figure 20 on page 369 to Figure 29 on page 373 show the structural organization of the Channelized PICs, channelized IQ PICs, and channelized IQE PICs. Table 38 on page 373 shows the structure of all channelized PICs, including channelized PICs, channelized IQ PICs, and channelized IQE PICs.

Figure 20: Structure of the Channelized OC3 IQ PIC

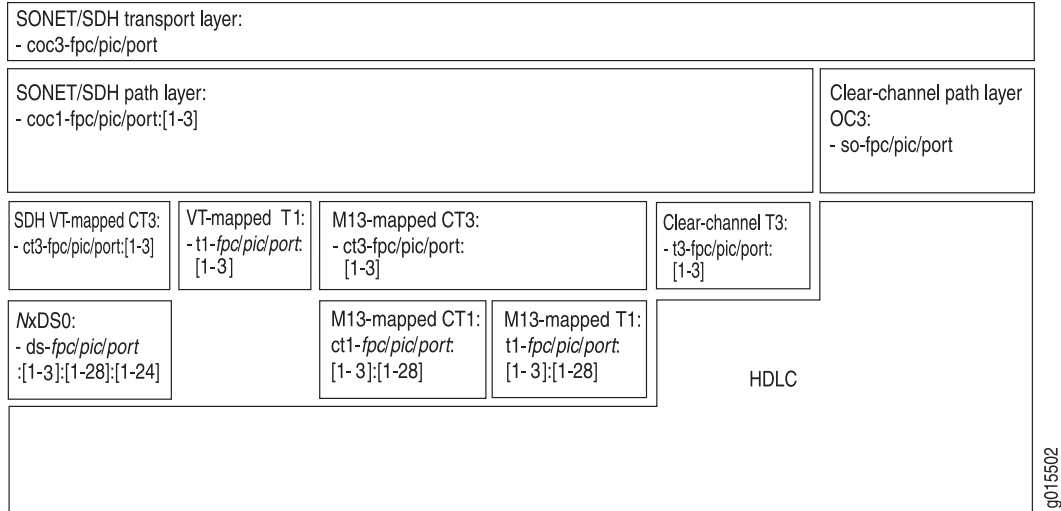


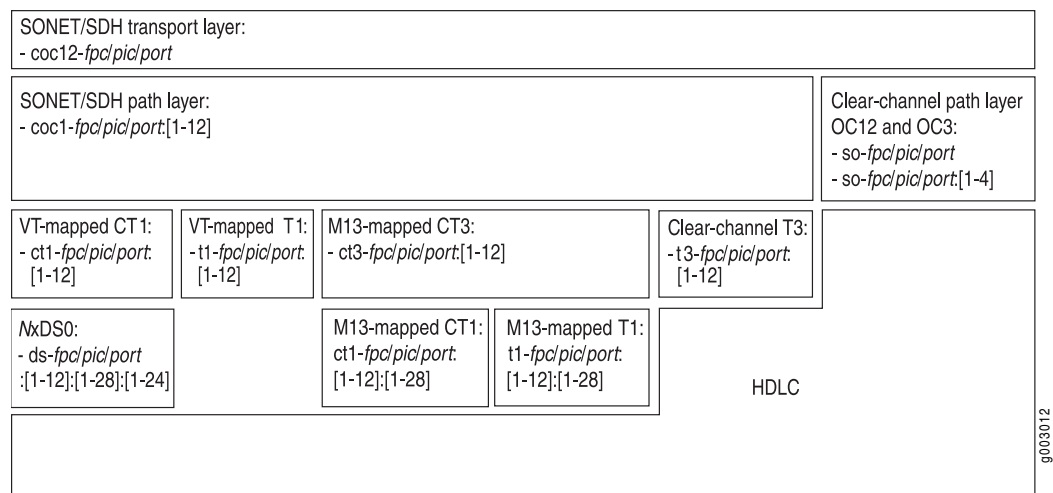
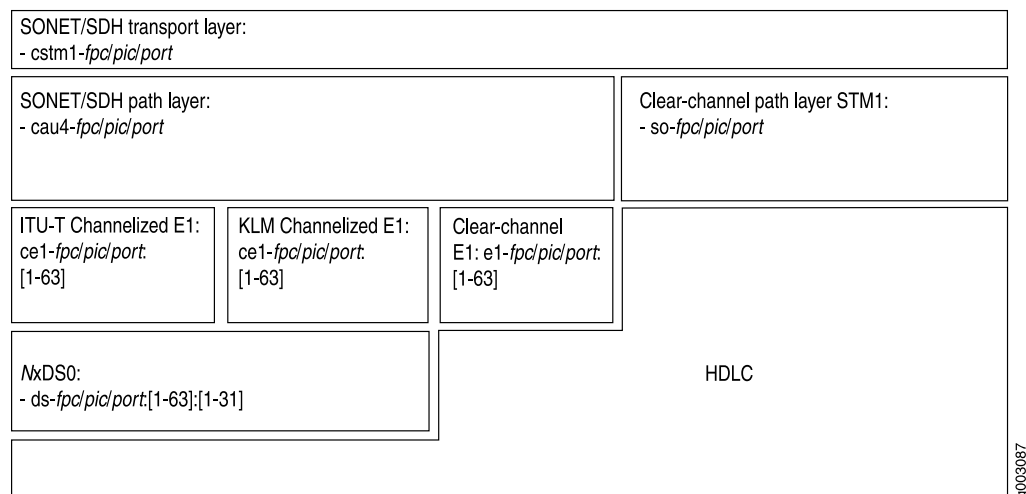
Figure 21: Structure of the Channelized OC12 IQ PIC**Figure 22: Structure of the Channelized STM1 IQ PIC**

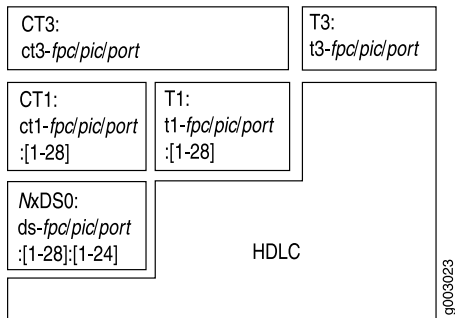
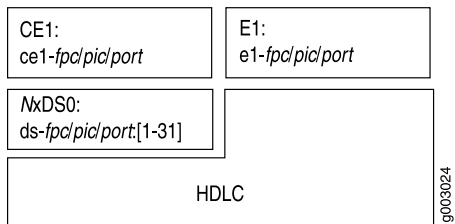
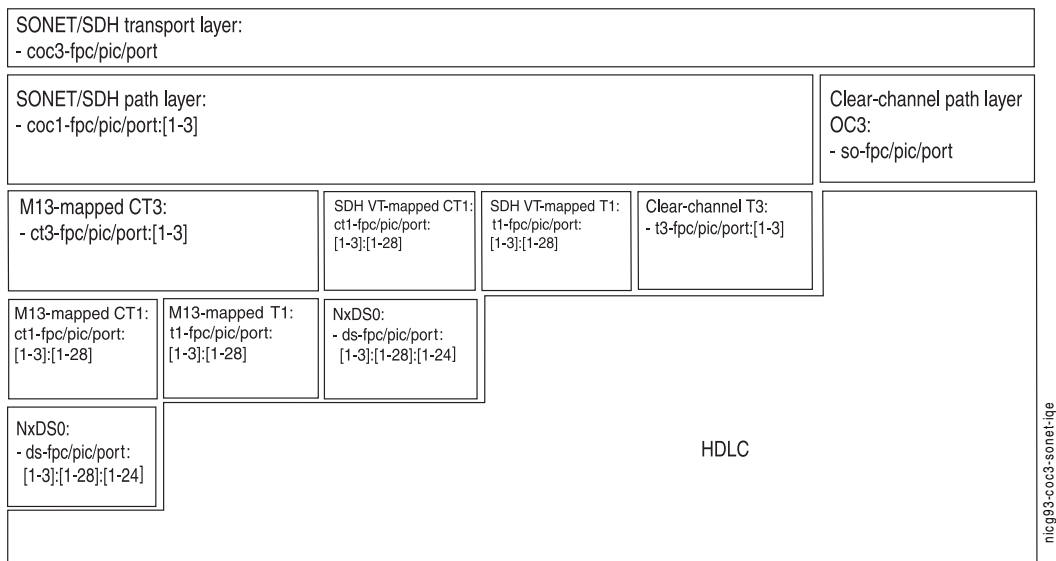
Figure 23: Structure of the Channelized DS3 IQ PIC**Figure 24: Structure of the Channelized E1 IQ PIC****Figure 25: Structure of the Channelized OC3/STM1 IQE PIC (port in SONET Mode)**

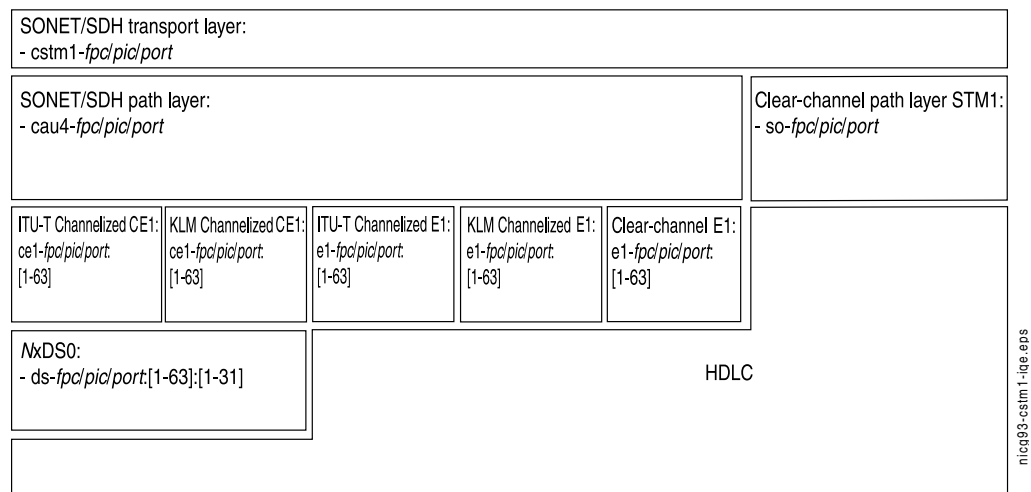
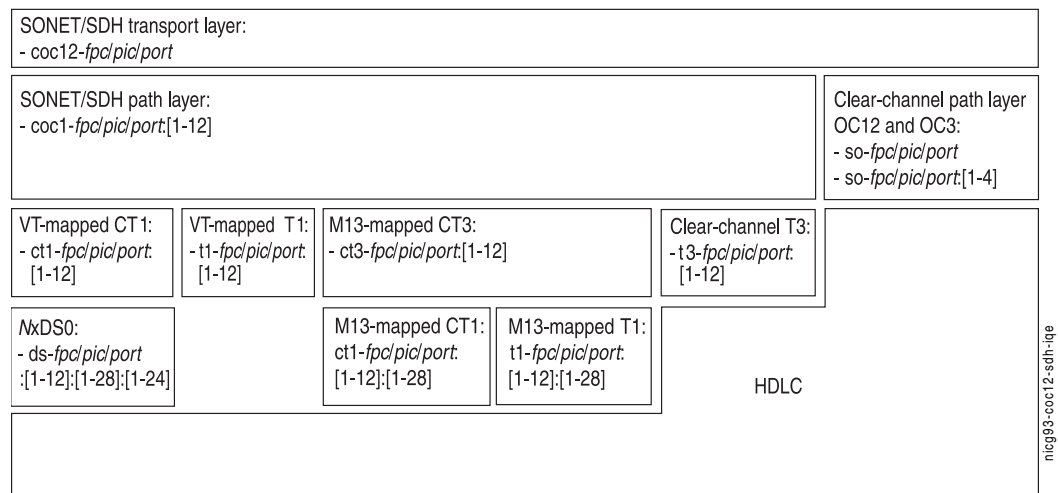
Figure 26: Structure of the Channelized OC3/STM1 IQE PIC (port in SDH Mode)**Figure 27: Structure of the Channelized OC12/STM4 IQE PIC (port in SONET Mode)**

Figure 28: Structure of the Channelized OC12/STM4 IQE PIC (port in SDH Mode)

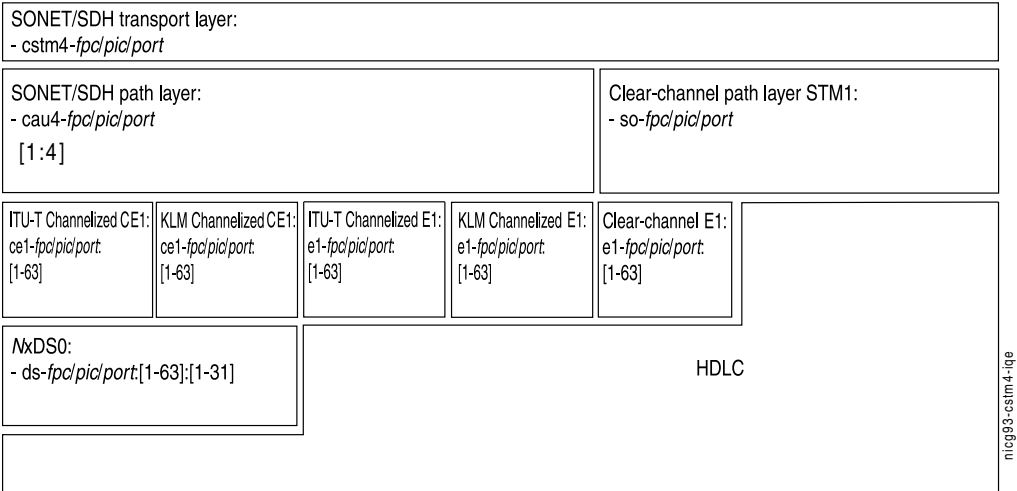


Figure 29: Structure of the Channelized CDS3/E3 IQE PIC (port in DS3 Mode)

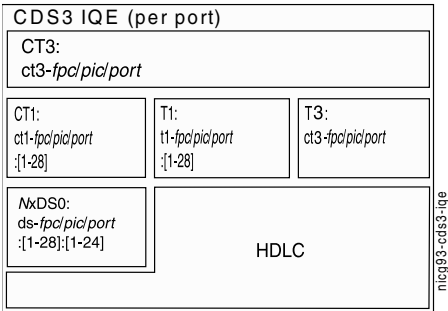


Figure 30: Structure of the Channelized CDS3/E3 IQE PIC (port in E3 Mode)

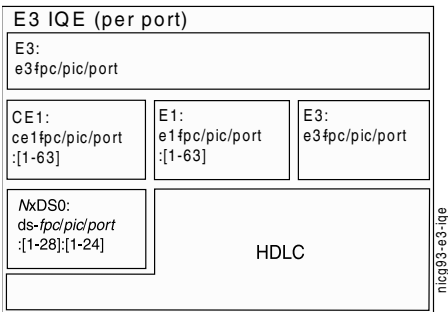


Table 38: Structural Differences: Channelized PICs, Channelized IQ PICs, and Channelized IQE PICs

PIC Type	Transport	Path	DS3	DS1/E1	E3
Channelized PICs					

Table 38: Structural Differences: Channelized PICs, Channelized IQ PICs, and Channelized IQE PICs (*continued*)

PIC Type	Transport	Path	DS3	DS1/E1	E3
Channelized E1	Not applicable.	Not applicable.	Not applicable.	e1-fpc/pic/port ds-fpc/pic/port:0	Not applicable.
Channelized OC12	t3-fpc/pic/port:0	t3-fpc/pic/port:[0-11]	t3-fpc/pic/port:[0-11]	Not applicable.	Not applicable.
Channelized STM1	e1-fpc/pic/port:0	e1-fpc/pic/port:0	Not applicable.	e1-fpc/pic/port:[0-63]	Not applicable.
Channelized T3 and Multichannel T3	Not applicable.	Not applicable.	t1-fpc/pic/port:0	t1-fpc/pic/port:[0-27]	Not applicable.
Channelized IQ PICs					
Channelized DS3 IQ	Not applicable.	Not applicable.	ct3-fpc/pic/port t3-fpc/pic/port	ct1-fpc/pic/port:[1-28] t1-fpc/pic/port:[1-28]	Not applicable.
Channelized E1 IQ	Not applicable.	Not applicable.	Not applicable.	ce1-fpc/pic/port e1-fpc/pic/port	Not applicable.
Channelized OC3 IQ	coc3-fpc/pic/port	coc1-fpc/pic/port:[1-3] so-fpc/pic/port	ct3-fpc/pic/port:[1-3] t3-fpc/pic/port:[1-3]	ct1-fpc/pic/port[13]:[1-28] t1-fpc/pic/port[13]:[1-28]	Not applicable.
Channelized OC12 IQ	coc12-fpc/pic/port	coc1-fpc/pic/port:[1-12] so-fpc/pic/port	ct3-fpc/pic/port:[1-12] t3-fpc/pic/port:[1-12]	ct1-fpc/pic/port[13]:[1-28] t1-fpc/pic/port[13]:[1-28]	Not applicable.
Channelized STM1 IQ	Not applicable.	cau4-fpc/pic/port so-fpc/pic/port	Not applicable.	ce1-fpc/pic/port:[1-63] e1-fpc/pic/port:[1-63]	Not applicable.
Channelized IQE PICs					
Channelized OC3 IQE	coc3-fpc/pic/port	coc1-fpc/pic/port:[1-3] so-fpc/pic/port	ct3-fpc/pic/port:[1-3] t3-fpc/pic/port:[1-3]	ct1-fpc/pic/port[13]:[1-28] t1-fpc/pic/port[13]:[1-28]	Not applicable.
Channelized OC12 IQE	coc12-fpc/pic/port	coc1-fpc/pic/port:[1-12] so-fpc/pic/port	ct3-fpc/pic/port:[1-12] t3-fpc/pic/port:[1-12]	ct1-fpc/pic/port[13]:[1-28] t1-fpc/pic/port[13]:[1-28]	Not applicable.
Channelized STM1 IQE	cstm1-fpc/pic/port	cau4-fpc/pic/port so-fpc/pic/port	Not applicable.	ce1-fpc/pic/port:[1-63] e1-fpc/pic/port:[1-63]	e3-fpc/pic/port:[1:3]
Channelized STM4 IQE	cstm4-fpc/pic/port	cau4-fpc/pic/port so-fpc/pic/port	Not applicable.	ce1-fpc/pic/port:[1-63] e1-fpc/pic/port:[1-63]	e3-fpc/pic/port:[1:3]

Table 38: Structural Differences: Channelized PICs, Channelized IQ PICs, and Channelized IQE PICs (*continued*)

PIC Type	Transport	Path	DS3	DS1/E1	E3
Channelized DS3 IQE	Not applicable.	Not applicable.	<i>ct3-fpc/pic/port</i>	<i>ct1-fpc/pic/port</i> :[1-28]	Not applicable.
			<i>t3-fpc/pic/port</i>	<i>t1-fpc/pic/port</i> :[1-28]	
Channelized E3 IQE	Not applicable.	<i>cau4-fpc/pic/port</i>	Not applicable.	<i>ce1-fpc/pic/port</i> :[1-4]::[1-163]	<i>e3-fpc/pic/port</i> :[1:4]
		<i>so-fpc/pic/port</i>		<i>e1-fpc/pic/port</i> :[1-4]::[1-163]	

Chapter 18

Configuring Channelized E1 Interfaces

Each Channelized E1 PIC and Channelized E1 Intelligent Queuing (IQ) PIC has 10 E1 ports that you can channelize to the *NxDS0* level. Each E1 interface has 32 time slots (DS0), in which time slot 0 is reserved. You can combine one or more of these DS0 time slots (channels) to create a channel group (*NxDS0*).

This section contains the following topics:

- Configuring Channelized E1 IQ Interfaces on page 377
- Configuring Channelized E1 Interfaces on page 379
- Example: Configuring Channelized E1 IQ Interfaces on page 381
- Example: Configuring Channelized E1 Interfaces on page 382

Configuring Channelized E1 IQ Interfaces

This section describes how to configure channelized E1 IQ interfaces, discussing the following topics:

- Configuring E1 IQ Interfaces on page 377
- Configuring Fractional E1 IQ Interfaces on page 378
- Configuring *NxDS0* IQ Interfaces on page 378



NOTE: Class-of-service (CoS) rules cannot be applied to an individual channel configured on channelized IQ interfaces. You can only apply CoS rules to the aggregate bit streams.

Configuring E1 IQ Interfaces

To configure an E1 interface, include the **no-partition** and **interface-type** statements at the [edit interfaces *ce1-fpc/pic/port*] hierarchy level:

```
[edit interfaces ce1-fpc/pic/port]
no-partition interface-type e1;
```

This configuration creates interface *e1-fpc/pic/port*.

Configuring Fractional E1 IQ Interfaces

By default, all the time slots on a channelized E1 interface are used. To configure a fractional E1 interface on a Channelized E1 IQ PIC, you must perform the following tasks:

1. Include the `no-partition` statement at the `[edit interfaces ce1-fpc/pic/port]` hierarchy level:

```
[edit interfaces ce1-fpc/pic/port]
no-partition interface-type e1;
```

This configuration creates interface `e1-fpc/pic/port`.

2. Configure the number of time slots allocated to the E1 IQ interface by including the `timeslots` statement at the `[edit interfaces e1-fpc/pic/port e1-options]` hierarchy level:

```
[edit interfaces e1-fpc/pic/port e1-options]
timeslots time-slot-range;
```

NxDS0 time slots configured on either a channelized STM1 IQ interface or a channelized E1 IQ interface are numbered from 1 to 31 (0 is reserved), while fractional E1 time slots are numbered from 2 to 31 (1 is reserved).

To configure ranges, use hyphens. To configure discontinuous time slots, use commas. Do not include spaces.

For more information about E1 time slots, see “Configuring Fractional E1 Time Slots” on page 474.

Example: Configuring Fractional E1 IQ Interfaces

Configure a fractional E1 interface that uses time slots 2 through 10:

```
[edit interfaces ce1-0/0/0]
no-partition interface-type e1;
[edit interfaces e1-0/0/0 e1-options]
timeslots 2-10;
```

For a full configuration example, see the *JUNOS Feature Guide*.

Configuring NxDS0 IQ Interfaces

By default, all the time slots on a channelized E1 interface are used. To configure an NxDS0 IQ interface on a Channelized E1 IQ PIC, you must configure the number of time slots allocated to the NxDS0 IQ interface by including the `partition`, `timeslots`, and `interface-type` statements at the `[edit interfaces ce1-fpc/pic/port]` hierarchy level, specifying the `ds` interface type:

```
[edit interfaces ce1-fpc/pic/port]
partition partition-number timeslots time-slot-range interface-type ds;
```

For channelized E1 IQ interfaces, the partition number range is from 1 through 31.

For E1 IQ interfaces (**e1-fpc/pic/port**), the time-slot range is from 2 through 31. For channelized E1 IQ interfaces (**ce1-fpc/pic/port**), the time-slot range is from 1 through 31. You can designate any combination of time slots. To configure ranges, use hyphens. To configure discontinuous time slots, use commas. Do not include spaces. For more information about E1 time slots, see “Configuring Fractional E1 Time Slots” on page 474.

Example: Configuring an NxDS0 IQ Interface

Configure an NxDS0 interface that uses time slots 2 through 10. This configuration creates the **ds-0/0/0:1:1** interface.

```
[edit interfaces ce1-0/0/0:1]
partition 1 timeslots 2-10 interface-type ds;
```

For a full configuration example, see the *JUNOS Feature Guide*.

Configuring Channelized E1 Interfaces

By default, all the time slots on a channelized E1 interface are used. There can be a maximum of 24 channel groups per channelized E1 interface. Thus, you can configure a maximum of 240 channel groups per PIC.

To specify the DS0 channel group number in the interface name, include a colon (:) as a separator. For example, a Channelized E1 PIC might have the following physical and virtual interfaces:

ds-0/0/0:x

x is a DS0 channel group from 0 through 23 (for more information about ranges, see Table 39 on page 380).

You can use any of the values within the range available for **x**; you do not have to configure the links sequentially. In addition, the JUNOS software applies the interface options you configure according to the following rules:

- To configure the **e1-options** statement, you must set channel group **x** to 0:


```
ds-0/0/0:0
```
- There are no restrictions on configuring the **ds0-options** statement.
- If you delete a configuration you previously committed for channel group 0, the options return to default values.

To configure the channel groups and time slots for a channelized E1 interface, include the following statements at the **[edit chassis]** hierarchy level:

```
[edit chassis]
fpc slot-number {
  pic pic-number {
    ce1 {
```

```

    e1 link-number {
        channel-group group-number;
        timeslots time-slot-range;
    }
}
}

```



NOTE: If you commit the interface name but do not include the [edit chassis] configuration, the Channelized E1 PIC behaves like a standard E1 PIC, and none of the DS0 functionality is accessible.

There are 32 time slots on an E1 interface; however, time slot 0 is reserved. You can designate any combination of time slots. To configure ranges, use hyphens. To configure discontinuous time slots, use commas. Do not include spaces.

Table 39 on page 380 shows the ranges you can specify.

Table 39: Ranges for Channelized E1 Configuration

Item	Option	Range
FPC slot	slot-number	0 through 7
PIC slot	pic-number	0 through 3
E1 link	link-number	0 through 9
DS0 channel group	group-number	0 through 23
Time slot	time-slot-range	0 through 31 (with time slot 0 reserved)

The theoretical maximum number of channel groups possible per PIC is $10 * 24 = 240$. This is within the maximum bandwidth available.



NOTE: NxDS0 time slots configured on either a channelized STM1 IQ interface or channelized E1 IQ interface are numbered from 1 to 31 (0 is reserved), while fractional E1 time slots range from 2 to 32 (1 is reserved).

FPC slot range depends on the routing platform. For the TX Matrix platform, the range is from 0 through 31. For M40, M40e, M160, M320, M120, and other T-series routing platforms, the range is from 0 through 7. For M20 routing platforms, the range is from 0 through 3. For M10 and M10i routing platforms the range is from 0 through 1. For M5 and M7i routing platforms, the only applicable value is 0.

Configuring Channelized E1 Interface Properties

To configure channelized E1 interface properties, include the **e1-options** statement at the [edit interfaces *interface-name*] hierarchy level:

```
[edit interfaces interface-name]
e1-options {
  fcs (16 | 32);
  framing (g704 | g704-no-crc4 | unframed);
  idle-cycle-flag (flags | ones);
  loopback (local | remote);
  start-end-flag (filler | shared);
}
```

To specify options for each of the DS0 channels, include the **ds0-options** statement at the [edit interfaces *interface-name*] hierarchy level:

```
[edit interfaces interface-name]
ds0-options {
  byte-encoding (nx56 | nx64);
  fcs (16 | 32);
  idle-cycle-flag (flags | ones);
  loopback payload;
  start-end-flag (filler | shared);
}
```

For DS0 channels on a channelized E1 interface, the **clocking** statement is supported only for channel 0; it is ignored if included in the configuration of channels 1 through 11. The clock source configured for channel 0 applies to all channels on the channelized E1 interface. The individual DS0 channels use a gapped 45-MHz clock as the transmit clock. When you configure the clock source for a channelized interface—**ds-x/y/z:0**, for example—you must also include the **channel-group** statement at the [edit chassis] hierarchy level, and specify channel group 0. For more information, see “Clock Sources on Channelized Interfaces” on page 364.

Only a subset of the E1 options is valid for the channelized configuration; you specify the time slots using the [edit chassis] configuration described in “Examples: Interface Naming” on page 55. For more information about the E1 and DS0 options, see “Configuring E1 Interfaces” on page 469 and “Configuring T1 Interfaces” on page 485.

Each E1 interface has 32 time slots (DS0s), in which time slot 0 is reserved. You can combine one or more of these DS0 time slots (channels) to create a channel group (*NxDS0*). There can be a maximum of 24 channel groups per E1 interface.

Example: Configuring Channelized E1 IQ Interfaces

Configure a channelized E1 interface as an unpartitioned, clear channel.

Configuring an E1 Interface

```
[edit interfaces]
ce1-2/0/0 {
  no-partition interface-type e1; # e1-2/0/0
}
```

The following configuration is sufficient to get the channelized E1 IQ interface up and running:

**Configuring Multiple
Interface Types**

```
[edit]
interfaces {
  ce1-1/2/3 {
    partition 1 timeslots 10 interface-type ds; # ds-1/2/3:1
    partition 2 timeslots 1-9 interface-type ds; # ds-1/2/3:2
  }
  ds-1/2/3:1 {
    unit 0 {
      family inet {
        address 10.25.1.2/24;
      }
    }
  }
  ds-1/2/3:2 {
    unit 0 {
      family inet {
        address 10.25.2.2/24;
      }
    }
  }
}
[edit]
interfaces {
  ce1-1/2/6 {
    no-partition interface-type e1; # e1-1/2/6
  }
  e1-1/2/6 {
    e1-options {
      timeslots 1-2;
    }
    unit 0 {
      family inet {
        address 10.255.126.2/24;
      }
    }
  }
}
```

Example: Configuring Channelized E1 Interfaces

The following configuration is sufficient to get the channelized E1 interface up and running:

```
[edit chassis]
fpc 0 {
  pic 1 {
    ce1 {
      e1 0 {
        channel-group 0 timeslots 1;
        channel-group 1 timeslots 2;
        channel-group 5 timeslots 5-7;
```



```

    }
    e1 4 {
        channel-group 10 timeslots 11,17,28-31;
    }
}
}
[edit interfaces ds-0/1/0:0]
e1-options {
    fcs 32;
    framing g704-non-grc;
    loopback remote;
}
[edit interfaces ds-0/1/4:10]
ds0-options {
    byte-encoding nx56;
    start-end-flag filler;
}

```

Configuring the following Interfaces:

ds-0/1/0:1, with time slot 1 allocated
 ds-0/1/0:5, with time slots 5 through 7 allocated
 ds-0/1/4:10, with time slots 11, 17, and 28 through 31 allocated

The remaining ports (other than 0 and 4) remain as regular E1 interfaces (and follow the e1-0/1/x naming convention).

```

[edit chassis]
fpc 0 {
    pic 1 {
        ce1 {
            e1 0 {
                channel-group 1 timeslots 1;
                channel-group 5 timeslots 5-7;
            }
            e1 4 {
                channel-group 10 timeslots 11,17, 28-31;
            }
        }
    }
}

```

**Use Time Slots
1 Through 10**

```

[edit chassis fpc slot-number pic pic-number ce1 e1 link-number]
channel-group group-number;
timeslots 1-10;

```

**Use Time Slots
1 Through 5, 10, and 24**

```

[edit chassis fpc slot-number pic pic-number ce1 e1 link-number]
channel-group group-number;
timeslots 1-5,10,24;

```


Chapter 19

Configuring Channelized E1 PRI and T1 PRI Interfaces

This section contains the following topics:

- Channelized E1 PRI and T1 PRI Overview on page 385
- Configuring a Clear Channel on page 386
- Configuring a Channelized T1/E1 Interface to Drop and Insert Time Slots on page 387
- Configuring Primary Rate Interfaces on page 388
- Allocating B-Channels for Dialout on page 389
- Configuring PRI Interfaces on page 389
- Example: Configuring a Channelized T1 Interface as Primary Rate Interface on page 390

Channelized E1 PRI and T1 PRI Overview

J-series Services Routers equipped with a Dual-Port Channelized T1/E1 PIM support Integrated Services Digital Network Primary Rate Interfaces (ISDN PRI). ISDN PRI, referred to as S2M in Europe, is the “primary” extended ISDN network interface. It offers a larger capacity of digital channels utilizing a variety of improved mediums and is used by large organizations with intensive communication needs. In contrast, ISDN Basic Rate Interfaces (BRI), known as SO in Europe, provides a limited number of channels, transmitting over copper wire, and is used by smaller organizations or individuals with less intensive communication needs. For more information about configuring ISDN BRI interfaces, see “Configuring ISDN Physical Interface Properties” on page 659.

Unlike channelized PICs on the M-series and T-series routing platforms, the interface type on the Dual-Port Channelized T1/E1 PIM is configurable. A single interface can operate as either a channelized T1 or channelized E1 interface (or clear channel) or as an ISDN PRI. The ISDN PRI channels can operate on the same interface as T1 or E1 channels. The PIM also supports a “drop-and-insert” feature, allowing you to insert channels from one port on the PIM into the other port on the PIM.

These ISDN channels are delivered to the user in one of two pre-defined configurations:

ISDN BRI is configured by specifying properties for a physical (**br-** interface) and a logical (**dln**) interface. For ISDN PRI, you configure:

1. Either a channelized E1 (**ce1-pim/0/port**) or channelized T1 (**ct1-pim/0/port**) interface.
2. Time slots within a **ce1-pim/0/port** interface or **ct1-pim/0/port** interface.
3. A bearer (B) channel **bc-pim/0/port:channel** interface for each time slot that you want to function as an ISDN PRI B-channel. The B-channel is used for data, video, voice, and multimedia. You can create up to 30 B-channels on a channelized E1 interface, and 23 B-channels on a channelized T1 interface.
4. One delta (D) channel, used between switching equipment in the ISDN network and the ISDN equipment at your site for signaling. For channelized E1, the D-channel must be time slot 16. For channelized T1, the D-channel must be time slot 24.



NOTE: Time slots can also be shared with **ds-pim/0/port** time slots within the same channelized interface.

Channelized E1 and T1 PIMs on J-series Services Routers provide support for ISDN Primary Rate Interface (PRI) connectivity for dial-in and callback and for use as primary or backup network connections.

Configuring a Clear Channel

A *clear channel* is an interface that uses the entire bandwidth of the port on a PIM. To configure a clear channel, include the **no-partition** and **interface-type** statements in the configuration. On a Dual-Port Channelized T1-E1 PIM, you can configure two clear-channel interfaces.

To configure an E1 interface, include the **no-partition** and **interface-type** statements at the [edit interfaces **ce1-pim/0/port**] hierarchy level:

```
[edit interfaces ce1-pim/0/port]
no-partition interface-type e1;
```

This configuration creates interface **e1-pim/0/port**.

To configure a T1 interface, include the **no-partition** and **interface-type** statements at the [edit interfaces **ct1-pim/0/port**] hierarchy level:

```
[edit interfaces ct1-pim/0/port]
no-partition interface-type t1;
```

This configuration creates interface **t1-pim/0/port**.

Configuring a Channelized T1/E1 Interface to Drop and Insert Time Slots

On channelized T1/E1 interfaces configured for channelized operation, you can insert channels (time slots) from one port (for example, channels carrying voice) directly into the other port on the PIM, to replace channels coming through the Routing Engine. This feature, known as drop and insert, allows you to integrate voice and data on a single T1 or E1 link by removing the DS0 time slots of one T1 or E1 port and replacing them by inserting the time slots of another T1 or E1 port. It is not necessary to use the same time slots on both interfaces, but the time slots count must be same. The channels that are not configured for the drop-and-insert feature are used for normal traffic.

You can configure:

- 30 channelized E1 time slots, with the 16th time slot operating as the signaling channel
- 23 channelized T1 time slots, with the 24th time slot operating as the signaling channel

The signaling channel, or D-channel, must be part of the channels that are being switched through the drop-and-insert functionality. The JUNOS software does not support switching of voice and data between ports by default.

Both ports involved in the drop-and-insert configuration must use the same clock source—either the router's internal clock or an external clock.

The following clock source settings are valid:

- When port 0 is set to use the internal clock, port 1 must also be set to use it, and vice versa.
- When port 0 is set to use its external clock, port 1 must be set to run on the same clock—the external clock for port 0.
- When port 1 is set to use its external clock, port 0 must be set to run on the same clock—the external clock for port 1.

For more details about valid clock combinations, see the *J-series Services Router Basic LAN and WAN Access Configuration Guide*.

To configure drop-and-insert time slots on a channelized T1 interface, include the **partition** statement at the `[edit interfaces ct1-pim/0/port]` hierarchy level with the **timeslots** statement specified.

To configure drop-and-insert time slots on a channelized T1 interface, include the **partition** statement at the `[edit interfaces ct1-pim/0/port]` hierarchy level with the **timeslots** statement and **interface-type** statements specified:

```
[edit interfaces]
ct1-pim/0/port {
  partition 1 timeslot 1-10 interface-type ds;
  partition 2 timeslot 11-14 interface-type ds;
  partition 3 timeslot 15-32 interface-type ds;
}
```

This configuration creates interfaces `ds-pim/0/port:1`, `ds-pim/0/port:2`, and `ds-pim/0/port:3`.

Use the same configuration to create drop-and insert time slots on a channelized E1 interface by including the `partition` statement and options at the `[edit interfaces ce1-pim/0/port]` hierarchy level.

Configuring Primary Rate Interfaces

Primary rate interfaces are a combination of B-channels with one controlling D-channel for the group. Configure B-channel interfaces for each time slot that you want to function as an ISDN PRI interface. The B-channel is used for data, video, voice, and multimedia. You can create:

- 23 B-channels on a channelized T1 interface
- 30 B-channels on a channelized E1 interface

To configure B-channels on a channelized T1 interface, include the `partition` statement at the `[edit interfaces ct1-pim/0/port]` hierarchy level with the `timeslots` statement and `interface-type bc` specified:

```
[edit interfaces]
ct1-pim/0/port {
    partition 1-23 timeslot 1-23 interface-type bc;
}
```

This configuration creates interfaces `bc-pim/0/port:1` through `bc-pim/0/port:1.`, and `ds-pim/0/port:3`.

Use the same configuration to create B-channels on a channelized E1 interface by including the `partition` statement and options at the `[edit interfaces ce1-pim/0/port]` hierarchy level.

One D-channel is used between switching equipment in the ISDN network and the ISDN equipment at your site for signaling. For channelized E1, the D-channel must be time slot 16. For channelized T1, the D-channel must be time slot 24.

To configure a D-channel on a channelized T1 interface, include the `partition` statement at the `[edit interfaces ct1-pim/0/port]` hierarchy level with the `timeslots` statement and `interface-type dc` specified:

```
[edit interfaces]
ct1-pim/0/port {
    partition 24 timeslot 24 interface-type dc;
}
```

This configuration creates interfaces `dc-pim/0/port`.

Use the same configuration to create B-channels on a channelized E1 interface by including the `partition` statement and options at the `[edit interfaces ce1-pim/0/port]` hierarchy level.

```
[edit interfaces]
```

```
ce1-pim/0/port {
    partition 16 timeslot 16 interface-type dc;
}
```

To view PRI or ISDN options information about interface, use the following operational mode commands supporting BRI interfaces:

- `show interfaces interface-name detail`
- `show interface dln`
- `show isdn calls`
- `show isdn history`
- `show isdn q921 statistics`
- `show isdn q931 statistics`
- `show isdn status`



NOTE: You must configure a D-channel and B-channels to complete your ISDN PRI line configuration.



NOTE: You can configure dso-options on the B-channel, but you cannot configure parameters for a D-channel. However, when interface statistics are displayed, both B-channel and D-channel interfaces have statistical values.

Allocating B-Channels for Dialout

You can configure the system to allocate B-channels for dialout from lowest or highest numbered B-channel (ascending or descending order). By configuring this feature, you reduce chances of “glare” on PRI lines carrying a mix of incoming and outgoing calls.

To configure the B-channel allocation, include the `bchannel-allocation` statement and options at the `[edit interfaces ct1-pim/0/port | ce1-pim/0/port]` hierarchy level.

```
[edit interfaces]
(ct1-pim/0/port | ce1-pim/0/port) {
    isdn-options {
        (bchannel-allocation (ascending | descending);
    }
}
```

Configuring PRI Interfaces

When you create a primary rate interface from a channelized E1 or channelized T1 interface, you can select all the slots for the PRI, or just a few of them, leaving the rest as ds- interfaces.

To configure a primary rate interface from a channelized T1 interface, include the **partition** statement at the `[edit interfaces ct1-pim/0/port]` hierarchy level with the **timeslots** statement and **interface-type** *bc* specified:

```
[edit interfaces]
ct1-pim/0/port {
  partition 1 timeslot 1-10 interface-type ds;
  partition 2 timeslot 11-24 interface-type pr;
}
```

This configuration creates interfaces *ds-pim/0/port:1* through *pr-pim/0/port:2*.

Use the same configuration to create interfaces on a channelized E1 interface by including the **partition** statement and options at the `[edit interfaces ce1-pim/0/port]` hierarchy level.

To configure channelized E1 interface properties, include the **e1-options** statement at the `[edit interfaces interface-name]` hierarchy level:

```
[edit interfaces interface-name]
e1-options {
  fcs (16 | 32);
  framing (g704 | g704-no-crc4 | unframed);
  idle-cycle-flag (flags | ones);
  loopback (local | remote);
  start-end-flag (filler | shared);
}
```

To specify options for each of the DS0 channels, include the **ds0-options** statement at the `[edit interfaces interface-name]` hierarchy level:

```
[edit interfaces interface-name]
ds0-options {
  byte-encoding (nx56 | nx64);
  fcs (16 | 32);
  idle-cycle-flag (flags | ones);
  loopback payload;
  start-end-flag (filler | shared);
}
```

Example: Configuring a Channelized T1 Interface as Primary Rate Interface

Configure a channelized T1 interface to operate fully as a primary rate interface:

```
[edit interfaces]
ct1-2/0/0 {
  partition 1-23 timeslots 1-23 interface-type bc;
  partition 24 timeslots 24 interface-type dc;
  t1-options {
    line-encoding b8zs;
    framing esf;
  }
  traceoptions {
    flag q931;
  }
}
```



```

    flag q921;
    file {
        pri_trace_log;
    }
}
dialer-options {
    pool 1 priority 25;
}
isdn-options {
    switch-type att5e;
    bchannel-allocation descending;
    incoming-called-number 384101;
    incoming-called-number 384102;
    incoming-called-number 384103;
}
}

[edit interfaces]
d10 {
    unit 0 {
        dialer-options {
            pool 1;
            dial-string 384010;
            incoming-map {
                accept-all;
            }
        }
        family inet {
            filter {
                dialer int-packet;
            }
            address 13.1.1.2/24;
        }
    }
}

[edit firewall]
family inet {
    dialer-filter int-packet {
        term term1 {
            from {
                destination address {
                    13.1.1.1/24;
                }
            }
            protocol icmp;
            then note;
        }
        term term2 {
            then ignore;
        }
    }
}
}

```


Chapter 20

Configuring Channelized OC3 IQ and IQE Interfaces

This chapter describes how to configure interfaces on Channelized OC3 IQ and IQE PICs, as follows:

- Channelized OC3 IQ and IQE Overview on page 393
- Partitions, OC Slices, Interface Types, and Time Slots on page 394
- Configuring a Clear Channel on page 395
- Configuring T3 IQ Interfaces on page 395
- Configuring T1 and NxDS0 Interfaces on page 396
- Configuring Fractional T1 IQ Interfaces on page 399
- Configuring Link PIC Failover on page 400

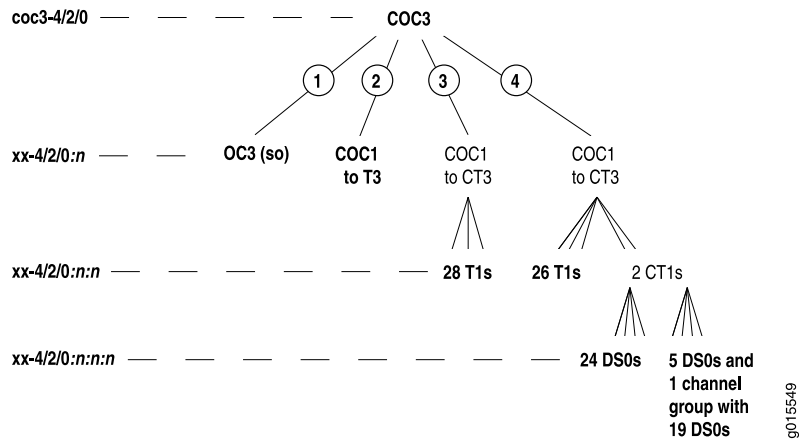
Channelized OC3 IQ and IQE Overview

Channelized intelligent queuing (IQ) and channelized enhanced intelligent queuing (IQE) interfaces allow arbitrary and dynamic channelization of serial links, allowing greater flexibility than regular channelized interfaces.

On each port of a Channelized OC3 IQ or a Channelized OC3 IQE interface, you can configure the following interface types:

- One OC3 SONET interface
- Up to three T3 interfaces
- Up to 84 T1 interfaces
- Up to 336 NxDS0 interfaces on an M-series platform
- Up to 768 NxDS0 interfaces on a T-series platform

Figure 31 on page 394 shows an example of how a Channelized OC3 PIC might be partitioned. In the figure, the OC3 SONET interface would be a standalone interface because it would use the entire bandwidth of the PIC. The same applies to each port of the 2-port Channelized OC3 Enhanced IQ (IQE) PIC.

Figure 31: Channelized OC3 IQ Interface Example for Show Interfaces Controller

You can configure the following encapsulation types:

- PPP
- Frame Relay
- Cisco HDLC
- CCC
- TCC
- MPLS—On IQE interfaces.

For more information about interface encapsulation, see “Configuring Interface Encapsulation” on page 98 and “Configuring Interface Encapsulation” on page 149.

To configure channelized interfaces, include the following statements at the [edit interfaces *interface-name*] hierarchy level:

```
[edit interfaces interface-name]
no-partition interface-type type;
partition partition-number oc-slice oc-slice-range interface-type type;
partition partition-number timeslots time-slot-range interface-type type;
```

Partitions, OC Slices, Interface Types, and Time Slots

The partition number is the sublevel interface partition index and is correlated with the channel number. For channelized OC3 interfaces, you can configure up to three OC1 interfaces, so the partition number can be 1, 2, or 3. For channelized T3 interfaces (ct3), you can configure multiple interfaces at once by including a partition range, such as 1-3. This creates three T1 interfaces with channel numbers 1 through 3.



NOTE: For channelized IQ and IQE interfaces, channel numbering begins with 1 (:1). For regular channelized interfaces, channel numbering begins with 0 (:0).

You configure the OC-slice range for SONET/SDH interfaces only. The OC-slice range is correlated with the bandwidth size required for the interface type you are configuring. For example, a channelized OC3 interface (**coc3**) can be divided into three OC1 interfaces, each containing one OC slice. Therefore the OC-slice value must be 1, 2, or 3.

The configurable interface types are dependent on the hierarchy level at which you include the **interface-type** and **partition** or **no-partition** statements. For example, when you include the **no-partition** statement at the [edit interfaces **coc3-fpc/pic/port**] hierarchy level, the only configurable interface type is **so**, because the **no-partition** statement signals that you are creating a clear-channel SONET/SDH interface. When you include the **partition** statement at the [edit interfaces **coc1-fpc/pic/port**] hierarchy level, the configurable interface types are **ct1** or **t1**. If you want to create a T1 interface, include the **t1** option. If you want to further channelize down to the **NxDS0** level, include the **ct1** option as an intermediate step before dividing the channelized T1 interface (**ct1**) into **NxDS0** interfaces.

You configure time slots for fractional T1 interfaces and **NxDS0** interfaces. You can configure ranges by using hyphens. You can configure discontinuous time slots by using commas. Do not include spaces.

Configuring a Clear Channel

A *clear channel* is an interface that uses the entire bandwidth of the PIC. To configure a clear channel, include the **no-partition** and **interface-type** statements in the configuration.

On Channelized OC3 IQ and IQE PICs, you can configure one OC3 clear-channel interface per port. To configure an OC3 interface, include the **no-partition** and **interface-type** statements at the [edit interfaces **coc3-fpc/pic/port**] hierarchy level:

```
[edit interfaces coc3-fpc/pic/port]
no-partition interface-type so;
```

This configuration creates interface **so-fpc/pic/port**. When you include the **no-partition** statement at the [edit interfaces **coc3-fpc/pic/port**] hierarchy level, the only configurable interface type is **so**, because the **no-partition** statement signals that you are creating a clear-channel SONET/SDH interface.

On a 2-port or 4-port Channelized OC3 IQE PIC, you can configure two to four separate OC3 clear-channel interfaces by additionally specifying the port numbers. Configuration is otherwise the same as previously described on a (1-port) Channelized OC3 IQ PIC.

Configuring T3 IQ Interfaces

To configure a T3 interface on an OC3 PIC, include the **partition**, **oc-slice**, and **interface-type** statements at the [edit interfaces **coc3-fpc/pic/port**] hierarchy level, specifying the **coc1** interface type:

```
[edit interfaces coc3-fpc/pic/port]
partition partition-number oc-slice oc-slice-range interface-type coc1;
```

When you include the **partition** statement at the `[edit interfaces coc3-fpc/pic/port]` hierarchy level, the only configurable interface type is **coc1**. This configuration creates interface `coc1-fpc/pic/port:channel`.



NOTE: Class-of-service (CoS) rules cannot be applied to an individual channel configured on channelized IQ interfaces. You can only apply CoS rules to the aggregate bit streams.

Then, include the **no-partition interface-type** statement at the `[edit interfaces coc1-fpc/pic/port:channel]` hierarchy level, specifying the **t3** interface type:

```
[edit interfaces coc1-fpc/pic/port:channel]
no-partition interface-type t3;
```

This configuration creates interface `t3-fpc/pic/port:channel`.

Example: Configuring T3 IQ Interfaces

Configure a T3 interface using partition 3 and OC slice 3. This configuration creates interface `t3-1/1/0:3`.

```
[edit interfaces coc3-1/1/0]
partition 3 oc-slice 3 interface-type coc1;
[edit interfaces coc1-1/1/0:3]
no-partition interface-type t3;
```

For a full configuration example, see the *JUNOS Feature Guide*.

Configuring T1 and NxDS0 Interfaces

To configure T1 interfaces on a Channelized OC3 IQ or IQE PIC, you perform the following tasks:

1. Partition the channelized OC3 interface into channelized OC1 interfaces by including the **partition**, **oc-slice**, and **interface-type** statements at the `[edit interfaces coc3-fpc/pic/port]` hierarchy level, specifying the **coc1** interface type:

```
[edit interfaces coc3-fpc/pic/port]
partition partition-number oc-slice oc-slice-range interface-type coc1;
```

2. If your network equipment uses VT mapping, partition the channelized OC1 interface into T1 interfaces by including the **partition** and **interface-type** statements at the `[edit interfaces coc1-fpc/pic/port:channel]` hierarchy level, specifying the **t1** interface type:

```
[edit interfaces coc1-fpc/pic/port:channel]
partition partition-number interface-type t1;
```

If your network equipment uses M13 or C-bit parity, convert the channelized OC1 interface into a channelized T3 interface by including the **no-partition** and

`interface-type` statements at the `[edit interfaces coc1-fpc/pic/port:channel]` hierarchy level, specifying the `ct3` interface type:

```
[edit interfaces coc1-fpc/pic/port:channel]
no-partition partition-number interface-type ct3;
```



NOTE: Class-of-service (CoS) rules cannot be applied to an individual channel configured on channelized IQ interfaces. You can only apply CoS rules to the aggregate bit streams.

Note that because the `no-partition` statement is included, this configuration does not create another level of channelization, as denoted by the number of colons in the resulting interface.

To configure T1 interfaces, partition the channelized T3 interface into T1 interfaces by specifying the `t1` interface type:

```
[edit interfaces ct3-fpc/pic/port:channel]
partition partition-number interface-type t1;
```

To configure NxDS0 interfaces, partition the channelized T3 interface into channelized T1 interfaces by specifying the `ct1` interface type:

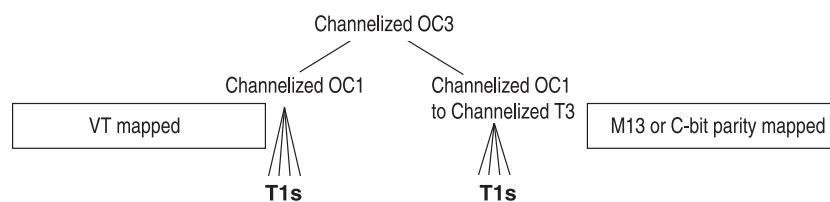
```
[edit interfaces ct3-fpc/pic/port:channel]
partition partition-number interface-type ct1;
```



NOTE: Class-of-service (CoS) rules cannot be applied to an individual channel configured on channelized IQ interfaces. You can only apply CoS rules to the aggregate bit streams.

Figure 32 on page 397 shows VT-mapped and M13 or C-bit parity-mapped configurations of T1 IQ interfaces.

Figure 32: T1 Interfaces on a Channelized OC3 PIC



Bold entries correspond to actual packet channels.

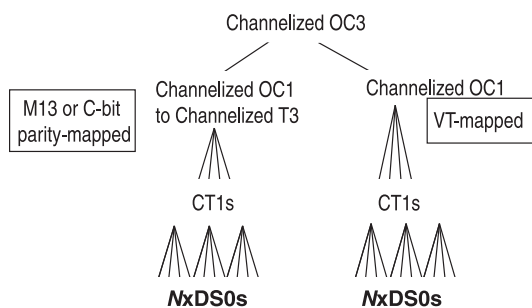
g015503

- Configure channelized NxDS0 IQ interfaces on the channelized T1 IQ interface by including the `partition`, `timeslots`, and `interface-type` statements at the `[edit interfaces ct1-fpc/pic/port<:channel>]` hierarchy level, specifying the `ds` interface type:

```
[edit interfaces ct1-fpc/pic/port:channel]
partition partition-number timeslots time-slot-range interface-type ds;
```

Figure 33 on page 398 shows VT-mapped and M13 or C-bit parity-mapped configurations of $N \times DS0$ IQ interfaces.

Figure 33: Sample Channelization of OC3 IQ or IQE PIC



Bold entries correspond to actual packet channels.

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Examples: Configuring T1 and $N \times DS0$ IQ Interfaces

Configure the following T1 interfaces:

```
t1-0/0/0:1:1
t1-0/0/0:1:2
t1-0/0/0:1:3
t1-0/0/0:1:4
t1-0/0/0:1:5
```

**VT-Mapped
Configuration**

```
[edit interfaces coc3-0/0/0]
partition 1 oc-slice 1 interface-type coc1;
[edit interfaces coc1-0/0/0:1]
partition 1-5 interface-type t1;
```

**M13 or C-bit
Parity-Mapped
Configuration**

```
[edit interfaces coc3-0/0/0]
partition 1 oc-slice 1 interface-type coc1;
[edit interfaces coc1-0/0/0:1]
no-partition interface-type ct3;
[edit interfaces ct3-0/0/0:1]
partition 1-5 interface-type t1;
```

Configure the following two $N \times DS0$ interfaces with 10 time slots and 4 time slots, respectively:

```
ds-0/0/0:1:2:1
ds-0/0/0:1:2:2
```

**VT-Mapped
Configuration**

```
[edit interfaces coc3-0/0/0]
partition 1 oc-slice 1 interface-type coc1;
[edit interfaces coc1-0/0/0:1]
```



```

partition 2 interface-type ct1;
[edit interfaces ct1-0/0/0:1:2]
partition 1 timeslots 1-10 interface-type ds;
partition 2 timeslots 12-16 interface-type ds;

M13 or C-bit  
Parity-Mapped  
Configuration
[edit interfaces coc3-0/0/0]
partition 1 oc-slice 1 interface-type coc1;
[edit interfaces coc1-0/0/0:1]
no-partition interface-type ct3;
[edit interfaces ct3-0/0/0:1]
partition 2 interface-type ct1;
[edit interfaces ct1-0/0/0:1:2]
partition 1 timeslots 1-10 interface-type ds;
partition 2 timeslots 12-16 interface-type ds;

```

For a full configuration example, see the *JUNOS Feature Guide*.

Setting Remote Loopback and Running BERT Tests on NxDS0 Interfaces

For Channelized OC3 IQ and IQE PICs, if you need remote loopback on a far-end NxDS0 interface, and you are running a BERT test from the local NxDS0 interface, you must set remote loopback on the far-end router's associated Channelized T1 interface (ct1). To do this, include the **loopback remote** statement at the **[edit interfaces ct1-fpc/picport t1-options]** hierarchy level. For example:

Local router:

```

[edit interfaces]
ct1-0/0/0:2:2 {
  partition 1 timeslots 1-10 interface-type ds;
  ds-0/0/0:2:2:1 {
    ds0-options {
      bert-period 30;
    }
  }
}

```

Remote router:

```

[edit interfaces]
ct1-0/0/0:2:2 {
  partition 1 timeslots 1-10 interface-type ds;
  t1-options {
    loopback remote;
  }
}

```

Configuring Fractional T1 IQ Interfaces

By default, all the time slots on a channelized T1 interface are used. To configure a fractional T1 interface on a Channelized OC3 IQ or IQE PIC, you must perform the following tasks:

1. Configure a T1 interface on the Channelized OC3 IQ or IQE PIC. For more information, see “Configuring T1 and NxDS0 Interfaces” on page 396.
2. Configure the number of time slots allocated to the T1 IQ interface by including the `timeslots` statement at the `[edit interfaces t1-fpc/pic/port<:channel> t1-options]` hierarchy level:

```
[edit interfaces t1-fpc/pic/port<:channel> t1-options]
timeslots time-slot-range;
```

For channelized T1 IQ interfaces, the time-slot range is from 1 through 24. You can designate any combination of time slots. To configure ranges, use hyphens. To configure discontinuous time slots, use commas. Do not include spaces. For more information, see “Configuring Fractional T1 Time Slots” on page 493.

Example: Configuring Fractional T1 IQ Interfaces

Configure a fractional T1 interface that uses time slots 1 through 5 and 10:

```
[edit interfaces coc3-0/0/0]
partition 1 oc-slice 1 interface-type coc1;
[edit interfaces coc1-0/0/0:1]
partition 1 interface-type t1;
[edit interfaces t1-0/0/0:1:1 t1-options]
timeslots 1-5,10;
```

For a full configuration example, see the *JUNOS Feature Guide*.

Configuring Link PIC Failover

For Channelized OC3 IQ or IQE PICs used as linking PICs in redundant LSQ configurations, you can inhibit the router from sending PPP termination-request messages to the remote host if the link PIC fails. To do this, include the `no-termination-request` statement at the `[edit interfaces interface-name ppp-options]` hierarchy level:

```
no-termination-request;
```

The `no-termination-request` statement is supported only with MLPPP and SONET APS configurations and works with PPP, PPP over Frame Relay, and MLPPP interfaces only.

For information about interchassis and intrachassis LSQ failover, see the *JUNOS Services Interfaces Configuration Guide*.

Chapter 21

Configuring Channelized OC12 Interfaces

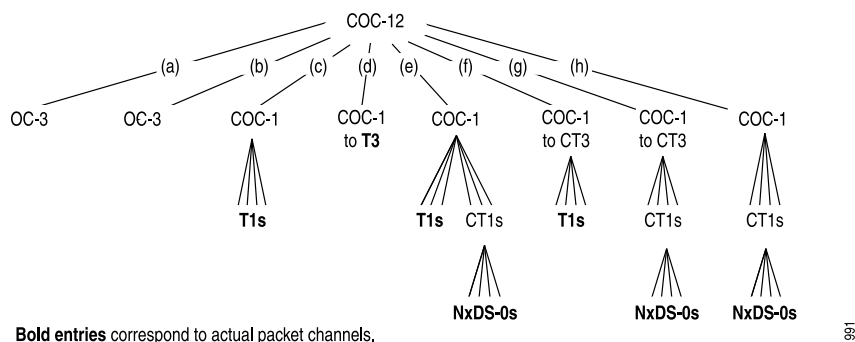
This section contains the following topics:

- Channelized OC12 Overview on page 401
- Configuring Channelized OC12 IQ and IQE Interfaces (SONET Mode) on page 403
- Configuring Channelized OC12 IQ or IQE Interfaces (SDH Mode) on page 410
- Configuring Channelized OC12 Interfaces on page 415
- Configuring Link PIC Failover on page 416
- Example: Configuring Channelized OC12 IQ Interfaces on page 416
- Example: Configuring Channelized OC12 Interfaces on page 420

Channelized OC12 Overview

Channelized intelligent queuing (IQ) interfaces allow arbitrary and dynamic channelization of serial links, allowing greater flexibility than the channelized interfaces. Figure 34 on page 401, Figure 35 on page 402, and Figure 36 on page 403 illustrate the difference in flexibility between Channelized OC12 IQ or IQE Physical Interface Cards (PICs) and a channelized OC12 PIC.

Figure 34: Sample Channelization of OC12 IQ or IQE PIC (SONET Mode)



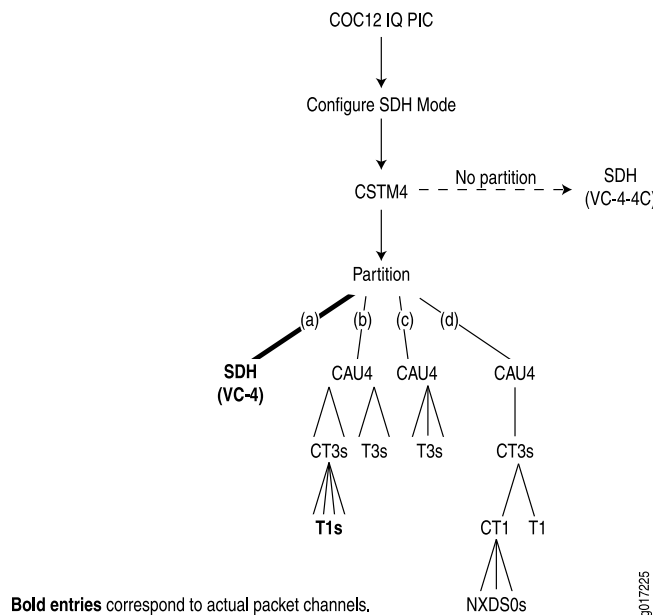
In Figure 34 on page 401, a Channelized OC12 IQ or IQE PIC operating in SONET mode is partitioned into the following OC slices:

- An OC3 interface
- Another OC3 interface

- c. A channelized OC1 partitioned into T1 interfaces
- d. A channelized OC1 converted into a T3 interface
- e. A channelized OC1 partitioned into T1 interfaces and channelized T1s, which are partitioned into NxDS0 interfaces
- f. A channelized OC1 converted into a channelized T3, which is partitioned into T1 interfaces
- g. A channelized OC1 converted into a channelized T3, which is partitioned into T1 interfaces and a channelized T1, which is partitioned into NxDS0 interfaces
- h. A channelized OC1 partitioned into channelized T1s, which are partitioned into NxDS0 interfaces

This is one of thousands of ways to configure a Channelized OC12 IQ or IQE PIC. To configure the interfaces shown in Figure 34 on page 401, see “Example: Configuring Channelized OC12 IQ Interfaces” on page 416.

Figure 35: Sample Channelization of OC12 IQ or IQE PIC (SDH Mode)



In Figure 35 on page 402, a Channelized OC12 IQ or IQE PIC operating in SDH mode results in a channelized STM4 interface, which can be nonpartitioned into one SDH VC-4-VC interface or partitioned into the following OC slices:

- a. An SDH VC-4 interface.
- b. A channelized administrative unit 4 (AU-4) partitioned into channelized T3 interfaces and T3 interfaces.
- c. Another channelized AU-4 interface converted into T3 interfaces.
- d. Another channelized AU-4 interface converted into a channelized T3 interface, which is partitioned further into a channelized T1 and a T1 interface. The channelized T1 interface is further partitioned into NxDS0 interfaces.

This is one of thousands of ways to configure a Channelized OC12 IQ or IQE PIC.

Figure 36: Sample Channelization of OC12 PIC

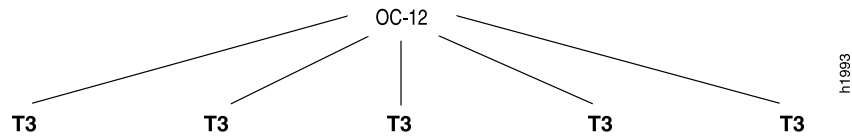


Figure 36 on page 403 shows five T3 channels configured on the Channelized OC12 PIC. You can configure seven additional T3 channels. For more information about configuring Channelized OC12 PICs, see “Configuring Channelized OC12 Interfaces” on page 415.

For a full configuration example, see the *JUNOS Feature Guide*.

Configuring Channelized OC12 IQ and IQE Interfaces (SONET Mode)

This section describes how to configure channelized OC12 IQ and IQE interfaces, discussing the following topics:

- Configuring an OC12 IQ and IQE Interface on page 403
- Configuring T3 IQ Interfaces on page 404
- Configuring OC3 IQ Interfaces on page 404
- Configuring T1 IQ Interfaces on page 405
- Configuring NxDS0 IQ Interfaces on page 407
- Configuring Fractional T1 IQ Interfaces on page 409

Configuring an OC12 IQ and IQE Interface

On a one-port Channelized OC12 IQ or IQE PIC, you can configure one OC12 interface. To configure an OC12 interface, include the **no-partition** and **interface-type** statements at the [edit interfaces coc12-fpc/pic/port] hierarchy level:

```
[edit interfaces coc12-fpc/pic/port]
no-partition interface-type so;
```

This configuration creates interface **so-fpc/pic/port**.



NOTE: Class-of-service (CoS) rules cannot be applied to an individual channel configured on channelized IQ and IQE interfaces. You can only apply CoS rules to the aggregate bit streams.

Configuring T3 IQ Interfaces

To configure a T3 interface on an OC12 PIC, include the `partition`, `oc-slice`, and `interface-type` statements at the `[edit interfaces coc12-fpc/pic/port]` hierarchy level, specifying the `coc1` interface type:

```
[edit interfaces coc12-fpc/pic/port]
partition partition-number oc-slice oc-slice-range interface-type coc1;
```

This configuration creates interface `coc1-fpc/pic/port:channel`.

Then, include the `no-partition interface-type` statement at the `[edit interfaces coc1-fpc/pic/port:channel]` hierarchy level, specifying the `t3` interface type:

```
[edit interfaces coc1-fpc/pic/port:channel]
no-partition interface-type t3;
```

This configuration creates interface `t3-fpc/pic/port:channel`.

The partition number is the sublevel interface partition index and is correlated with the channel number. For channelized OC1 interfaces, the partition number can be from 1 through 12.



NOTE: For channelized OC12 interfaces, channel numbering begins with 0 (:0). For channelized OC12 IQ interfaces, channel numbering begins with 1 (:1).

The OC-slice range is the range of SONET/SDH slices. For SONET/SDH interfaces, the OC-slice range specifies the bandwidth size required for the interface type you are configuring. For channelized OC1 interfaces, the OC slice can be from 1 through 12. You can configure only one OC slice per channelized OC1 interface.

The interface type is the channelized interface type or clear channel you are creating. For channelized OC12 interfaces, `type` can be `so` or `coc1`.

Example: Configuring T3 IQ Interfaces

Configure a T3 interface using partition 3 and OC slice 3. This configuration creates interface `t3-1/1/0:3`.

```
[edit interfaces coc12-1/1/0]
partition 3 oc-slice 3 interface-type coc1;
[edit interfaces coc1-1/1/0:3]
no-partition interface-type t3;
```

For a full configuration example, see the *JUNOS Feature Guide*.

Configuring OC3 IQ Interfaces

To configure an OC3 IQ interface, include the `partition`, `oc-slice`, and `interface-type` statements at the `[edit interfaces coc12-fpc/pic/port]` hierarchy level, specifying the `so` interface type:

```
[edit interfaces coc12-fpc/pic/port]
partition partition-number oc-slice oc-slice-range interface-type so;
```

The partition number is the sublevel interface partition index. For SONET/SDH interfaces, the partition number does not correlate with bandwidth size. For OC3 interfaces, the partition number can be 1 through 4.



NOTE: For channelized OC12 interfaces, channel numbering begins with 0 (:0). For channelized OC12 IQ interfaces, channel numbering begins with 1 (:1).

The OC-slice range is the range of SONET/SDH slices. For SONET/SDH interfaces, the OC-slice range specifies the bandwidth size required for the interface type you are configuring. OC3 IQ interfaces must occupy three consecutive OC slices per interface, in one of the following forms:

- 1–3
- 4–6
- 7–9
- 10–12

By contrast, the T3 and OC1 IQ interfaces each occupy one OC slice per interface.

The interface type is the channelized interface type or data channel you are creating. For channelized OC12 interfaces, the interface type can be **coc1** or **so**.

Example: Configuring OC3 IQ Interfaces

Configure an OC3 interface, using partition 1 and OC slices 4 through 6. This configuration creates interface **so-1/1/0:1**.

```
[edit interfaces coc12-1/1/0]
partition 1 oc-slice 4-6 interface-type so;
```

For a full configuration example, see the *JUNOS Feature Guide*.

Configuring T1 IQ Interfaces

To configure T1 interfaces on a Channelized OC12 IQ or IQE PIC, you perform the following tasks:

1. Partition the channelized OC12 interface into channelized OC1 interfaces by including the **partition**, **oc-slice**, and **interface-type** statements at the **[edit interfaces coc12-fpc/pic/port]** hierarchy level, specifying the **coc1** interface type:

```
[edit interfaces coc12-fpc/pic/port]
partition partition-number oc-slice oc-slice-range interface-type coc1;
```

2. If your network equipment uses VT mapping, partition the channelized OC1 interface into T1 interfaces by including the **partition** and **interface-type** statements

at the `[edit interfaces coc1-fpc/pic/port]` hierarchy level, specifying the **t1** interface type:

```
[edit interfaces coc1-fpc/pic/port]
partition partition-number interface-type t1;
```

3. If your network equipment uses M13 or C-bit parity, convert the channelized OC1 interface into a channelized T3 interface by including the **no-partition** and **interface-type** statements at the `[edit interfaces coc1-fpc/pic/port:channel]` hierarchy level, specifying the **ct3** interface type. Note that because the **no-partition** statement is included, this configuration does not create another level of channelization, as denoted by the number of colons in the resulting interface.

```
[edit interfaces coc1-fpc/pic/port]
no-partition partition-number interface-type ct3;
```

4. You then partition the channelized T3 interface into T1 interfaces by including the **partition** and **interface-type** statements at the `[edit interfaces ct3-fpc/pic/port]` hierarchy level, specifying the **t1** interface type:

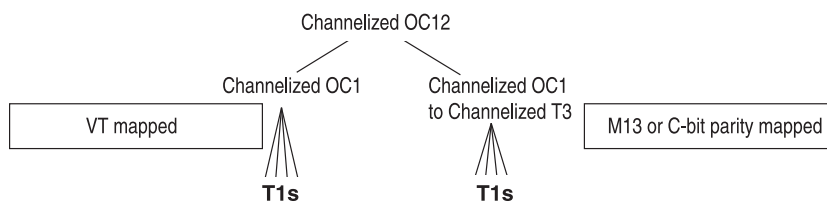
```
[edit interfaces ct3-fpc/pic/port]
partition partition-number interface-type t1;
```



NOTE: Class-of-service (CoS) rules cannot be applied to an individual channel configured on channelized IQ interfaces. You can only apply CoS rules to the aggregate bit streams.

Figure 37 on page 406 shows VT-mapped and M13 or C-bit parity-mapped configurations of T1 IQ interfaces.

Figure 37: T1 Interfaces on a Channelized OC12 PIC



Bold entries correspond to actual packet channels.

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Example: Configuring T1 IQ Interfaces

Configure the following T1 interfaces:

```
t1-0/0/0:1:1
t1-0/0/0:1:2
t1-0/0/0:1:3
t1-0/0/0:1:4
```


VT-Mapped Configuration	<pre>t1-0/0/0:1:5 [edit interfaces coc12-0/0/0] partition 1 oc-slice 1 interface-type coc1; [edit interfaces coc1-0/0/0:1] partition 1-5 interface-type t1;</pre>
M13 or C-bit Parity-Mapped Configuration	<pre>[edit interfaces coc12-0/0/0] partition 1 oc-slice 1 interface-type coc1; [edit interfaces coc1-0/0/0:1] no-partition interface-type ct3; [edit interfaces ct3-0/0/0:1] partition 1-5 interface-type t1;</pre>

For a full configuration example, see the *JUNOS Feature Guide*.

Configuring NxDS0 IQ Interfaces

To configure NxDS0 interfaces on a Channelized OC12 IQ or IQE PIC, you perform the following tasks:

1. Partition the channelized OC12 interface into channelized OC1 interfaces by including the **partition**, **oc-slice**, and **interface-type** statements at the **[edit interfaces coc12-fpc/pic/port]** hierarchy level, specifying the **coc1** interface type:

```
[edit interfaces coc12-fpc/pic/port]
partition partition-number oc-slice oc-slice-range interface-type coc1;
```

2. If your network equipment uses VT mapping, partition the channelized OC1 interface into channelized T1 interfaces by including the **partition** and **interface-type** statements at the **[edit interfaces coc1-fpc/pic/port]** hierarchy level, specifying the **ct1** interface type:

```
[edit interfaces coc1-fpc/pic/port]
partition partition-number interface-type ct1;
```



NOTE: Class-of-service (CoS) rules cannot be applied to an individual channel configured on channelized IQ interfaces. You can only apply CoS rules to the aggregate bit streams.

If your network equipment uses M13 or C-bit parity, convert the channelized OC1 interface into a channelized T3 interface by including the **no-partition** and **interface-type** statements at the **[edit interfaces coc1-fpc/pic/port]** hierarchy level, specifying the **ct3** interface type:

```
[edit interfaces coc1-fpc/pic/port]
no-partition partition-number interface-type ct3;
```



NOTE: Because the **no-partition** statement is included, this configuration task does not create another level of channelization, as denoted by the number of colons in the resulting interface.



NOTE: Class-of-service (CoS) rules cannot be applied to an individual channel configured on channelized IQ interfaces. You can only apply CoS rules to the aggregate bit streams.

3. You then partition the channelized T3 interface into channelized T1 interfaces by including the **partition** and **interface-type** statements at the [edit interfaces **ct3-fpc/pic/port**] hierarchy level, specifying the **ct1** interface type:

```
[edit interfaces ct3-fpc/pic/port]
partition partition-number interface-type ct1;
```



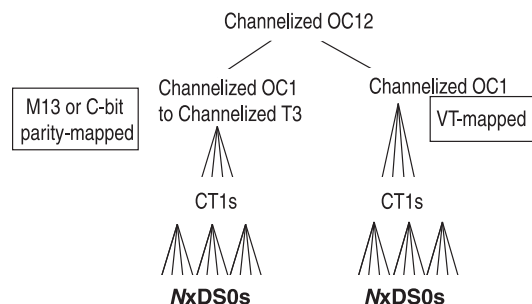
NOTE: Class-of-service (CoS) rules cannot be applied to an individual channel configured on channelized IQ interfaces. You can only apply CoS rules to the aggregate bit streams.

4. Configure channelized *NxDS0* IQ interfaces on the channelized T1 IQ interface by including the **partition**, **timeslots**, and **interface-type** statements at the [edit interfaces **ct1-fpc/pic/port**] hierarchy level, specifying the **ds** interface type:

```
[edit interfaces ct1-fpc/pic/port:channel:channel]
partition partition-number timeslots time-slot-range interface-type ds;
```

Figure 38 on page 408 shows VT-mapped and M13 or C-bit parity-mapped configurations of *NxDS0* IQ interfaces.

Figure 38: Sample Channelization of OC12 IQ or IQE PIC



Bold entries correspond to actual packet channels.

g003014

Example: Configuring NxDS0 IQ Interfaces

Configure the following two NxDS0 interfaces with 10 time slots and 4 time slots, respectively:

VT-Mapped Configuration	<pre>ds-0/0/0:1:2:1 ds-0/0/0:1:2:2 [edit interfaces coc12-0/0/0] partition 1 oc-slice 1 interface-type coc1; [edit interfaces coc1-0/0/0:1] partition 2 interface-type ct1; [edit interfaces ct1-0/0/0:1:2] partition 1 timeslots 1-10 interface-type ds; partition 2 timeslots 12-16 interface-type ds;</pre>
M13 or C-bit Parity-Mapped Configuration	<pre>[edit interfaces coc12-0/0/0] partition 1 oc-slice 1 interface-type coc1; [edit interfaces coc1-0/0/0:1] no-partition interface-type ct3; [edit interfaces ct3-0/0/0:1] partition 2 interface-type ct1; [edit interfaces ct1-0/0/0:1:2] partition 1 timeslots 1-10 interface-type ds; partition 2 timeslots 12-16 interface-type ds;</pre>

For a full configuration example, see the *JUNOS Feature Guide*.

Configuring Fractional T1 IQ Interfaces

By default, all the time slots on a channelized T1 interface are used. To configure a fractional T1 interface on a Channelized OC12 IQ or IQE PIC, you must perform the following tasks:

1. Configure a T1 IQ interface. For more information, see “Configuring T1 IQ Interfaces” on page 405.
2. Configure the number of time slots allocated to the T1 IQ interface by including the `timeslots` statement at the `[edit interfaces t1-fpc/pic/port<:channel> t1-options]` hierarchy level:

```
[edit interfaces t1-fpc/pic/port<:channel> t1-options]
timeslots time-slot-range;
```

For channelized T1 IQ interfaces, the time-slot range is from 1 through 24. You can designate any combination of time slots. To configure ranges, use hyphens. To

configure discontinuous time slots, use commas. Do not include spaces. For more information, see “Configuring Fractional T1 Time Slots” on page 493.

Example: Configuring Fractional T1 IQ Interfaces

Configure a fractional T1 interface that uses time slots 1 through 5 and 10:

```
[edit interfaces coc12-0/0/0]
partition 1 oc-slice 1 interface-type coc1;
[edit interfaces coc1-0/0/0:1]
partition 1 interface-type t1;
[edit interfaces t1-0/0/0:1:1 t1-options]
timeslots 1-5,10;
```

For a full configuration example, see the *JUNOS Feature Guide*.

Configuring Channelized OC12 IQ or IQE Interfaces (SDH Mode)

The Channelized OC12 IQ or IQE PIC configured for SDH mode creates a single channelized STM4 interface. You can configure this interface as unpartitioned using the `no-partition` statement at the `[edit interfaces cstm4-fpc/pic/port]` hierarchy level to create a single SDH VC-4-4C interface, or you can partition it into the following OC slices:

- SDH Virtual Concatenation 4 (VC-4) and channelized AU-4 interfaces (4 interfaces, any combination)
- Channelized T3 or T3 interfaces from a channelized AU-4 interface (3 interfaces, any combination)
- Channelized T1 or T1 interfaces from a channelized T3 interface (28 interfaces, any combination)
- NxDS0 interfaces from a channelized T1 interface

This section describes how to configure the following channelized OC12 IQ and IQE interfaces on a Channelized OC12 IQ or IQE PIC configured in SDH mode:

- Configuring a Channelized OC12 IQ or IQE PIC for SDH Mode on page 410
- Configuring an Unpartitioned SDH (VC-4-4C) Interface on page 411
- Configuring SDH (VC-4) Interfaces on page 411
- Configuring Channelized AU-4 Interfaces on page 412
- Configuring T3 or Channelized T3 Interfaces on page 413
- Configuring T1 or Channelized T1 Interfaces on page 414
- Configuring NxDS0 IQ Interfaces on page 414

Configuring a Channelized OC12 IQ or IQE PIC for SDH Mode

To configure a Channelized OC12 IQ or IQE PIC to operate in SDH mode, include the `framing sdh` statement at the `[edit chassis fpc fpc/pic/port]` hierarchy level:

```
[edit chassis{
  fpc 0 {
    pic 2 {
      framing sdh;
    }
  }
}
```

This configuration creates interface `cstm4-0/2/0`

For more information, see the *JUNOS System Basics Configuration Guide*.

Configuring an Unpartitioned SDH (VC-4-4C) Interface

On a Channelized OC12 IQ or IQE PIC, you can configure one SDH (VC-4-4C) interface. To configure an SDH (VC-4-4C) interface, include the `no-partition` and `interface-type` statements at the `[edit interfaces cstm4-fpc/pic/port]` hierarchy level:

```
[edit interfaces cstm4-fpc/pic/port]
no-partition interface-type so;
```

This configuration creates interface `so-fpc/pic/port`.

Example: Configuring an Unpartitioned SDH (VC-4-4C) Interface

Configure an unpartitioned SDH (VC-4-4C) interface, using partition 1 and OC slices 4 through 6.

```
[edit interfaces cstm4-0/2/0]
no-partition interface-type so;
```

This configuration creates the interface `so-0/2/0`.

Configuring SDH (VC-4) Interfaces

To configure a SDH (VC-4) interface on a Channelized OC12 IQ or IQE PIC, include the `partition`, `oc-slice`, and `interface-type` statements at the `[edit interfaces cstm4-fpc/pic/port]` hierarchy level, specifying the `so` interface type:

```
[edit interfaces cstm4-fpc/pic/port]
partition partition-number oc-slice oc-slice-range interface-type so;
```

This configuration creates interface `so-fpc/pic/port:channel`.

The partition number is the sublevel interface partition index and is correlated with the channel number. For Channelized OC12 IQ or IQE PICs, the OC slice range can be from 1 through 12.



NOTE: For channelized OC12 IQ interfaces, channel numbering begins with 1 (:1).

The OC slice range is the range of SONET/SDH slices. For SDH interfaces, the OC slice range specifies the bandwidth size required for the interface type you are configuring. SDH (VC-4) interfaces must occupy three consecutive OC slices per interface, in one of the following forms:

- 1–3
- 4–6
- 7–9
- 10–12

The interface type is the channelized interface type or data channel you are creating.

Example: Configuring SDH (VC-4) Interfaces

Configure SDH (VC-4) interfaces:

```
[edit interfaces cstm4-0/2/0]
partition 1 oc-slice 1-3 interface-type so;
partition 2 oc-slice 4-6 interface-type so;
partition 3 oc-slice 7-9 interface-type so;
partition 4 oc-slice 10-12 interface-type so;
```

This configuration creates the interfaces `so-0/2/0:1` through `so-0/2/0:4`.

Configuring Channelized AU-4 Interfaces

To configure a channelized AU-4 interface, include the `partition`, `oc-slice`, and `interface-type` statements at the `[edit interfaces cstm4-fpc/pic/port]` hierarchy level, specifying the `cau4` interface type:

```
[edit interfaces cstm4-fpc/pic/port]
partition partition-number oc-slice oc-slice-range interface-type cau4;
```

This configuration creates interface `cau4-fpc/pic/port:channel`.

The partition number is the sublevel interface partition index. For SDH interfaces, the partition number is not correlated with bandwidth size. A channelized STM-4 interface can have 1 through 4 partition numbers.



NOTE: For channelized OC12 interfaces, channel numbering begins with 0 (:0). For channelized OC12 IQ interfaces, channel numbering begins with 1 (:1).

The OC-slice range is the range of SONET/SDH slices. For SDH interfaces, the OC-slice range specifies the bandwidth size required for the interface type you are configuring. Channelized AU-4 IQ interfaces must occupy three consecutive OC slices per interface, in one of the following forms:

- 1–3
- 4–6

- 7–9
- 10–12

The interface type is the channelized interface type or data channel you are creating.

Example: Configuring Channelized AU-4 Interfaces

Configure channelized AU-4 interfaces, using partitions 1 through 4:

```
[edit interfaces cstm4-0/2/0]
partition 1 oc-slice 1-3 interface-type cau4;
partition 2 oc-slice 4-6 interface-type cau4;
partition 3 oc-slice 7-9 interface-type cau4;
partition 4 oc-slice 10-12 interface-type cau4;
```

This configuration creates the interfaces cau4-0/2/0:1 through cau4-0/2/0:4.

Configuring T3 or Channelized T3 Interfaces

To configure T3 or channelized T3 interfaces, include the `partition` and `interface-type` statements at the `[edit interfaces cau4-fpc/pic/port]` hierarchy level, specifying the `t3` or `ct3` interface type:

```
[edit interfaces]
cau4-fpc/pic/port {
  partition partition-number interface-type t3;
}
cau4-fpc/pic/port {
  partition partition-number interface-type ct3;
}
```

This configuration creates the interfaces `t3-fpc/pic/port:channel` and `t3-fpc/pic/port:channel`.



NOTE: Class-of-service (CoS) rules cannot be applied to an individual channel configured on channelized IQ interfaces. You can only apply CoS rules to the aggregate bit streams.

Example: Configuring T3 or Channelized T3 Interfaces

Configure T3 and channelized T3 interfaces, using partition 1 and partition 2.

```
[edit interfaces]
cau4-0/2/0:1 {
  partition 1 interface-type t3;
}
cau4-0/2/0:1 {
  partition 2 interface-type ct3;
}
t3-0/2/0:1:1 ct3-0/2/0:1:2;
```

Configuring T1 or Channelized T1 Interfaces

To configure T1 or channelized T1 interfaces, include the `partition` and `interface-type` statements at the `[edit interfaces ct3-fpc/pic/port]` hierarchy level, specifying the `t1` or `ct1` interface type:

```
[edit interfaces]
ct3-fpc/pic/port {
  partition partition-number interface-type t1;
}
ct3-fpc/pic/port {
  partition partition-number interface-type ct1;
}
```

This configuration creates the interfaces `t1-fpc/pic/port:channel` and `ct1-fpc/pic/port:channel`.



NOTE: Class-of-service (CoS) rules cannot be applied to an individual channel configured on channelized IQ interfaces. You can only apply CoS rules to the aggregate bit streams.

Example: Configuring T1 or Channelized T1 Interfaces

Configure T1 or channelized T1 interfaces, using partition 3 and partition 4.

```
[edit interfaces]
ct3-0/2/0:1:2 {
  partition 3 interface-type t1;
}
ct3-0/2/0:1:2 {
  partition 4 interface-type ct1;
}
```

This configuration creates interfaces `ct1-0/2/0:1:2:3` and `t1-0/2/0:1:2:4`.

Configuring NxDS0 IQ Interfaces

Configure channelized NxDS0 IQ interfaces on the channelized T1 IQ interface by including the `partition`, `timeslots`, and `interface-type` statements at the `[edit interfaces ct1-fpc/pic/port:channel]` hierarchy level, specifying the `ds` interface type:

```
[edit interfaces ct1-fpc/pic/port:channel:channel]
partition partition-number timeslots time-slot-range interface-type ds;
```

This configuration creates the interface `ds-fpc/pic/port:channel`.

The time-slot range is from 1 through 24. You can designate any combination of time slots. To configure ranges, use hyphens. To configure discontinuous time slots, use commas. You can use a combination of ranges and discontinuous time slots:

```
1,9-18,21
```


Example: Configuring NxDS0 IQ Interfaces

Configure channelized NxDS0 interfaces, using partition 4 and time slots 1 through 10.

```
[edit interfaces]
ct1-0/2/0:1:2:3 {
  partition 4 interface-type ds0 timeslots 1-10;
}
```

This configuration creates interface ds-0/2/0:1:2:3:4.

Configuring Channelized OC12 Interfaces

On Channelized OC12 PICs, you can configure 12 T3 channels per port. To configure channelized OC12 interface properties, you can include the **sonet-options** and **t3-options** statements at the `[edit interfaces interface-name]` hierarchy level. Some SONET/SDH options are ignored, and some can only be configured for channel 0, though they apply equally to all channels. The **long-buildout** statement under **t3-options** is also ignored.

For T3 channels on a channelized OC12 interface, the **clocking** statement is supported only for channel 0; it is ignored if included in the configuration of channels 1 through 11. The clock source configured for channel 0 applies to all channels on the channelized OC12 interface. The individual T3 channels use a gapped 45-MHz clock as the transmit clock. When you configure the clock source for a channelized interface—ds-x/y/z:0, for example—you must also include the **channel-group** statement at the `[edit chassis]` hierarchy level and specify channel group 0. For more information, see “Clock Sources on Channelized Interfaces” on page 364.

For more information, see “Configuring SONET/SDH Interfaces” on page 679 and “Configuring T3 Interfaces” on page 495. For a configuration example, see “Configuring Aggregated SONET/SDH Interfaces” on page 716.

Table 40 on page 415 summarizes the OC12-to-DS3 numbering scheme.

Table 40: OC12-to-DS3 Numbering Scheme

Two-Level STS-1 Number (STS-3,STS-1)	One-Level STS Number	OC12-to-DS3 PIC DS3 Number
1,1	1	0
1,2	2	1
1,3	3	2
2,1	4	3
2,2	5	4
2,3	6	5

Table 40: OC12-to-DS3 Numbering Scheme (continued)

Two-Level STS-1 Number (STS-3,STS-1)	One-Level STS Number	OC12-to-DS3 PIC DS3 Number
3,1	7	6
3,2	8	7
3,3	9	8
4,1	10	9
4,2	11	10
4,3	12	11

Configuring Link PIC Failover

For Channelized OC12 IQ or IQE PICs used as linking PICs in redundant LSQ configurations, you can inhibit the router from sending PPP termination-request messages to the remote host if the link PIC fails. To do this, include the **no-termination-request** statement at the [edit interfaces *interface-name* ppp-options] hierarchy level:

```
no-termination-request;
```

The **no-termination-request** statement is supported only with MLPPP and SONET APS configurations and works with PPP, PPP over Frame Relay, and MLPPP interfaces only.

For information about interchassis and intrachassis LSQ failover, see the *JUNOS Services Interfaces Configuration Guide*.

Example: Configuring Channelized OC12 IQ Interfaces

Configuring a SONET/SDH Interface

Configure a channelized OC12 interface as an unpartitioned, clear channel:

```
[edit interfaces]
coc12-5/0/0 {
  no-partition interface-type so; # so-5/0/0
}
```

Configuring Multiple Interface Types

Configure the following interfaces on a Channelized OC12 IQ or IQE PIC:

- An OC3 interface
- Another OC3 interface
- A channelized OC1 partitioned into T1 interfaces
- A channelized OC1 converted into a T3 interface

- e. A channelized OC1 partitioned into T1 interfaces and channelized T1s, which are partitioned into NxDS0 interfaces
- f. A channelized OC1 converted into a channelized T3, which is partitioned into T1 interfaces
- g. A channelized OC1 converted into a channelized T3, which is partitioned into T1 interfaces and a channelized T1, which is partitioned into NxDS0 interfaces
- h. A channelized OC1 partitioned into channelized T1s, which are partitioned into NxDS0 interfaces

**Configuring the Interface
Partitions**

```
[edit interfaces]
coc12-1/1/0 {
  sonet-options {
    sonet-options-statements;
  }
  partition 1 oc-slice 1-3 interface-type so; # (a) so-1/1/0:1
  partition 2 oc-slice 4-6 interface-type so; # (b) so-1/1/0:2
  partition 3 oc-slice 7 interface-type coc1; # (c) coc1-1/1/0:3
  partition 4 oc-slice 8 interface-type coc1; # (d) coc1-1/1/0:4
  partition 5 oc-slice 9 interface-type coc1; # (e) coc1-1/1/0:5
  partition 6 oc-slice 10 interface-type coc1; # (f) coc1-1/1/0:6
  partition 7 oc-slice 11 interface-type coc1; # (g) coc1-1/1/0:7
  partition 8 oc-slice 12 interface-type coc1; # (h) coc1-1/1/0:8
}

(a) so-1/1/0:1 {
  description "(a) OC-slice 1-3 of coc12-1/1/0. COC12 > OC3.";
  sonet-options {
    sonet-options-statements;
  }
}

(b) so-1/1/0:2 {
  description "(b) OC-slice 4-6 of coc12-1/1/0. COC12 > OC3.";
  sonet-options {
    sonet-options-statements;
  }
}

(c) coc1-1/1/0:3 {
  description "(c) OC-slice 7 of coc12-1/1/0. COC12 to COC1 VT-mapped to T1s.";
  sonet-options {
    sonet-options-statements;
  }
  partition 1 - 10 interface-type t1; # t1-1/1/0:[1-10]
}
t1-1/1/0:3:1 {
  description "(c) OC-slice 7 of coc12-1/1/0. T1 interface configuration.";
  t1-options {
    t1-options-statements;
  }
}
...
```

```

(d) coc1-1/1/0:4 {
    description "(d) OC-slice 8 of coc12-1/1/0. COC12 to COC1 converted to a T3.";
    sonet-options {
        sonet-options-statements;;
    }
    no-partition interface-type t3; # t3-1/1/0:4
}
t3-1/1/0:4 {
    description "(d) OC-slice 8 of coc12-1/1/0. T3 interface configuration.";
}

(e) coc1-1/1/0:5 {
    description "(e) OC-slice 9 of coc12-1/1/0. COC12 to COC1 VT-mapped to T1s.";
    sonet-options {
        sonet-options-statements;
    }
    partition 1 - 3 interface-type t1; # t1-1/1/0:5:[1-3]
    partition 4 interface-type ct1; # ct1-1/1/0:5:4
}
t1-1/1/0:5:1 {
    description "(e) OC-slice 9 of coc12-1/1/0. T1 interface configuration.";
    t1-options {
        t1-options-statements;
    }
}
...
ct1-1/1/0:5:4 {
    description "(e) OC-slice 9 of coc12-1/1/0. CT1 to NxDSOs.";
    t1-options {
        t1-options-statements;
    }
    partition 1 timeslots 0 - 10 interface-type ds0; # ds-1/1/0:5:4:1
    partition 2 timeslots 11- 23 interface-type ds0; # ds-1/1/0:5:4:2
    ...
}

(f) coc1-1/1/0:6 {
    description "(f) OC-slice 10 of coc12-1/1/0. COC12 to COC1 converted to a CT3
        to T1s.";
    sonet-options {
        sonet-options-statements;
    }
    no-partition interface-type ct3; # ct3-1/1/0:6
}
ct3-1/1/0:6 {
    description "(f) COC12 to CT3 M-13 and C-bit parity-mapped to T1s.";
    sonet-options {
        sonet-options-statements;
    }
    partition 1 - 10 interface-type t1; # t1-1/1/0:6:[1-10]
}
t1-1/1/0:6:1 {
    description "(f) T1 interface configuration.";
    t1-options {
        t1-options-statements;
    }
}

```

```

    }
  }
  ...

(g) coc1-1/1/0:7 {
    description "(g) OC-slice 11 of coc12-1/1/0. COC12 to COC1 converted to a CT3
        to T1s and CT1 to NxDSOs.";
    sonet-options {
        sonet-options-statements;
    }
    no-partition interface-type ct3; # ct3-1/1/0:7
  }
  ct3-1/1/0:7 {
    description "(g) COC12 to CT3 M-13 and C-bit parity-mapped to T1s and CT1.";
    sonet-options {
        sonet-options-statements;
    }
    partition 1 - 10 interface-type t1; # t1-1/1/0:7:[1-10]
    partition 2 interface-type ct1; # ct1-1/1/0:7:11
  }
  t1-1/1/0:7:1 {
    description "(g) T1 interface configuration.";
    t1-options {
        t1-options-statements;
    }
  }
  ...
  ct1-1/1/0:7:11 {
    description "(g) CT1 to NxDSOs.";
    t1-options {
        t1-options-statements;
    }
    partition 1 timeslots 0 - 10 interface-type ds0; # ds-1/1/0:7:11:1
    partition 2 timeslots 11- 23 interface-type ds0; # ds-1/1/0:7:11:2
    ...
  }

(h) coc1-1/1/0:8 {
    description "(h) OC-slice 12 of coc12-1/1/0. COC12 to COC1 VT-mapped to CT1
        to NxDSOs.";
    sonet-options {
        sonet-options-statements;
    }
    partition 1 interface-type t1; # ct1-1/1/0:8:1
  }
  ct1-1/1/0:8:1 {
    description "(h) CT1 to NxDSOs.";
    t1-options {
        t1-options-statements;
    }
    partition 1 timeslots 0 - 10 interface-type ds0; # ds-1/1/0:8:1:1
    partition 2 timeslots 11- 23 interface-type ds0; # ds-1/1/0:8:1:2
    ...
  }
}

```

For a full configuration example, see the *JUNOS Feature Guide*.

Example: Configuring Channelized OC12 Interfaces

The following configuration is sufficient to get the channelized OC12 interface up and running. The OC12 interface can be divided into 12 channels. DS3 channels can use the following encapsulation types:

- PPP, PPP CCC, and PPP TCC
- Frame Relay, Frame Relay CCC, and Frame Relay TCC
- Cisco HDLC, Cisco HDLC CCC, and Cisco HDLC TCC

The channels can also have logical interfaces.

```
[edit interfaces]
t3-fpc/pic/port:0 {
  encapsulation cisco-hdlc;
  t3-options {
    compatibility-mode larscom;
    payload-scrambler;
  }
  unit 0 {
    family inet {
      address 10.11.30.1/30;
    }
    family iso;
  }
}
t3-fpc/pic/port:1 {
  encapsulation ppp;
  t3-options {
    compatibility-mode larscom;
    payload-scrambler;
  }
  unit 0 {
    family inet {
      address 10.11.30.5/30;
    }
    family iso;
  }
}
t3-fpc/pic/port:2 {
  encapsulation frame-relay;
  t3-options {
    compatibility-mode larscom;
    payload-scrambler;
  }
  unit 0 {
    dlci 100;
    family inet {
      address 10.11.30.9/30;
    }
    family iso;
  }
}
```

```

    }
    unit 1 {
        dlc1 101;
        family inet {
            address 10.11.31.9/30;
        }
        family iso;
    }
}
t3-1fpc/pic/port:3 {
    encapsulation cisco-hdlc-ccc;
    t3-options {
        compatibility-mode larscom;
        payload-scrambler;
    }
    unit 0;
}
t3-fpc/pic/port:4 {
    encapsulation ppp-ccc;
    t3-options {
        compatibility-mode larscom;
        payload-scrambler;
    }
    unit 0;
}
t3-fpc/pic/port:5 {
    dce;
    encapsulation frame-relay-ccc;
    t3-options {
        compatibility-mode larscom;
        payload-scrambler;
    }
    unit 0 {
        encapsulation frame-relay-ccc;
        dlc1 1000;
    }
    unit 1 {
        encapsulation frame-relay-ccc;
        dlc1 1001;
    }
}
}

```


Chapter 22

Configuring Channelized STM1 Interfaces

Each Channelized STM1 PIC and Channelized STM1 Intelligent Queuing (IQ) PIC has one STM1 port.

For the Channelized STM1 IQ or IQE PIC, you can channelize the single port to the NxDS0 level. Each E1 interface has 32 time slots (DS0), in which time slot 0 is reserved.

You can combine one or more of these DS0 time slots (channels) to create a channel group (NxDS0).

This section contains the following topics:

- Configuring Channelized STM1 IQ and IQE Interfaces on page 423
- Configuring Channelized STM1 Interfaces on page 429
- Configuring Link PIC Failover on page 433
- Example: Configuring Channelized STM1 Interfaces on page 433

Configuring Channelized STM1 IQ and IQE Interfaces

This section includes the following topics:

- Configuring an STM1 IQ or STM1 IQE Interface on page 423
- Configuring E1 IQ and IQE Interfaces on page 424
- Configuring Fractional E1 IQ Interfaces on page 425
- Configuring an NxDS0 IQ Interface on page 426
- Example: Configuring Channelized STM1 IQ and IQE Interfaces on page 427

Configuring an STM1 IQ or STM1 IQE Interface

On a one-port Channelized STM1 IQ PIC, or each individual ports of the 4-port Channelized STM1 IQE PIC, you can configure one SDH STM1 interface. To configure an SDH STM1 interface, include the **no-partition interface-type** statement at the [edit interfaces cstm1-*fpc/pic/port*] hierarchy level, specifying the **so** interface type:

```
[edit interfaces cstm1-fpc/pic/port]  
no-partition interface-type so;
```

This configuration creates interface **so-*fpc/pic/port***.



NOTE: Class-of-service (CoS) rules cannot be applied to an individual channel configured on channelized IQ and IQE interfaces. You can only apply CoS rules to the aggregate bit streams.

Configuring E1 IQ and IQE Interfaces

To configure an E1 interface on a Channelized STM1 IQ or IQE PIC, you must perform the following tasks:

1. Include the **no-partition** and **interface-type** statements at the [edit interfaces **cstm1-fpc/pic/port**] hierarchy level, specifying the **cau4** interface type. This converts the channelized STM1 interface into a channelized Administrative Unit 4 (AU-4) interface. The resulting interface name is **cau4-fpc/pic/port**:

```
[edit interfaces cstm1-fpc/pic/port]
no-partition interface-type cau4;
```

2. Partition the channelized AU-4 interface into E1 interfaces by including the **partition** and **interface-type** statements at the [edit interfaces **cau4-fpc/pic/port**] hierarchy level, specifying the **e1** interface type. This configuration creates interface **e1-fpc/pic/port:channel**. The partition number is the sublevel interface partition index and is correlated with the channel number. For channelized E1 interfaces, the partition number can be from 1 through 63. The interface type is the channelized interface type or clear channel you are creating. For channelized AU-4 interfaces, **type** can be **ce1** or **e1**.

```
[edit interfaces cau4-fpc/pic/port]
partition partition-number interface-type e1;
```



NOTE: Class-of-service (CoS) rules cannot be applied to an individual channel configured on channelized IQ or IQE interfaces. You can only apply CoS rules to the aggregate bit streams.



NOTE: For channelized STM1 interfaces, channel numbering begins with 0 (:0). For channelized STM1 IQ and IQE interfaces, channel numbering begins with 1 (:1).

Example: Configuring E1 IQ and IQE Interfaces

Configure the following five E1 interfaces:

- e1-0/0/0:1
- e1-0/0/0:2
- e1-0/0/0:3
- e1-0/0/0:4
- e1-0/0/0:5

```
[edit interfaces cstm1-0/0/0]
no-partition interface-type cau4;
[edit interfaces cau4-0/0/0]
partition 1-5 interface-type e1;
```

For a full configuration example, see the *JUNOS Feature Guide*.

Configuring Fractional E1 IQ Interfaces

By default, all the time slots on a channelized E1 interface are used. To configure a fractional E1 interface on a Channelized STM1 IQ or IQE PIC, you must perform the following tasks:

1. Include the **no-partition** and **interface-type** statements at the **[edit interfaces cstm1-fpc/pic/port]** hierarchy level, specifying the **cau4** interface type. This converts the channelized STM1 interface into a channelized AU-4 interface. The resulting interface name is **cau4-fpc/pic/port**:

```
[edit interfaces cstm1-fpc/pic/port]
no-partition interface-type cau4;
```

2. Partition the channelized AU-4 interface into E1 interfaces by including the **partition** and **interface-type** statements at the **[edit interfaces cau4-fpc/pic/port]** hierarchy level, specifying the **e1** interface type. The partition number is the sublevel interface partition index and is correlated with the channel number. For channelized E1 interfaces, the partition number can be from 1 through 63. The interface type is the channelized interface type or clear channel you are creating. For channelized AU-4 interfaces, **type** can be **ce1** or **e1**. This configuration creates interface **e1-fpc/pic/port:channel**:

```
[edit interfaces cau4-fpc/pic/port]
partition partition-number interface-type e1;
```

3. Configure the number of time slots allocated to the E1 IQ or IQE interface by including the **timeslots** statement at the **[edit interfaces e1-fpc/pic/port:channel e1-options]** hierarchy level. NxDS0 time slots configured on either a channelized STM1 IQ or IQE interface or channelized E1 IQ or IQE interface are numbered from 1 to 31 (0 is reserved), while fractional E1 time slots range from 2 to 32 (1 is reserved). To configure ranges, use hyphens. To configure discontinuous time slots, use commas. Do not include spaces.

```
[edit interfaces e1-fpc/pic/port:channel e1-options]
timeslots time-slot-range;
```



NOTE: For channelized STM1 interfaces, channel numbering begins with 0 (:0). For channelized STM1 IQ or IQE interfaces, channel numbering begins with 1 (:1).

For more information about E1 time slots, see “Configuring Fractional E1 Time Slots” on page 474.

Example: Configuring Fractional E1 IQ Interfaces

Configure a fractional E1 interface that uses time slots 2 through 10:

```
[edit interfaces cstm1-0/0/0]
no-partition cau4;
[edit interfaces cau4-0/0/0]
partition 1 interface-type e1;
[edit interfaces e1-0/0/0 e1-options]
timeslots 2-10;
```

For a full configuration example, see the *JUNOS Feature Guide*.

Configuring an NxDS0 IQ Interface

By default, all the time slots on a channelized STM1 interface are used. To configure an NxDS0 IQ interface on a Channelized STM1 IQ or IQE PIC, you must perform the following tasks:

1. Include the **no-partition** and **interface-type** statements at the **[edit interfaces cstm1-fpc/pic/port]** hierarchy level, specifying the **cau4** interface type. This converts the channelized STM1 interface into a channelized AU-4 interface. The resulting interface name is **cau4-fpc/pic/port**:

```
[edit interfaces cstm1-fpc/pic/port]
no-partition interface-type cau4;
```

2. Partition the channelized AU-4 interface into E1 interfaces by including the **partition** and **interface-type** statements at the **[edit interfaces cau4-fpc/pic/port]** hierarchy level, specifying the **ce1** interface type. This configuration creates interface **ce1-fpc/pic/port:channel**. The partition number is the sublevel interface partition index and is correlated with the channel number. For channelized E1 interfaces, the partition number can be from 1 through 63. The interface type is the channelized interface type or clear channel you are creating. For channelized AU-4 interfaces, **type** can be **ce1** or **e1**:

```
[edit interfaces cau4-fpc/pic/port]
partition partition-number interface-type ce1;
```

3. Configure the number of time slots allocated to the NxDS0 IQ interface by including the **partition**, **timeslots**, and **interface-type** statements at the **[edit interfaces e1-fpc/pic/port:channel]** hierarchy level, specifying the **ds** interface type. For channelized E1 IQ interfaces, the partition number range is from 1 through 31. For E1 IQ interfaces (**e1-fpc/pic/port**), the time-slot range is from 2 through 31. For channelized E1 IQ interfaces (**ce1-fpc/pic/port**), the time-slot range is from 1 through 31. You can designate any combination of time slots. To configure ranges, use hyphens. To configure discontinuous time slots, use commas. Do not include spaces:

```
[edit interfaces ce1-fpc/pic/port:channel]
partition partition-number timeslots time-slot-range interface-type ds;
```



NOTE: Class-of-service (CoS) rules cannot be applied to an individual channel configured on channelized IQ and IQE interfaces. You can only apply CoS rules to the aggregate bit streams.



NOTE: For channelized STM1 interfaces, channel numbering begins with 0 (:0). For channelized STM1 IQ and IQE interfaces, channel numbering begins with 1 (:1).

For more information about E1 time slots, see “Configuring Fractional E1 Time Slots” on page 474.

Example: Configuring an NxDS0 IQ Interface

Configure an NxDS0 interface that uses time slots 1 through 10. This configuration creates the ds-0/0/0:1:1 interface.

```
[edit interfaces cstm1-0/0/0]
no-partition interface-type cau4;
[edit interfaces cau4-0/0/0]
partition 1 interface-type ce1;
[edit interfaces ce1-0/0/0:1]
partition 1 timeslots 1-10 interface-type ds;
```

For a full configuration example, see the *JUNOS Feature Guide*.

Example: Configuring Channelized STM1 IQ and IQE Interfaces

Configure STM1, E1, fractional E1, and NxDS0 interfaces:

STM1 Interface	<pre>[edit interfaces] cstm1-0/0/0 { no-partition interface-type so; } so-0/0/0 { unit 0 { family inet { address 10.10.12.1/30; } } }</pre>
E1 Interface	<pre>[edit interfaces] cstm1-1/1/0 { no-partition interface-type cau4; } [edit interfaces] cau4-1/1/0 { partition 1-63 interface-type e1; } [edit interfaces] e1-1/1/0:1 {</pre>

```

        unit 0 {
            family inet {
                address 10.10.10.1/30;
            }
        }
    }
    ...

```

Fractional E1 Interface

```

[edit interfaces]
cstm1-1/0/0 {
    no-partition interface-type cau4;
}
[edit interfaces]
cau4-1/0/0 {
    partition 1-63 interface-type e1;
}
[edit interfaces]
e1-1/1/0:1 {
    e1-options {
        timeslots 2-10;
    }
    unit 0 {
        family inet {
            address 10.10.10.1/30;
        }
    }
}
...

```

DS0 Interface

```

[edit interfaces]
cstm1-2/0/0 {
    no-partition interface-type cau4;
}
[edit interfaces]
cau4-2/0/0 {
    partition 1-10 interface-type ce1;
}
[edit interfaces]
ce1-2/0/0:1 {
    partition 1 interface-type ds timeslots 2-10;
    [edit interfaces]
    ds-2/0/0:1:1 {
        unit 0 {
            family inet {
                address 10.12.12.1/30;
            }
        }
    }
}
...
}

```

For a full configuration example, see the *JUNOS Feature Guide*.

Configuring Channelized STM1 Interfaces

To specify the channel number, include it after the colon (:) in the interface name. For example, a Channelized STM1-to-E1 PIC in FPC 1 and slot 1 will have the following physical interface, depending on the media type:

```
e1-1/1/0:x
```

The E1 channel number can be from 0 through 62.

This section contains the following topics:

- Configuring Channelized STM1 Interface Properties on page 429
- Configuring Virtual Tributary Mapping of Channelized STM1 Interfaces on page 430

Configuring Channelized STM1 Interface Properties

To configure the interface properties for Channelized STM1-to-E1 PICs, include the **e1-options** and **sonet-options** statements for both sides of the connection. The following configurations list all the valid statements.

To specify options for each of the E1 channels on the Channelized STM1-to-E1 PIC, include the **e1-options** statement at the [edit interfaces *interface-name*] hierarchy level:

```
[edit interfaces interface-name]
e1-options {
  bert-error-rate;
  bert-period;
  fcs (16 | 32);
  framing (g704 | g704-no-crc4 | unframed);
  idle-cycle-flag (flags | ones);
  loopback (local | remote);
  start-end-flag (filler | shared);
  timeslots time-slot-number;
}
```



NOTE: When a channelized STM1 interface experiences a line transition, the E1 channels configured in unframed mode log a large number of drops (around 24,000) as the channelized STM1 interface clocks resynchronize. This does not occur on framed channels, because the framing resynchronizes clocks very quickly.

To specify options for the SONET/SDH side of the connection, include the **sonet-options** statement at the [edit interfaces *interface-name*] hierarchy level:

```
[edit interfaces interface-name]
sonet-options {
  aps {
    advertise-interval milliseconds;
    authentication-key key;
    force;
    hold-time milliseconds;
    lockout;
```

```

neighbor address;
paired-group group-name;
protect-circuit group-name;
request;
revert-time seconds;
switching-mode (bidirectional | unidirectional);
working-circuit group-name;
}
bytes {
  e1-quiet value;
  f1 value;
  f2 value;
  s1 value;
  z3 value;
  z4 value;
}
loopback (local | remote);
}

```



NOTE: On channelized STM1 interfaces, you should configure the clock source on one side of the connection to be internal (the default JUNOS configuration) and on the other side of the connection to be external.

For information about Frame Relay DLCI limitations for channelized interfaces, see “Data-Link Connection Identifiers on Channelized Interfaces” on page 362. For more information about Frame Relay DLCIs, see “Configuring a Point-to-Point Frame Relay Connection” on page 356. For information about DLCI sparse mode, see the *JUNOS System Basics Configuration Guide*.

For more information about specific statements, see “Configuring E1 Interfaces” on page 469, “Configuring SONET/SDH Interfaces” on page 679, and “Configuring T1 Interfaces” on page 485. For a configuration example, see “Example: Configuring Channelized STM1 Interfaces” on page 433.

Configuring Virtual Tributary Mapping of Channelized STM1 Interfaces

You can configure virtual tributary mapping to use KLM mode or ITU-T mode. To configure virtual tributary mapping, include the `vtmapping` statement at the [edit chassis fpc slot-number pic pic-number] hierarchy level:

```

[edit chassis fpc slot-number pic pic-number]
vtmapping (klm | itu-t);

```

By default, virtual tributary mapping uses KLM mode. For more information, see the *JUNOS System Basics Configuration Guide*.

For the Channelized STM1 IQ and IQE PICs, you can configure virtual tributary mapping by including the `vtmapping` statement at the [edit interfaces cau4-fpc/pic/port sonet-options] hierarchy level:

```

[edit interfaces cau4-fpc/pic/port sonet-options]
vtmapping (klm | itu-t);

```


Table 41 on page 431 lists the KLM mappings used by the channelized STM1-to-E1 PIC interfaces. The PIC defaults to KLM numbering with an offset of -1; for example, KLM 1 = STM1 PIC 0.

Table 41: Channelized STM1-to-E1 Channel Mapping

Channel Number	KLM Number	Tributary Unit Group 3	Tributary Unit Group 2	Virtual Tributary	ITU-T Number
0	1	1	1	1	1
1	2	1	1	2	22
2	3	1	1	3	43
3	4	1	2	1	4
4	5	1	2	2	25
5	6	1	2	3	46
6	7	1	3	1	7
7	8	1	3	2	28
8	9	1	3	3	49
9	10	1	4	1	10
10	11	1	4	2	31
11	12	1	4	3	52
12	13	1	5	1	13
13	14	1	5	2	34
14	15	1	5	3	55
15	16	1	6	1	16
16	17	1	6	2	37
17	18	1	6	3	58
18	19	1	7	1	19
19	20	1	7	2	40
20	21	1	7	3	61
21	22	2	1	1	2
22	23	2	1	2	23
23	24	2	1	3	44

Table 41: Channelized STM1-to-E1 Channel Mapping *(continued)*

Channel Number	KLM Number	Tributary Unit Group 3	Tributary Unit Group 2	Virtual Tributary	ITU-T Number
24	25	2	2	1	5
25	26	2	2	2	26
26	27	2	2	3	47
27	28	2	3	1	8
28	29	2	3	2	29
29	30	2	3	3	50
30	31	2	4	1	11
31	32	2	4	2	32
32	33	2	4	3	53
33	34	2	5	1	14
34	35	2	5	2	35
35	36	2	5	3	56
36	37	2	6	1	17
37	38	2	6	2	38
38	39	2	6	3	59
39	40	2	7	1	20
40	41	2	7	2	41
41	42	2	7	3	62
42	43	3	1	1	3
43	44	3	1	2	24
44	45	3	1	3	45
45	46	3	2	1	6
46	47	3	2	2	27
47	48	3	2	3	48
48	49	3	3	1	9
49	50	3	3	2	30
50	51	3	3	3	51

Table 41: Channelized STM1-to-E1 Channel Mapping (*continued*)

Channel Number	KLM Number	Tributary Unit Group 3	Tributary Unit Group 2	Virtual Tributary	ITU-T Number
51	52	3	4	1	12
52	53	3	4	2	33
53	54	3	4	3	54
54	55	3	5	1	15
55	56	3	5	2	36
56	57	3	5	3	57
57	58	3	6	1	18
58	59	3	6	2	39
59	60	3	6	3	60
60	61	3	7	1	21
61	62	3	7	2	42
62	63	3	7	3	63

Configuring Link PIC Failover

For Channelized STM1 IQ and IQE PICs used as linking PICs in redundant LSQ configurations, you can inhibit the router from sending PPP termination-request messages to the remote host if the link PIC fails. To do this, include the `no-termination-request` statement at the [edit interfaces *interface-name* ppp-options] hierarchy level:

```
no-termination-request;
```

The `no-termination-request` statement is supported only with MLPPP and SONET APS configurations and works with PPP, PPP over Frame Relay, and MLPPP interfaces only.

For information about interchassis and intrachassis LSQ failover, see the *JUNOS Services Interfaces Configuration Guide*.

Example: Configuring Channelized STM1 Interfaces

The following configuration is sufficient to get the Channelized STM1-to-E1 PIC interface up and running. The channelized STM1-to-E1 interface is an STM1 that is divided into 63 E1 interfaces. E1 interfaces can use the following encapsulation types:

- PPP, PPP CCC, and PPP TCC

- Frame Relay, Frame Relay CCC, and Frame Relay TCC
- Cisco HDLC, Cisco HDLC CCC, and Cisco HDLC TCC

The channels can also have logical interfaces. For information about Frame Relay DLCI limitations for channelized interfaces, see “Data-Link Connection Identifiers on Channelized Interfaces” on page 362. For more information about Frame Relay DLCIs, see “Configuring a Point-to-Point Frame Relay Connection” on page 356. For more information about DLCI sparse mode, see the *JUNOS System Basics Configuration Guide*.

You apply all STM1 interface SONET/SDH options to the first E1 interface in the configuration by including the `sonet-options` statement at the `[edit interfaces e1-fpc/pic/port:channel]` hierarchy level:

```
[edit]
interfaces {
  e1-fpc/pic/port:0 {
    encapsulation cisco-hdlc;
    sonet-options {
      no-z0-increment;
    }
    e1-options {
      framing g704;
    }
    unit 0 {
      family inet {
        address 10.11.30.1/30;
      }
    }
  }
  e1-fpc/pic/port:1 {
    encapsulation frame-relay;
    e1-options {
      framing g704;
    }
    unit 1 {
      dlci 16;
      family inet {
        address 10.11.31.9/30;
      }
    }
  }
  e1-fpc/pic/port:2 {
    encapsulation ppp;
    no-keepalives;
    unit 0 {
      family inet {
        address 10.11.31.47/30;
      }
    }
  }
}
[edit]
chassis {
```

```
fpc 2 {  
  pic 0 {  
    vtmapping klm;  
  }  
}
```


Chapter 23

Configuring Channelized T1 IQ Interfaces

The Channelized T1 intelligent queuing (IQ) PIC has 10 T1 ports that you can channelize to the DS0 level. Each T1 interface has 24 DS0 time slots. You can combine DS0 time slots (channels) to create a channel group ($N \times DS0$).

The Channelized T1 IQ PIC is supported on the M7i, M10i, M20, M40e, M120, and M320 platforms.

This section contains the following topics:

- Configuring Channelized T1 IQ Interfaces on page 437
- Example: Configuring Channelized T1 IQ Interfaces on page 441

Configuring Channelized T1 IQ Interfaces

This section describes how to configure channelized T1 IQ interfaces, discussing the following topics:

- Configuring T1 IQ Interfaces on page 437
- Configuring Fractional T1 IQ Interfaces on page 438
- Configuring $N \times DS0$ IQ Interfaces on page 439
- Configuring Payload Loopback on page 439
- Configuring Channelized T1 Interface Properties on page 441

Configuring T1 IQ Interfaces

To configure a T1 interface, include the `no-partition` and `interface-type` statements at the `[edit interfaces ct1-fpc/pic/port]` hierarchy level:

```
[edit interfaces ct1-fpc/pic/port]
no-partition interface-type t1;
```

This configuration creates the interface `t1-fpc/pic/port`.



NOTE: For a T1 (t1-) interface configured on channelized T1 (ct1-) interface on a Channelized T1 IQ PIC, you can configure the following T1 options, but in fact, these options do not take effect for the T1 interface:

- bert-algorithm
- bert-error-rate
- bert-period
- buildout
- framing
- line-encoding
- loopback
- remote-loopback-respond

The T1 interface inherits these option settings from the parent channelized T1 interface.

Configuring Fractional T1 IQ Interfaces

By default, all the time slots on a channelized T1 interface are used. To configure a fractional T1 interface on a Channelized T1 IQ PIC, perform the following tasks:

1. Include the **no-partition** statement at the [edit interfaces *ct1-fpc/pic/port*] hierarchy level. This configuration creates the interface *t1-fpc/pic/port*.

```
[edit interfaces ct1-fpc/pic/port]
no-partition interface-type t1;
```

2. Configure the number of time slots allocated to the T1 IQ interface by including the **timeslots** statement at the [edit interfaces *t1-fpc/pic/port* t1-options] hierarchy level. DS0 time slots configured on the channelized T1 IQ interface are numbered from 1 to 24. To configure ranges, use hyphens. To configure discontinuous time slots, use commas. Do not include spaces.

```
[edit interfaces t1-fpc/pic/port t1-options]
timeslots time-slot-range;
```

For more information about T1 time slots, see “Configuring Fractional T1 Time Slots” on page 493.

Example: Configuring Fractional T1 IQ Interfaces

Configure a fractional T1 interface that uses time slots 2 through 10:

```
[edit interfaces t1-0/0/0]
no-partition interface-type t1;
[edit interfaces t1-0/0/0 t1-options]
timeslots 1-10;
```


For a full configuration example, see the *JUNOS Feature Guide*.

Configuring NxDS0 IQ Interfaces

By default, all the time slots on a channelized T1 interface are used. To configure an NxDS0 IQ interface on a Channelized T1 IQ PIC, you must configure the number of time slots allocated to the NxDS0 IQ interface by including the **partition**, **timeslots**, and **interface-type** statements at the [edit interfaces **t1-fpc/pic/port**] hierarchy level, specifying the **ds** interface type:

```
[edit interfaces t1-fpc/pic/port]
partition partition-number timeslots time-slot-range interface-type ds;
```

For channelized T1 IQ interfaces, the partition number range is from 1 through 24.

For channelized T1 IQ interfaces (**t1-fpc/pic/port**), the time-slot range is from 1 through 24. You can designate any combination of time slots. To configure ranges, use hyphens. To configure discontinuous time slots, use commas. Do not include spaces. For more information about T1 time slots, see “Configuring Fractional T1 Time Slots” on page 493.

Example: Configuring an NxDS0 IQ Interface

Configure an NxDS0 interface that uses time slots 2 through 10. This configuration creates the **ds-0/0/0:1** interface.

```
[edit interfaces t1-0/0/0:1]
partition 1 timeslots 1-10 interface-type ds;
```

For a full configuration example, see the *JUNOS Feature Guide*.

Configuring Payload Loopback

Clocking and loopback options are configured at the controller level for all IQ-based and IQE-based interfaces. However, for the channelized T1 IQ interfaces, configure the payload loopback on the T1 interfaces instead of the channelized T1 IQ interface. To configure the payload option, include the **payload** statement at the [edit interfaces **t1-fpc/pic/port t1-options loopback**] hierarchy level.

By default, all the time slots on a channelized T1 IQ interface are used. There can be a maximum of 24 channel groups per channelized T1 IQ interface. Thus, you can configure a maximum of 240 channel groups per PIC.

To specify the DS0 channel group number in the interface name, include a colon (:) as a separator. For example, a Channelized T1 IQ PIC might have the following physical and virtual interfaces:

```
ds-0/0/0:x
```

x is a DS0 channel group from 1 through 24 (for more information about ranges, see Table 42 on page 440).

You can use any of the values within the range available for *x*; you do not have to configure the links sequentially. In addition, the JUNOS software applies the interface options you configure according to the following rules:

- To configure the **t1-options** statement, you must set channel group *x* to 0:
- ```
ds-0/0/0:0
```
- There are no restrictions on configuring the **ds0-options** statement.
  - If you delete a configuration you previously committed for channel group 0, the options return to default values.

To configure the channel groups and time slots for a channelized T1 IQ interface, include the following statements at the **[edit chassis]** hierarchy level:

```
[edit chassis]
fpc slot-number {
 pic pic-number {
 ct1 {
 t1 link-number {
 channel-group group-number;
 timeslots time-slot-range;
 }
 }
 }
}
```

There are 24 time slots on a T1 interface. You can designate any combination of time slots. To configure ranges, use hyphens. To configure discontinuous time slots, use commas. Do not include spaces.

Table 42 on page 440 shows the ranges you can specify.

**Table 42: Ranges for Channelized T1 IQ Configuration**

| Item              | Option          | Range        |
|-------------------|-----------------|--------------|
| FPC slot          | slot-number     | 0 through 7  |
| PIC slot          | pic-number      | 0 through 3  |
| T1 port           | port-number     | 0 through 9  |
| DS0 channel group | partition       | 1 through 24 |
| Time slot         | time-slot-range | 1 through 24 |

The theoretical maximum number of channel groups possible per PIC is  $10 * 24 = 240$ . This is within the maximum bandwidth available.

## Configuring Channelized T1 Interface Properties

To configure channelized T1 IQ interface properties, include the **t1-options** statement at the [edit interfaces *interface-name*] hierarchy level:

```
[edit interfaces interface-name]
t1-options {
 byte-encoding (nx56 | nx64)
 fcs (16 | 32);
 framing (esf | sf);
 idle-cycle-flag (flags | ones);
 invert-data;
 line-encoding (ami | b8zs);
 loopback (local | payload | remote);
 start-end-flag (filler | shared);
}
```



**NOTE:** If you configure the **line-encoding** statement with the **ami** option and the **byte-encoding** statement with the **nx64** option, excessive zeros in the payload area may bring the interface down. To prevent this, configure the **byte-encoding** statement with the **nx56** option or include the **invert-data** statement.

To specify options for each of the DS0 channels, include the **ds0-options** statement at the [edit interfaces *interface-name*] hierarchy level:

```
[edit interfaces interface-name]
ds0-options {
 byte-encoding (nx56 | nx64);
 fcs (16 | 32);
 idle-cycle-flag (flags | ones);
 loopback payload;
 start-end-flag (filler | shared);
}
```

Only a subset of the T1 options is valid for the channelized configuration; you specify the time slots using the [edit chassis] configuration described in “Examples: Interface Naming” on page 55. For more information about the T1 and DS0 options, see “Configuring T1 Interfaces” on page 485.

Each T1 interface has 24 time slots (DS0s). You can combine one or more of these DS0 time slots (channels) to create a channel group (NxDS0). There can be a maximum of 24 channel groups per T1 interface.

## Example: Configuring Channelized T1 IQ Interfaces

Configure a channelized T1 interface as an unpartitioned, clear channel.

### Configuring a T1 Interface

```
[edit interfaces]
ct1-2/0/0 {
 no-partition interface-type t1; # t1-2/0/0
}
```

Configure a partitioned channel group.

**Configuring a Channel Group**

```
[edit interfaces]
ct1-0/0/1 {
 partition 1 interface-type ds0 timeslots 1-10;
 partition 2 interface-type ds0 timeslots 11-20;
}
```

The following configuration is sufficient to get the channelized T1 IQ interface up and running:

**Configuring Multiple Interface Types**

```
[edit]
interfaces {
 ct1-1/2/3 {
 partition 1 timeslots 10 interface-type ds; # ds-1/2/3:1
 partition 2 timeslots 1-9 interface-type ds; # ds-1/2/3:2
 }
 ds-1/2/3:1 {
 unit 0 {
 family inet {
 address 10.25.1.2/24;
 }
 }
 }
 ds-1/2/3:2 {
 unit 0 {
 family inet {
 address 10.25.2.2/24;
 }
 }
 }
}
[edit]
interfaces {
 ct1-1/2/6 {
 no-partition interface-type t1; # t1-1/2/6
 }
 t1-1/2/6 {
 t1-options {
 timeslots 1-2;
 }
 unit 0 {
 family inet {
 address 10.255.126.2/24;
 }
 }
 }
}
```

## Chapter 24

# Configuring Channelized T3 Interfaces



**NOTE:** Class-of-service (CoS) rules cannot be applied to an individual channel configured on channelized IQ interfaces. You can only apply CoS rules to the aggregate bit streams.

This section contains the following topics:

- Configuring Channelized T3 IQ Interfaces on page 443
- Configuring Channelized DS3-to-DS0 Interfaces on page 446
- Configuring Channelized DS3-to-DS1 Interfaces on page 449
- Example: Configuring Channelized T3 IQ Interfaces on page 450
- Examples: Configuring Channelized DS3-to-DS0 Interfaces on page 451
- Examples: Configuring Channelized DS3-to-DS1 Interfaces on page 454

## Configuring Channelized T3 IQ Interfaces

This section describes how to configure channelized T3 intelligent queuing (IQ) interfaces, discussing the following topics:

- Configuring T3 IQ Interfaces on page 443
- Configuring T1 IQ Interfaces on page 444
- Configuring Fractional T1 IQ and IQE Interfaces on page 444
- Configuring an NxDS0 IQ Interface on page 445

## Configuring T3 IQ Interfaces

To configure a T3 interface, include the **no-partition** and **interface-type** statements at the [edit interfaces *ct3-fpc/pic/port*] hierarchy level:

```
[edit interfaces ct3-fpc/pic/port]
no-partition interface-type t3;
```

This configuration creates interface *t3-fpc/pic/port*.

## Configuring T1 IQ Interfaces

On a Channelized DS3 IQ or IQE Physical Interface Card (PIC), you can create up to 112 T1 interfaces. To configure a T1 interface on a Channelized DS3 IQ or IQE PIC, include the **partition** and **interface-type** statements at the `[edit interfaces ct3-fpc/pic/port]` hierarchy level, specifying the **t1** interface type:

```
[edit interfaces ct3-fpc/pic/port]
partition partition-number interface-type t1;
```

This configuration creates interface `t1-fpc/pic/port:channel`.

The partition number is the sublevel interface partition index and is correlated with the channel number. For channelized T3 interfaces, the partition number can be from 1 through 28.



**NOTE:** For channelized T3 interfaces, channel numbering begins with 0 (:0). For channelized T3 IQ and IQE interfaces, channel numbering begins with 1 (:1).

---

The interface type is the channelized interface type or clear channel you are creating. For channelized T3 interfaces, **type** can be **ct1** or **t1**.

### Example: Configuring T1 IQ and IQE Interfaces

Configure the following five T1 interfaces:

- t1-0/0/0:1
- t1-0/0/0:2
- t1-0/0/0:3
- t1-0/0/0:4
- t1-0/0/0:5

```
[edit interfaces ct3-0/0/0]
partition 1-5 interface-type t1;
```

For a full configuration example, see the *JUNOS Feature Guide*.

## Configuring Fractional T1 IQ and IQE Interfaces

By default, all the time slots on a channelized T1 interface are used. To configure a fractional T1 interface on a Channelized DS3 IQ or IQE PIC, you must perform the following tasks:

1. Configure a T1 IQ interface. For more information, see “Configuring T1 IQ Interfaces” on page 444.

This configuration creates interface `t1-fpc/pic/port:channel`.

2. Configure the number of time slots allocated to the T1 IQ interface by including the `timeslots` statement at the `[edit interfaces t1-fpc/pic/port:channel t1-options]` hierarchy level:

```
[edit interfaces t1-fpc/pic/port t1-options]
timeslots time-slot-range;
```

For channelized T1 IQ interfaces, the time-slot range is from 1 through 24. You can designate any combination of time slots. To configure ranges, use hyphens. To configure discontinuous time slots, use commas. Do not include spaces. For more information about T1 time slots, see “Configuring Fractional T1 Time Slots” on page 493.

### Example: Configuring Fractional T1 IQ Interfaces

Configure a fractional T1 interface that uses time slots 1 through 10:

```
[edit interfaces ct3-0/0/0:1]
partition 1 interface-type t1;
[edit interfaces t1-0/0/0:1:1 t1-options]
timeslots 1-10;
```

For a full configuration example, see the *JUNOS Feature Guide*.

## Configuring an NxDS0 IQ Interface

By default, all the time slots on a channelized T3 interface are used. To configure an NxDS0 IQ interface on a Channelized DS3 IQ or IQE PIC, you must perform the following tasks:

1. Partition the channelized T3 interface into channelized T1 interfaces by including the `partition` and `interface-type` statements at the `[edit interfaces ct3-fpc/pic/port]` hierarchy level, specifying the `ct1` interface type:

```
[edit interfaces ct3-fpc/pic/port]
partition partition-number interface-type ct1;
```

This configuration creates interface `ct1-fpc/pic/port:channel`.

The partition number is the sublevel interface partition index and is correlated with the channel number. For channelized T1 interfaces, the partition number can be from 1 through 28.

The interface type is the channelized interface type or clear channel you are creating. For channelized T3 interfaces, `type` can be `ct1` or `t1`.



**NOTE:** For channelized T3 interfaces, channel numbering begins with 0 (:0). For channelized T3 IQ interfaces, channel numbering begins with 1 (:1).

---

2. Configure the number of time slots allocated to the NxDS0 IQ interface by including the `partition`, `timeslots`, and `interface-type` statements at the `[edit`

`interfaces ct1-fpc/pic/port:channel]` hierarchy level, specifying the `ds` interface type:

```
[edit interfaces ct1-fpc/pic/port:channel]
partition partition-number timeslots time-slot-range interface-type ds;
```

For channelized T1 IQ interfaces, the partition number range is from 1 through 28; the time-slot range is from 1 through 24. You can designate any combination of time slots. To configure ranges, use hyphens. To configure discontinuous time slots, use commas. Do not include spaces. For more information about T1 time slots, see “Configuring Fractional T1 Time Slots” on page 493.

### Example: Configuring an NxDS0 IQ Interface

Configure the following two NxDS0 interfaces with 10 time slots and 4 time slots, respectively:

- `ds-0/0/0:1:1`
- `ds-0/0/0:1:2`

```
[edit interfaces ct3-0/0/0]
partition 1 interface-type ct1;
[edit interfaces ct1-0/0/0:1]
partition 1 timeslots 1-10 interface-type ds;
partition 2 timeslots 12-16 interface-type ds;
```

For a full configuration example, see the *JUNOS Feature Guide*.

## Configuring Channelized DS3-to-DS0 Interfaces

For channelized interfaces, you can configure 28 T1 channels per T3 interface. Each T1 link can have up to eight DS0 channel groups, and each channel group can hold any combination of DS0 time slots. To specify the T1 link and DS0 channel group number in the interface name, use colons (:) as separators. For example, a Multichannel DS3 PIC might have the following physical and virtual interfaces:

`ds-0/0/0:x:y`

`x` is a T1 link ranging from 0 through 27 and `y` is a DS0 channel group from 0 through 7. For more information about ranges, see Table 43 on page 447.

You can use any of the values within the range available for `x` and `y`, and you do not have to configure the links sequentially. In addition, the JUNOS software applies the interface options you configure according to the following rules:

- To configure the T1 options, you must set channel group `y` to 0; the T1 link `x` can be any value:

`ds-0/0/0:x:0`

- To configure the T3 options, you must set the T1 link `x` to 0 and channel group `y` to 0:



ds-0/0/0:0:0

- There are no restrictions on configuring the DS0 options.
- If you delete a configuration you previously committed for channel group 0, the options return to default values.

By default, all the time slots are used. To configure the channel groups and time slots for a channelized DS3-to-DS0 interface, include the `channel-group` and `timeslots` statements at the `[edit chassis fpc slot-number pic pic-number ct3 port port-number t1 link-number]` hierarchy level:

```
[edit chassis fpc slot-number pic pic-number ct3 port port-number t1 link-number]
channel-group group-number;
timeslots time-slot-range;
```



**NOTE:** If you commit the interface name but do not include the `[edit chassis]` configuration, the channelized DS3-to-DS0 interface behaves like a channelized DS3-to-DS1 interface: none of the DS0 functionality is accessible.

Table 43 on page 447 shows the ranges you can specify for each of the elements in the preceding configuration.

**Table 43: Ranges for Channelized DS3-to-DS0 Configuration**

| Item              | Option          | Range                        |
|-------------------|-----------------|------------------------------|
| FPC slot          | slot-number     | 0 through 7 (see note below) |
| PIC slot          | pic-number      | 0 through 3                  |
| Port              | port-number     | 0 through 1                  |
| T1 link           | link-number     | 0 through 27                 |
| DS0 channel group | group-number    | 0 through 7                  |
| Time slot         | time-slot-range | 1 through 24                 |



**NOTE:** The FPC slot range depends on the routing platform. For the TX Matrix platform, the range is from 0 through 31. For M40, M40e, M160, M320, M120, and other T-series routing platforms, the range is from 0 through 7. For M20 routing platforms, the range is from 0 through 3. For M10 and M10i routing platforms the range is from 0 through 1. For M5 and M7i routing platforms, the only applicable value is 0.

Bandwidth limitations restrict the interface to a maximum of 128 channel groups per T3 port, rather than the theoretical maximum of  $8 * 28 = 224$ .

There are 24 time slots on a T1 interface. You can designate any combination of time slots. To configure ranges, use hyphens. To configure discontinuous time slots, use commas. Do not include spaces. You can use each time slot number on only one channel group within the same T1 link.

To configure channelized DS3-to-DS0 interface properties, you can include the **t3-options**, **t1-options**, and **ds0-options** statements. Only a subset of the T3 options are valid for this configuration, and the **buildout**, **invert-data**, and **line-encoding** statements at the **[edit interfaces *interface-name* t1-options]** hierarchy level are ignored. Likewise, only a subset of the DS0 options are valid for this configuration, and the **bert-algorithm**, **bert-error-rate**, **bert-period**, and **loopback payload** statements at the **[edit interfaces *interface-name* ds0-options]** hierarchy level are ignored. The following configurations list all the valid parameters.



**NOTE:** The set of options the JUNOS software applies to the interface depends on how you specify the interface name. For more information, see “Examples: Configuring Channelized DS3-to-DS0 Interfaces” on page 451.

To specify options for the T3 side of the connection, include the **t3-options** statement at the **[edit interfaces *interface-name*]** hierarchy level:

```
[edit interfaces interface-name]
t3-options {
 bert-algorithm algorithm;
 bert-error-rate rate;
 bert-period seconds;
 (cbit-parity | no-cbit-parity);
 (long-buildout | no-long-buildout);
 loopback (local | payload | remote);
}
```

The statements at the **t3-options** hierarchy are supported only for channel 0; they are ignored if configured on other channels. To specify options for each of the T1 channels, include the **t1-options** statement at the **[edit interfaces *interface-name*]** hierarchy level:

```
[edit interfaces interface-name]
t1-options {
 byte-encoding (nx56 | nx64);
 fcs (16 | 32);
 framing (esf | lf);
 idle-cycle-flag (flags | ones);
 invert-data;
 loopback (local | payload | remote);
 start-end-flag (filler | shared);
 timeslots time-slot-number;
}
```

To specify options for each of the DS0 channels, include the **ds0-options** statement at the **[edit interfaces *interface-name*]** hierarchy level:

```
[edit interfaces interface-name]
ds0-options {
```

```

bert-algorithm algorithm;
bert-error-rate rate;
bert-period seconds;
byte-encoding (nx56 | nx64);
fcs (16 | 32);
idle-cycle-flag (flags | ones);
invert-data;
loopback payload;
start-end-flag (filler | shared);
}

```

For more information about specific parameters, see “Configuring E1 Interfaces” on page 469, “Configuring E3 Interfaces” on page 477, “Configuring T1 Interfaces” on page 485, and “Configuring T3 Interfaces” on page 495. For a configuration example, see “Examples: Configuring Channelized DS3-to-DS0 Interfaces” on page 451.

For information about Frame Relay DLCI limitations for channelized interfaces, see “Data-Link Connection Identifiers on Channelized Interfaces” on page 362. For more information about Frame Relay DLCIs, see “Configuring a Point-to-Point Frame Relay Connection” on page 356. For more information about DLCI sparse mode, see the *JUNOS System Basics Configuration Guide*.

Each T1 link can have up to eight DS0 channel groups, and each channel group can hold any combination of DS0 time slots.

## Configuring Channelized DS3-to-DS1 Interfaces

You can configure 28 T1 channels per T3 interface, and each interface can have logical interfaces. To specify the channel number, include it after the colon (:) in the interface name. For example, a 4-port T3 PIC in FPC 1 and slot 1 will have the following physical interfaces, depending on the media type:

```

t1-1/1/0:x
t1-1/1/1:x
t1-1/1/2:x
t1-1/1/3:x

```

x is a channel number ranging from 0 through 27.

To configure channelized DS3-to-DS1 interface properties, you can include both the **t1-options** and **t3-options** statements. Only a subset of the T3 options is valid for this configuration, and the **buildout**, **invert-data**, and **line-encoding** statements at the [edit interfaces *interface-name* **t1-options**] hierarchy level are ignored. Likewise, only a subset of the DS0 options are valid for this configuration, and the **bert-algorithm**, **bert-error-rate**, **bert-period**, and **loopback payload** statements at the [edit interfaces *interface-name* **ds0-options**] hierarchy level are ignored. The following configuration lists all the valid parameters.

To specify options for the T3 side of the connection, include the **t3-options** statement at the [edit interfaces *interface-name*] hierarchy level:

```

[edit interfaces interface-name]

```

```
t3-options {
 bert-algorithm algorithm;
 bert-error-rate rate;
 bert-period seconds;
 (cbit-parity | no-cbit-parity);
 (feac-loop-respond | no-feac-loop-respond);
 loopback (local | payload | remote);
}
```

The statements in the **t3-options** hierarchy are supported only for channel 0; they are ignored if configured on other channels.

To specify options for each of the T1 channels, include the **t1-options** statement at the [edit interfaces *interface-name*] hierarchy level:

```
[edit interfaces interface-name]
t1-options {
 byte-encoding (nx56 | nx64);
 fcs (16 | 32);
 framing (sf | esf);
 idle-cycle-flag (flags | ones);
 loopback (local | payload | remote);
 start-end-flag (filler | shared);
 timeslots time-slot-number;
}
```

For T1 channels on a channelized T3 interface, the **clocking** statement is supported only for channel 0; it is ignored if included in the configuration of channels 1 through 11. The clock source configured for channel 0 applies to all channels on the channelized T3 interface. The individual T1 channels use a gapped 45-MHz clock as the transmit clock. When you configure the clock source for a channelized interface—**ds-x/y/z:0**, for example—you must also include the **channel-group** statement at the [edit chassis] hierarchy level, and specify channel group 0. For more information, see “Clock Sources on Channelized Interfaces” on page 364.

For information about Frame Relay DLCI limitations for channelized interfaces, see “Data-Link Connection Identifiers on Channelized Interfaces” on page 362. For more information about Frame Relay DLCIs, see “Configuring a Point-to-Point Frame Relay Connection” on page 356. For more information about DLCI sparse mode, see the *JUNOS System Basics Configuration Guide*.

For more information about specific parameters, see “Configuring T1 Interfaces” on page 485 and “Configuring T3 Interfaces” on page 495. For a configuration example, see “Examples: Configuring Channelized DS3-to-DS1 Interfaces” on page 454.

## Example: Configuring Channelized T3 IQ Interfaces

Configure a channelized T3 interface as an unpartitioned, clear channel.

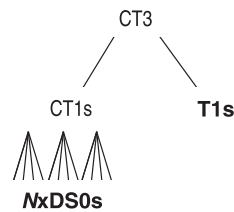
|                                   |                                                                                |
|-----------------------------------|--------------------------------------------------------------------------------|
| <b>Configuring a T3 Interface</b> | <pre>[edit interfaces] ct3-5/0/0 {     no-partition interface-type t3; }</pre> |
|-----------------------------------|--------------------------------------------------------------------------------|

**Configuring NxDS0 and T1 Interfaces**

Figure 39 on page 451 shows the following interfaces on a Channelized DS3 IQ or IQE PIC:

- A channelized T1, which is partitioned into NxDS0 interfaces
- T1 interfaces

**Figure 39: Sample Channelization of DS3 IQ or IQE PIC**



**Bold** entries correspond to actual packet channels.

9003015

```

[edit interfaces]
ct3-1/1/0 {
 description " CT3 to CT1 and CT3 to T1.";
 t3-options {
 loopback remote;
 looptiming;
 }
 partition 1 interface-type ct1; # ct1-1/1/0:1.
 partition 2-28 interface-type t1; # t1-1/1/0:[2-28]
}
ct1-1/1/0:1 {
 description " case (a) CT1s to NxDS0s.";
 t1-options {
 bert-algorithm all-ones-repeating;
 framing sf;
 line-encoding ami;
 }
 partition 1 timeslots 2 - 10 interface-type ds0; # ds-1/1/0:1:1, channel group
 with 10 DS0s
 partition 2 timeslots 11- 23 interface-type ds0; # ds-1/1/0:1:2, channel group
 with 13 DS0s
 ...
}

```

## Examples: Configuring Channelized DS3-to-DS0 Interfaces

The following configuration is sufficient to get the channelized DS3-to-DS0 interface up and running. The T3 interface can be divided into 28 channels, each at T1 line rate. DS3 channels can use the following encapsulation types for their logical interfaces:

- PPP, PPP CCC, and PPP TCC
- Frame Relay, Frame Relay CCC, and Frame Relay TCC

- Cisco HDLC, Cisco HDLC CCC, and Cisco HDLC TCC

For more information, see “Configuring a Point-to-Point Frame Relay Connection” on page 356.



**NOTE:** All these configuration examples specify channel group 0 in the interface address, which is required for configuring the **t3-options** and **t1-options** statements.

**Configuring Cisco HDLC  
Encapsulation on a  
Channelized DS3-to-DS0  
Interface**

```
[edit interfaces]
ds-2/0/1:20:0 {
 encapsulation cisco-hdlc;
 unit 0 {
 family inet {
 address 10.0.4.40/32 {
 destination 10.0.4.41;
 }
 }
 }
}
[edit chassis]
fpc 2 {
 pic 0 {
 ct3 {
 port 1 {
 t1 20 {
 channel-group 0 timeslots 1-5;
 }
 }
 }
 }
}
```

**Configuring PPP  
Encapsulation on a  
Channelized DS3-to-DS0  
Interface**

```
[edit interfaces]
ds-2/0/1:20:0 {
 encapsulation ppp;
 unit 0 {
 family inet {
 address 10.0.4.40/32 {
 destination 10.0.4.41;
 }
 }
 }
}
[edit chassis]
fpc 2 {
 pic 0 {
 ct3 {
 port 1 {
 t1 20 {
 channel-group 0 timeslots 1-5;
 }
 }
 }
 }
}
```

**Configuring Three Frame  
Relay DLCIs on a  
Channelized DS3  
Interface**

```

 }
 }

[edit interfaces]
t1-5/1/3:0 {
 mtu 9192;
 encapsulation frame-relay;
 unit 1 {
 dlc1 101;
 family inet {
 mtu 9000;
 address 10.123.1.2/32 {
 destination 10.123.1.1;
 }
 }
 family iso {
 mtu 9000;
 }
 family mpls {
 mtu 9000;
 }
 }
 unit 2 {
 dlc1 102;
 family inet {
 mtu 9000;
 address 10.123.1.4/32 {
 destination 10.123.1.3;
 }
 }
 family iso {
 mtu 9000;
 }
 family mpls {
 mtu 9000;
 }
 }
 unit 3 {
 dlc1 103;
 family inet {
 mtu 9000;
 address 10.123.1.6/32 {
 destination 10.123.1.5;
 }
 }
 family iso {
 mtu 9000;
 }
 family mpls {
 mtu 9000;
 }
 }
}

```

**Configuring Cisco HDLC Encapsulation with Byte-Encoding**

```
[edit interfaces ds-0/1/0:5:0]
no-keepalives;
encapsulation cisco-hdlc;
ds0-options {
 byte-encoding nx56;
}
unit 0 {
 family inet {
 address 10.221.2.8/24;
 }
}
```

**Configuring Cisco HDLC Encapsulation with Byte-Encoding and Framing**

```
[edit interfaces ds-0/1/0:5:0]
no-keepalives;
encapsulation cisco-hdlc;
t1-options {
 byte-encoding nx56;
 framing sf;
}
unit 0 {
 family inet {
 address 10.221.2.8/24;
 }
}
```

**Use Time Slots 1 Through 10**

```
[edit chassis fpc slot-number pic pic-number ct3 port port-number t1 link-number]
channel-group group-number;
timeslots 1-10;
```

**Use Time Slots 1 Through 5, 10, and 24**

```
[edit chassis fpc slot-number pic pic-number ct3 port port-number t1 link-number]
channel-group group-number;
timeslots 1-5,10,24;
```

**Examples: Configuring Channelized DS3-to-DS1 Interfaces**

---

The following configuration is sufficient to get the channelized DS3-to-DS1 interface up and running. The T3 interface can be divided into 28 channels, each at T1 line rate. DS3 channels can use the following encapsulation types for their logical interfaces:

- PPP, PPP CCC, and PPP TCC
- Frame Relay, Frame Relay CCC, and Frame Relay TCC
- Cisco HDLC, Cisco HDLC CCC, and Cisco HDLC TCC

For more information, see “Configuring a Point-to-Point Frame Relay Connection” on page 356.

**Configuring Cisco HDLC Encapsulation on a Channelized DS3 Interface**

```
[edit interfaces]
t1-2/0/1:20 {
 encapsulation cisco-hdlc;
 unit 0 {
 family inet {
```



```

 address 10.0.4.40/32 {
 destination 10.0.4.41;
 }
 }
}

```

**Configuring PPP  
Encapsulation on a  
Channelized DS3  
Interface**

```

[edit interfaces]
t1-2/0/1:20 {
 encapsulation ppp;
 unit 0 {
 family inet {
 address 10.0.4.40/32 {
 destination 10.0.4.41;
 }
 }
 }
}

```

**Configuring Five Frame  
Relay DLCIs on a  
Channelized DS3  
Interface**

```

[edit interfaces]
t1-5/1/3:0 {
 mtu 9192;
 encapsulation frame-relay;
 unit 1 {
 dlci 101;
 family inet {
 mtu 9000;
 address 10.123.1.2/32 {
 destination 10.123.1.1;
 }
 }
 family iso {
 mtu 9000;
 }
 family mpls {
 mtu 9000;
 }
 }
 unit 2 {
 dlci 102;
 family inet {
 mtu 9000;
 address 10.123.1.4/32 {
 destination 10.123.1.3;
 }
 }
 family iso {
 mtu 9000;
 }
 family mpls {
 mtu 9000;
 }
 }
 unit 3 {
 dlci 103;
 }
}

```

```

 family inet {
 mtu 9000;
 address 10.123.1.6/32 {
 destination 10.123.1.5;
 }
 }
 family iso {
 mtu 9000;
 }
 family mpls {
 mtu 9000;
 }
 }
 unit 4 {
 dlci 104;
 family inet {
 mtu 9000;
 address 10.123.1.8/32 {
 destination 10.123.1.7;
 }
 }
 family iso {
 mtu 9000;
 }
 family mpls {
 mtu 9000;
 }
 }
 unit 5 {
 dlci 105;
 family inet {
 mtu 9000;
 address 10.123.1.10/32 {
 destination 10.123.1.9;
 }
 }
 family iso {
 mtu 9000;
 }
 family mpls {
 mtu 9000;
 }
 }
}

```

**Configuring Cisco HDLC  
Encapsulation with  
Byte-Encoding**

```

[edit interfaces t1-1/1/0:1]
no-keepalives;
encapsulation cisco-hdlc;
t1-options {
 byte-encoding nx56;
}
unit 0 {
 family inet {
 address 10.221.2.8/24;
 }
}

```

```
}
```

**Configuring Cisco HDLC  
Encapsulation with  
Byte-Encoding and  
Framing**

```
[edit interfaces t1-1/1/0:1]
no-keepalives;
encapsulation cisco-hdlc;
t1-options {
 byte-encoding nx56;
 framing sf;
}
unit 0 {
 family inet {
 address 10.221.2.8/24;
 }
}
```



## **Part 7**

# **Configuring Circuit Emulation Interfaces**

- Configuring Circuit Emulation Interfaces on page 461



## Chapter 25

# Configuring Circuit Emulation Interfaces

This section provides an overview of the circuit emulation interfaces, describes their main features, indicates which routers support them, describes their configuration, and includes the following subsections:

- Circuit Emulation Interface Types on page 461
- Clocking Features on page 461
- Example: Mobile Backhaul Application on page 462
- Configuring Circuit Emulation PICs on page 465

### Circuit Emulation Interface Types

---

- Channelized OC3/STM1 Circuit Emulation PIC on page 461
- 12xT1/E1 Circuit Emulation PIC Overview on page 461

#### ***Channelized OC3/STM1 Circuit Emulation PIC***

M7i, M10i, and M40e routers with 4-port Channelized OC3/STM1 Circuit Emulation (CE) PICs support TDM interfaces using the Structure-Agnostic Time Division Multiplexing (TDM) over Packet (SAToP) protocol [RFC 4553] encapsulation, and support T1/E1 and SONET clocking features.

#### ***12xT1/E1 Circuit Emulation PIC Overview***

M7i, M10i, and M40e routers with 12xT1/E1 Circuit Emulation PICs provide Layer 1 and Layer 2 circuit emulation service, support TDM interfaces using SAToP protocol encapsulation, and support for T1/E1 and SONET clocking features. The 12xT1/E1 CE can be configured to work as either 12 T1s or 12 E1s; however, mixing T1s and E1s is not allowed.

### Clocking Features

---

All Circuit Emulation PICs support the following features:

- External clocking—Also known as “loop timing”. Clock is distributed via the TDM interfaces.
- Internal clocking with external synchronization—Also known as “external timing” or “external synchronization”.

- Adaptive clock recovery—Our proprietary method of recovering a clock, based on the arrival rate of packets. The accuracy of the recovered clock depends on the packet delay variation. This method of clock recovery is also known as “circuit emulation system” clocking.
- Internal clocking with FPC-based synchronization—Synchronizing the internal clock with a clock supplied by each FPC to the timing module is an alternative to external synchronization. The following are potential sources for FPC-supplied clock:
  - Clock recovered from TDM interface – also called “line timing” or “line synchronization (system level)”
  - Clock recovered from CES (adaptive clock recovery)
  - Clock recovered from IEEE 1588v2
- Internal clocking with PIC-level line synchronization—Synchronizing the PIC’s internal clock with a clock recovered from a TDM interface local to the PIC-provided line timing at the PIC level.

This feature set is useful for aggregation in mobile backhaul applications.



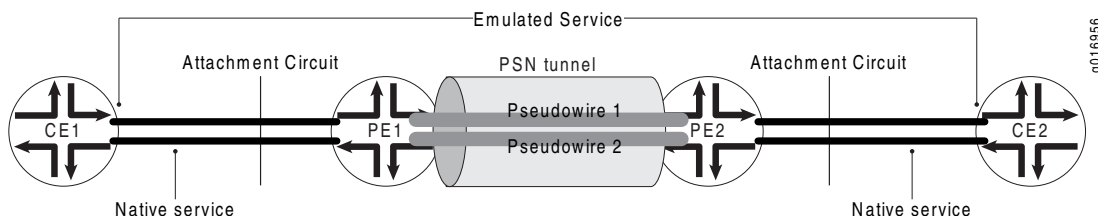
**NOTE:** The PRS of the clock recovered from one interface may not be the same as that of another TDM interface. There is a limitation on the number of timing domains that can be supported in practice.

## Example: Mobile Backhaul Application

This section provides a configuration example (see Figure 40 on page 462) based on the following mobile backhaul reference model where Customer Edge 1 (CE1) is a base station controller (BSC), Provider Edge 1 (PE1) is a cell site router, PE2 is an M-series (aggregation) router, and CE2 is a BSC and Radio Network Controller (RNC).

- Configuring SAToP Emulation on 12x T1/E1 CE PICs on page 462
- Configuring SAToP Emulation on Channelized OC3/STM1 CE PICs on page 464

**Figure 40: Mobile Backhaul Application**



### Configuring SAToP Emulation on 12x T1/E1 CE PICs

This configuration example applies to the mobile backhaul application shown in Figure 40 on page 462.



**Set the Encapsulation Mode** T1/E1 CE PICs can be configured with SAToP encapsulation at the PE router, as follows:

```
[edit]
interfaces {
 t1|e1-x/y/x {
 encapsulation <satop>;
 unit <0>;
 }
}
```

There is no need to configure any cross-connect circuit family since it will be automatically created for the above encapsulation.

**Set the Payload Size and Octet-Aligned Mode** You can configure the payload size and octet-aligned mode on the PE-CE bound interface, as follows:

```
[edit]
interfaces {
 t1|e1-x/y/x {
 satop-options {
 payload-size <n># Payload-size in integer number of bytes;
 octet-aligned # Octet-aligned is a toggle, not setting equates to no-octet-aligned;

 }
 }
}
```

**Pseudowire Interface Configuration** Configuration for the TDM pseudowire at the PE uses the existing Layer 2 circuit infrastructure:

```
[edit]
neighbor a.b.x.y {
 interface t1-x/y/z.0 {
 virtual-circuit-id 1;
 }
}
```

After the CE-bound interfaces (for both PEs) are configured with proper encapsulation, payload size, and other parameters, the two PEs will try to establish a pseudowire with PWE3 signaling extensions. The following pseudowire interface configurations will be disabled or ignored for TDM pseudowires:

- ignore-encapsulation
- mtu

The supported pseudowire types are:

- 0x0011 Structure-Agnostic E1 over Packet (SAToP)
- 0x0012 Structure-Agnostic T1 (DS1) over Packet (SAToP)

When the local interface parameters match the received parameters, and the pseudowire type and control world bit are equal, the pseudowire is established.

For detailed information about PICs, see the *PIC Guide* for your router.

## Configuring SAToP Emulation on Channelized OC3/STM1 CE PICs

This configuration example applies to the mobile backhaul application shown in Figure 40 on page 462.

### Set the Encapsulation Mode

Channelized OC3/STM1 CE PICs can be configured with SAToP encapsulation at the PE router:

```
[edit]
interfaces {
 coc3|cstm1-x/y/x {
 encapsulation <satop>;
 unit <0>;
 }
}
```

There is no need to configure any cross-connect circuit family since it will be automatically created for the above encapsulation.

### Setting Payload Size and Octet Aligned Mode

You can configure the payload size and octet-aligned mode on the PE-CE bound interface, as follows:

```
[edit]
interfaces {
 coc3|cstm1-x/y/x {
 satop-options {
 payload-size <n># Payload-size in integer number of bytes;
 octet-aligned # Octet-aligned is a toggle, not setting equates to no-octet-aligned;

 }
 }
}
```

Configuration for the TDM pseudowire at the PE uses the existing Layer 2 circuit infrastructure:

```
neighbor a.b.x.y {
 interface coc3-x/y/z.0 {
 virtual-circuit-id 1;
 }
}
```

After the CE-bound interfaces (for both PEs) are configured with proper encapsulation, payload size, and other parameters, the two PEs will try to establish a pseudowire with PWE3 signaling extensions. The following pseudowire interface configurations will be disabled or ignored for TDM pseudowires:

- ignore-encapsulation
- mtu

The supported pseudowire types are:

- 0x0011 Structure-Agnostic E1 over Packet (SAToP)

- 0x0012 Structure-Agnostic T1 (DS1) over Packet (SAToP)

When the local interface parameters match the received parameters, and the pseudowire type and control world bit are equal, the pseudowire is established.

For detailed information about PICs, see the *PIC Guide* for your router.

## Configuring Circuit Emulation PICs

---

This section describes configuration of Circuit Emulation PICs as follows:

- Setting the Emulation Mode on page 465
- T1/E1 Loopback Support on page 465
- T1 FDL Support on page 465
- Viewing the PIC in the CLI Chassis Hardware Configuration on page 466

### Setting the Emulation Mode

To set the framing emulation mode, use the following statements:

```
[edit chassis fpc fpc-slot pic pic-slot]
framing (<sonet|sdh>|<t1|e1>); # Option dependent on interface type
```

After a PIC is brought online, interfaces are created for the PIC's available ports according to the PIC type and the framing option used. For example:

- If you configure a 12xT1/E1 CE PIC, then 12 CT1 interfaces or 12 CE1 interfaces are created.
- If you configure a 4xCOC3/CSTM1 CE PIC, then 4 COC3 interfaces or 4 CSTM1 interfaces are created.



**NOTE:** If you set the **framing** option incorrectly for the PIC type, performing a commit will log the failure.

---

### T1/E1 Loopback Support

Use the CLI to configure external and internal loopback of T1/E1 (on CT1/CE1). By default, no loopback is configured.

### T1 FDL Support

If T1 is used for SAToP, T1 facility data-link (FDL) loop is NOT supported on the CT1 interface device because SAToP does not analyze T1 framing bits.

***Viewing the PIC in the CLI Chassis Hardware Configuration***

Use the CLI `show chassis hardware` command to display information about the PIC configuration.

For the 12xT1/E1 CE PIC, the output designation is **12x T1/E1 CE**. For the 4xCOC3/CSTM1 CE PIC, the output designation is **4x COC1/CSTM1 CE**.

## **Part 8**

# **Configuring E1, E3, T1, and T3 Interfaces**

- Configuring E1 Interfaces on page 469
- Configuring E3 Interfaces on page 477
- Configuring T1 Interfaces on page 485
- Configuring T3 Interfaces on page 495



## Chapter 26

# Configuring E1 Interfaces

This chapter contains the following sections:

- E1 Interfaces Overview on page 469
- Configuring E1 Specific Interface Properties on page 470
- Configuring E1 BERT Properties on page 470
- Configuring the E1 Frame Checksum on page 471
- Configuring E1 Framing on page 471
- Configuring the E1 Idle Cycle Flag on page 472
- Configuring E1 Data Inversion on page 472
- Configuring E1 Loopback Capability on page 472
- Configuring E1 Start and End Flags on page 474
- Configuring Fractional E1 Time Slots on page 474

## E1 Interfaces Overview

---

E1 is a standard WAN digital communication format designed to operate over copper facilities at a rate of 2.048 Mbps. Widely used outside North America, it is a basic time-division multiplexing scheme used to carry digital circuits. The following standards apply to E1 interfaces:

- ITU-T Recommendation G.703, *Physical/electrical characteristics of hierarchical digital interfaces*, describes data rates and multiplexing schemes for the E series.
- ITU-T Recommendation G.751, *General Aspects of Digital Transmission Systems: Terminal Equipment*, describes framing methods.
- ITU-T Recommendation G.775, *Loss of Signal (LOS) and Alarm Indication Signal (AIS) Defect Detection and Clearance Criteria*, describes alarm reporting methods.



**NOTE:** The Juniper Networks E1 Physical Interface Card (PIC) does not support Channel Associated Signaling (CAS).

---

## Configuring E1 Specific Interface Properties

---

To configure E1-specific physical interface properties, include the **e1-options** statement at the [edit interfaces *interface-name*] hierarchy level:

```
[edit interfaces interface-name]
e1-options {
 bert-error-rate rate;
 bert-period seconds;
 fcs (16 | 32);
 framing (g704 | g704-no-crc4 | unframed);
 idle-cycle-flag (flags | ones);
 invert-data;
 loopback (local | remote);
 start-end-flag (filler | shared);
 timeslots time-slot-range;
}
```

## Configuring E1 BERT Properties

---

This section discusses BERT properties for the E1 interface specifically. For general information about the JUNOS implementation of the BERT procedure, see “Interface Diagnostics” on page 125.

You can configure an E1 interface to execute a bit error rate test (BERT) when the interface receives a request to run this test. You specify the duration of the test and the error rate to include in the bit stream by including the **bert-period** and **bert-error-rate** statements at the [edit interfaces *interface-name* **e1-options**] hierarchy level:

```
[edit interfaces interface-name e1-options]
bert-error-rate rate;
bert-period seconds;
```

By default, the BERT period is 10 seconds. You can configure the BERT period to last from 1 through 239 seconds on some PICs and from 1 through 240 seconds on other PICs.

**rate** is the bit error rate. This can be an integer from 0 through 7, which corresponds to a bit error rate from  $10^{-0}$  (0, which corresponds to no errors) to  $10^{-7}$  (1 error per 10 million bits). The default is 0.

Individual concatenated E1 interfaces do not support the **bert-algorithm** configuration statement. For individual concatenated E1 interfaces, the **bert-algorithm** statement at the [edit interfaces *interface-name* **e1-options**] hierarchy level is ignored. The algorithm for the E1 BERT procedure is **pseudo-2e15-o151** (pattern is  $2^{15}-1$ , as defined in the CCITT/ITU O.151 standard).

For channelized E1 intelligent queuing (IQ and IQE) interfaces, you can configure the BERT algorithm by including the **bert-algorithm** statement at the [edit interfaces *ce1-fpc/pic/port* **e1-options**] or [edit interfaces *e1-fpc/pic/port* **e1-options**] hierarchy level:

```
[edit interfaces ce1-fpc/pic/port e1-options]
```



```
bert-algorithm algorithm;
[edit interfaces e1-fpc/pic/port e1-options]
bert-algorithm algorithm;
```

For a list of supported algorithms, enter a ? after the **bert-algorithm** statement; for example:

```
[edit interfaces ce1-0/0/0 e1-options]
user@host# set bert-algorithm ?
Possible completions:
pseudo-2e11-o152 Pattern is 2^11 - 1 (per O.152 standard)
pseudo-2e15-o151 Pattern is 2^15 - 1 (per O.152 standard)
pseudo-2e20-o151 Pattern is 2^20 - 1 (per O.151 standard)
pseudo-2e20-o153 Pattern is 2^20 - 1 (per O.153 standard)
```

## Configuring the E1 Frame Checksum

---

By default, the E1 interface supports a 16-bit checksum. You can configure a 32-bit checksum, which provides more reliable packet verification. However, some older equipment might not support 32-bit checksums.

To configure a 32-bit checksum, include the **fcs 32** statement at the [edit interfaces *interface-name* e1-options] hierarchy level:

```
[edit interfaces interface-name e1-options]
fcs 32;
```

To return to the default 16-bit frame checksum, delete the **fcs 32** statement from the configuration:

```
[edit]
user@host# delete interfaces e1-fpc/pic/port e1-options fcs 32
```

To explicitly configure a 16-bit checksum, include the **fcs 16** statement at the [edit interfaces *interface-name* e1-options] hierarchy level:

```
[edit interfaces interface-name e1-options]
fcs 16;
```

## Configuring E1 Framing

---

By default, E1 interfaces use the G704 framing mode. You can configure the alternative unframed mode if needed.

To have the interface use the unframed mode, include the **framing** statement at the [edit interfaces *interface-name* e1-options] hierarchy level, specifying the **unframed** option:

```
[edit interfaces interface-name e1-options]
framing unframed;
```

To explicitly configure G704 framing, include the **framing** statement at the [edit interfaces *interface-name* e1-options] hierarchy level, specifying the **g704** option:

```
[edit interfaces interface-name e1-options]
framing g704;
```

By default, G704 framing uses CRC4. To explicitly configure an interface's G704 framing to not use CRC4, include the **framing** statement at the [edit interfaces *interface-name* e1-options] hierarchy level, specifying the **g704-no-crc4** option:

```
[edit interfaces interface-name e1-options]
framing g704-no-crc4;
```

## Configuring the E1 Idle Cycle Flag

---

By default, an E1 interface transmits the value 0x7E in the idle cycles. To have the interface transmit the value 0xFF (all ones) instead, include the **idle-cycle-flag** statement at the [edit interfaces *interface-name* e1-options] hierarchy level, specifying the **ones** option:

```
[edit interfaces interface-name e1-options]
idle-cycle-flag ones;
```

To explicitly configure the default value of 0x7E, include the **idle-cycle-flag** statement with the **flags** option:

```
[edit interfaces interface-name e1-options]
idle-cycle-flag flags;
```

## Configuring E1 Data Inversion

---

By default, data inversion is disabled. To enable data inversion at the HDLC level, include the **invert-data** statement at the [edit interfaces *interface-name* e1-options] hierarchy level:

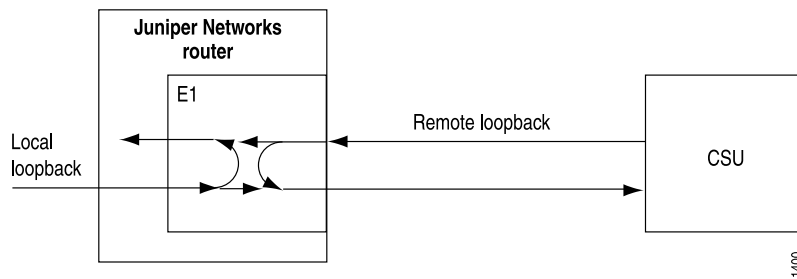
```
[edit interfaces interface-name e1-options]
invert-data;
```

When you enable data inversion, all data bits in the data stream are transmitted inverted; that is, zeroes are transmitted as ones and ones as zeroes. Data inversion is normally used only in AMI mode to guarantee ones density in the transmitted stream.

## Configuring E1 Loopback Capability

---

You can configure loopback capability between the local E1 interface and the remote channel service unit (CSU), as shown in Figure 41 on page 473. You can configure the loopback to be local or remote. With local loopback, the E1 interface can transmit packets to the CSU, but receives its own transmission back again and ignores data from the CSU. With remote loopback, packets sent from the CSU are received by the E1 interface, forwarded if there is a valid route, and immediately retransmitted to the CSU.

**Figure 41: Remote and Local E1 Loopback**

To configure loopback capability on an E1 interface, include the **loopback** statement at the [edit interfaces *interface-name* e1-options] hierarchy level:

```
[edit interfaces interface-name e1-options]
 loopback (local | remote);
```

Packets can be looped on either the local routing platform or the remote CSU.

To exchange BERT patterns between a local routing platform and a remote routing platform, include the **loopback remote** statement in the interface configuration at the remote end of the link. From the local routing platform, you issue the **test interface** command.

For more information about configuring BERT, see “Interface Diagnostics” on page 125. For more information about using operational mode commands to test interfaces, see the *JUNOS System Basics and Services Command Reference*.

To turn off the loopback capability, remove the **loopback** statement from the configuration:

```
[edit]
user@host# delete interfaces e1-fpc/pic/port e1-options loopback
```

You can determine whether there is an internal problem or an external problem by checking the error counters in the output of the **show interface *interface-name* extensive** command:

```
user@host> show interfaces interface-name extensive
```

### **Example: Configuring E1 Loopback Capability**

To determine whether a problem is internal or external, loop packets on both the local and the remote routing platform. To do this, include the **no-keepalives** and **encapsulation cisco-hdlc** statements at the [edit interfaces *interface-name*] hierarchy level and the **loopback local** statement at the [edit interfaces *interface-name* e1-options] hierarchy level.

With this configuration, the link stays up, so you can loop ping packets to a remote routing platform. The **loopback local** statement causes the interface to loop within the PIC just before the data reaches the transceiver.

```
[edit interfaces]
```

```
e1-1/0/0 {
 no-keepalives;
 encapsulation cisco-hdlc;
 e1-options {
 loopback local;
 }
 unit 0 {
 family inet {
 address 10.100.100.1/24;
 }
 }
}
```

## Configuring E1 Start and End Flags

---

By default, start and end flags are shared.

To configure an E1 interface to wait two idle cycles between the start and end flags, include the `start-end-flag filler` statement at the `[edit interfaces interface-name e1-options]` hierarchy level:

```
[edit interfaces interface-name e1-options]
start-end-flag filler;
```

To revert to the default behavior, sharing the transmission of start and end flags, include the `start-end-flag shared` statement at the `[edit interfaces interface-name e1-options]` hierarchy level:

```
[edit interfaces interface-name e1-options]
start-end-flag shared;
```

## Configuring Fractional E1 Time Slots

---

By default, all the time slots on an E1 interface are used. To configure the number of time slots allocated to a fractional E1 interface, include the `timeslots` statement at the `[edit interfaces interface-name e1-options]` hierarchy level:

```
[edit interfaces interface-name e1-options]
timeslots time-slot-range;
```

There are 32 time slots on an E1 interface. Time slot 0 is always reserved for framing and cannot be used to configure a fractional E1 interface.

Time slot numbering constraints vary for different E1 PICs. For 4-port E1 PICs, the configurable time-slot range is 1 through 31 (time slot 0 is reserved for framing).

For 10-port Channelized E1 and 10-port Channelized E1 IQ PICs, the configurable time-slot range is 2 through 32 (time slots 0 and 1 are reserved for framing).

For fractional E1 interfaces only, if you connect a 4-port E1 PIC interface to a device that uses time slot numbering from 2 through 32, you must subtract 1 from the configured number of time slots. To do this, include the `timeslots` statement at the

[edit interfaces *interface-name* e1-options] hierarchy level, and offset 1 from the specified slot number.



**NOTE:** When configuring fractional E1 time slots, you also must include the **framing g704** statement at the [edit interfaces *e1-fpc/pic/port* e1-options] hierarchy level.

To configure ranges, use hyphens. To configure discontinuous time slots, use commas. Do not include spaces

**Example: Configuring Fractional E1 Time Slots**

In this example, time slots are offset by 1 to compensate for the fractional E1 interface being connected to a device that uses time slot numbering from 0 through 31.

|                                                         |                                                                                                      |
|---------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| <b>Use Time Slots</b><br><b>3 Through 5, 10, and 24</b> | [edit interfaces <i>interface-name</i> e1-options] # Fractional E1 interface<br>timeslots 4-6,11,25; |
| <b>Use Time Slots</b><br><b>1 Through 10</b>            | [edit interfaces <i>interface-name</i> e1-options]<br>timeslots 1-10;                                |
| <b>Use Time Slots</b><br><b>1 Through 5, 10, and 24</b> | [edit interfaces <i>interface-name</i> e1-options]<br>timeslots 1-5,10,24;                           |



## Chapter 27

# Configuring E3 Interfaces

This chapter contains the following sections:

- E3 Interfaces Overview on page 477
- Configuring E3 Physical Interface Properties on page 478
- Configuring E3 BERT Properties on page 478
- Configuring the E3 CSU Compatibility Mode on page 479
- Configuring the E3 Frame Checksum on page 480
- Configuring the E3 Idle Cycle Flag on page 481
- Configuring E3 Data Inversion on page 481
- Configuring E3 Loopback Capability on page 481
- Configuring E3 HDLC Payload Scrambling on page 483
- Configuring the E3 Start and End Flags on page 483
- Configuring E3 IQ and IQE Unframed Mode on page 484

## E3 Interfaces Overview

---

E3 is a high-speed WAN digital communication technique designed to operate over copper facilities at a rate of 34.368 Mbps. Widely used outside North America, it is the time-division multiplexing scheme used to carry 16 E1 circuits. The following standards apply to E3 interfaces:

- ITU-T Recommendation G.703, *Physical/electrical characteristics of hierarchical digital interfaces*, describes data rates and multiplexing schemes for the E series.
- ITU-T Recommendation G.751, *General Aspects of Digital Transmission Systems: Terminal Equipment*, describes framing methods.
- ITU-T Recommendation G.775, *Loss of Signal (LOS) and Alarm Indication Signal (AIS) Defect Detection and Clearance Criteria*, describes alarm reporting methods.

The JUNOS software supports the E3 Physical Interface Card (PIC) and the E3 Intelligent Queuing (IQ and IQE) PICs. The E3 IQ and E3 IQE PICs supports transmission scheduling on logical interfaces. For more information, see the *JUNOS Class of Service Configuration Guide*.



**NOTE:** In unframed mode, the E3 IQ and E3 IQE PICs do not detect yellow or loss-of-frame alarms.

## Configuring E3 Physical Interface Properties

To configure E3-specific physical interface properties, include the **e3-options** statement at the [edit interfaces *interface-name*] hierarchy level:

```
[edit interfaces interface-name]
e3-options {
 bert-algorithm algorithm;
 bert-error-rate rate;
 bert-period seconds;
 compatibility-mode (digital-link | kentrox | larscom) <subrate value>;
 fcs (16 | 32);
 idle-cycle-flag value;
 invert-data;
 loopback (local | remote);
 (payload-scrambler | no-payload-scrambler);
 start-end-flag value;
 (unframed | no-unframed);
}
```

## Configuring E3 BERT Properties

This section discusses BERT properties for the E3 interface specifically. For general information about the JUNOS implementation of the BERT procedure, see “Interface Diagnostics” on page 125.

You can configure an E3 interface to execute a bit error rate test (BERT) when the interface receives a request to run this test. You specify the duration of the test, the pattern to send in the bit stream, and the error rate to include in the bit stream by including the **bert-period**, **bert-algorithm**, and **bert-error-rate** statements at the [edit interfaces *interface-name* e3-options] hierarchy level:

```
[edit interfaces interface-name e3-options]
bert-algorithm algorithm;
bert-error-rate rate;
bert-period seconds;
```

By default, the BERT period is 10 seconds. You can configure the BERT period to last from 1 through 239 seconds on some PICs and from 1 through 240 seconds on other PICs.

**rate** is the bit error rate. This can be an integer from 0 through 7, which corresponds to a bit error rate from  $10^{-0}$  (0, which corresponds to no errors) to  $10^{-7}$  (1 error per 10 million bits).

**algorithm** is the pattern to send in the bit stream. On E3 interfaces, you can also select the pattern to send in the bit stream by including the **bert-algorithm** statement at the [edit interfaces *interface-name* *interface-options*] hierarchy level:



```
[edit interfaces interface-name interface-options]
bert-algorithm algorithm;
```

For a list of supported algorithms, enter a ? after the **bert-algorithm** statement; for example:

```
[edit interfaces e3-0/0/0 e3-options]
user@host# set bert-algorithm ?
Possible completions:
pseudo-2e11-o152 Pattern is 2^11 - 1 (per O.152 standard)
pseudo-2e15-o151 Pattern is 2^15 - 1 (per O.152 standard)
pseudo-2e20-o151 Pattern is 2^20 - 1 (per O.151 standard)
pseudo-2e20-o153 Pattern is 2^20 - 1 (per O.153 standard)
```

For specific hierarchy information, see individual interface types. For information about running the BERT procedure, see the *JUNOS System Basics and Services Command Reference*.

## Configuring the E3 CSU Compatibility Mode

Subrating an E3 interface reduces the maximum allowable peak rate by limiting the High-level Data Link Control (HDLC)-encapsulated payload. Subrate modes configure the PIC to connect with channel service units (CSUs) that use proprietary methods of multiplexing.

On M-series and T-series routing platforms, you can configure E3 interfaces to be compatible with a Digital Link, Kentrox, or Larscom CSU. On J-series Services Routers, you can configure E3 interfaces to be compatible with a Digital Link or Kentrox CSU.



**NOTE:** To subrate an E3 interface to be compatible with a Kentrox CSU, you must have an IQ or IQE-based PIC. Non-IQ or IQE PICs allow a commit of the configuration, but the interfaces remain at the full E3 rate for the Kentrox compatibility mode.

To configure an E3 interface so that it is compatible with the CSU at the remote end of the line, include the **compatibility-mode** statement at the `[edit interfaces interface-name e3-options]` hierarchy level:

```
[edit interfaces interface-name e3-options]
compatibility-mode (digital-link | kentrox | larscom) <subrate value>;
```

The subrate of an E3 interface must exactly match that of the remote CSU. To specify the subrate, include the **subrate** statement in the configuration:

- For Kentrox CSUs, specify the subrate as a number from 1 through 48 that exactly matches the value configured on the CSU. Each increment of the subrate value corresponds to a rate increment of about 0.5 Mbps.
- For Digital Link CSUs, you can specify the subrate value to match the data rate configured on the CSU in the format *xkb* or *x.xMb*. You can configure the subrate values shown in Table 44 on page 480.
- Larscom CSUs do not support the E3 subrate.

**Table 44: Subrate Values for E3 Digital Link Compatibility Mode**

|          |           |           |           |           |
|----------|-----------|-----------|-----------|-----------|
| 358 Kbps | 7.2 Mbps  | 14.0 Mbps | 20.8 Mbps | 27.6 Mbps |
| 716 Kbps | 7.5 Mbps  | 14.3 Mbps | 21.1 Mbps | 27.9 Mbps |
| 1.1 Mbps | 7.9 Mbps  | 14.7 Mbps | 21.5 Mbps | 28.3 Mbps |
| 1.4 Mbps | 8.2 Mbps  | 15.0 Mbps | 21.8 Mbps | 28.6 Mbps |
| 1.8 Mbps | 8.6 Mbps  | 15.4 Mbps | 22.2 Mbps | 29.0 Mbps |
| 2.1 Mbps | 9.0 Mbps  | 15.8 Mbps | 22.6 Mbps | 29.4 Mbps |
| 2.5 Mbps | 9.3 Mbps  | 16.1 Mbps | 22.9 Mbps | 29.7 Mbps |
| 2.9 Mbps | 9.7 Mbps  | 16.5 Mbps | 23.3 Mbps | 30.1 Mbps |
| 3.2 Mbps | 10.0 Mbps | 16.8 Mbps | 23.6 Mbps | 30.4 Mbps |
| 3.6 Mbps | 10.4 Mbps | 17.2 Mbps | 24.0 Mbps | 30.8 Mbps |
| 3.9 Mbps | 10.7 Mbps | 17.5 Mbps | 24.3 Mbps | 31.1 Mbps |
| 4.3 Mbps | 11.1 Mbps | 17.9 Mbps | 24.7 Mbps | 31.5 Mbps |
| 4.7 Mbps | 11.5 Mbps | 18.3 Mbps | 25.1 Mbps | 31.9 Mbps |
| 5.0 Mbps | 11.8 Mbps | 18.6 Mbps | 25.4 Mbps | 32.2 Mbps |
| 5.4 Mbps | 12.2 Mbps | 19.0 Mbps | 25.8 Mbps | 32.6 Mbps |
| 5.7 Mbps | 12.5 Mbps | 19.3 Mbps | 26.1 Mbps | 32.9 Mbps |
| 6.1 Mbps | 12.9 Mbps | 19.7 Mbps | 26.5 Mbps | 33.3 Mbps |
| 6.4 Mbps | 13.2 Mbps | 20.0 Mbps | 26.9 Mbps | 33.7 Mbps |
| 6.8 Mbps | 13.6 Mbps | 20.4 Mbps | 27.2 Mbps |           |

For information about subrating a T3 interface, see “Configuring the T3 CSU Compatibility Mode” on page 498.

## Configuring the E3 Frame Checksum

You can configure a 32-bit checksum, which provides more reliable packet verification. However, some older equipment might not support 32-bit checksums.

On a channelized OC12 interface, the **fcs** statement is not supported. To configure FCS on each E3 channel, you must include the **e3-options fcs** statement in the configuration for each channel.

To configure a 32-bit checksum, include the **fcs** statement at the **[edit interfaces interface-name e3-options]** hierarchy level:

```
[edit interfaces interface-name e3-options]
fcs 32;
```

To return to the default 16-bit frame checksum, delete the `fcs 32` statement from the configuration:

```
[edit]
user@host# delete interfaces e3-fpc/pic/port e3-options fcs 32
```

To explicitly configure a 16-bit checksum, include the `fcs` statement at the `[edit interfaces interface-name e3-options]` hierarchy level:

```
[edit interfaces interface-name e3-options]
fcs 16;
```

## Configuring the E3 Idle Cycle Flag

---

By default, an E3 interface transmits the value 0x7E in the idle cycles. To have the interface transmit the value 0xFF (all ones) instead, include the `idle-cycle-flag` statement at the `[edit interfaces interface-name e3-options]` hierarchy level, specifying the `ones` option:

```
[edit interfaces interface-name e3-options]
idle-cycle-flag ones;
```

To explicitly configure the default value of 0x7E, include the `idle-cycle-flag` statement with the `flags` option:

```
[edit interfaces interface-name e3-options]
idle-cycle-flag flags;
```

## Configuring E3 Data Inversion

---

By default, data inversion is disabled. To enable data inversion at the HDLC level, include the `invert-data` statement at the `[edit interfaces interface-name e3-options]` hierarchy level:

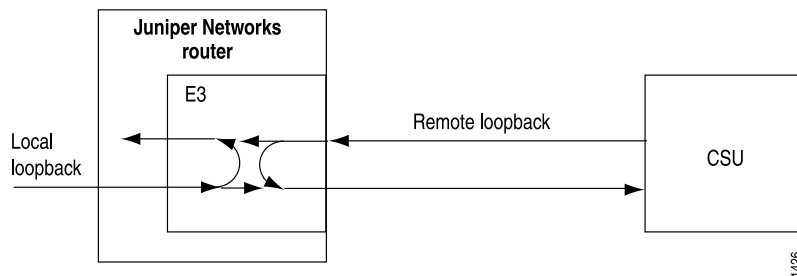
```
[edit interfaces interface-name e3-options]
invert-data;
```

When you enable data inversion, unused data bits in the data stream are transmitted inverted; that is, zeroes are transmitted as ones and ones as zeroes. Enable inversion to be compatible with another vendor's E3 interface.

## Configuring E3 Loopback Capability

---

You can configure loopback capability between the local E3 interface and the remote CSU. You can configure the loopback to be local or remote. With local loopback, the E3 interface can transmit packets to the CSU, but receives its own transmission back again and ignores data from the CSU. With remote loopback, packets sent from the CSU are received by the E3 interface, forwarded if there is a valid route, and immediately retransmitted to the CSU (see Figure 42 on page 482).

**Figure 42: Remote and Local E3 Loopback**

To configure loopback capability on an E3 interface, include the **loopback** statement at the `[edit interfaces interface-name e3-options]` hierarchy level:

```
[edit interfaces interface-name e3-options]
 loopback (local | remote);
```

Packets can be looped on either the local routing platform or the remote CSU.

To exchange BERT patterns between a local routing platform and a remote routing platform, include the **loopback remote** statement in the interface configuration at the remote end of the link. From the local routing platform, you issue the **test interface** command.

For more information about configuring BERT, see “Interface Diagnostics” on page 125. For more information about using operational mode commands to test interfaces, see the *JUNOS System Basics and Services Command Reference*.

To turn off the loopback capability, remove the **loopback** statement from the configuration:

```
[edit]
user@host# delete interfaces e3-fpc/pic/port e3-options loopback
```

You can determine whether there is an internal problem or an external problem by checking the error counters in the output of the **show interface *interface-name* extensive** command:

```
user@host> show interfaces interface-name extensive
```

### Example: Configuring E3 Loopback Capability

To determine whether a problem is internal or external, loop packets on both the local and the remote routing platform. To do this, include the **no-keepalives** and **encapsulation cisco-hdlc** statements at the `[edit interfaces interface-name]` hierarchy level and the **loopback local** statement at the `[edit interfaces interface-name e3-options]` hierarchy level. With this configuration, the link stays up, so you can loop ping packets to a remote routing platform. The **loopback local** statement causes the interface to loop within the PIC just before the data reaches the transceiver.

```
[edit interfaces]
e3-1/0/0 {
 no-keepalives;
```

```

encapsulation cisco-hdlc;
e3-options {
 loopback local;
}
unit 0 {
 family inet {
 address 10.100.100.1/24;
 }
}
}

```

## Configuring E3 HDLC Payload Scrambling

---

E3 HDLC payload scrambling, which is disabled by default, provides better link stability. Both sides of a connection must either use or not use scrambling.

To configure scrambling on the interface, you can include the `payload-scrambler` statement at the `[edit interfaces interface-name e3-options]` hierarchy level:

```

[edit interfaces interface-name e3-options]
payload-scrambler;

```

To explicitly disable HDLC payload scrambling, include the `no-payload-scrambler` statement at the `[edit interfaces interface-name e3-options]` hierarchy level:

```

[edit interfaces interface-name e3-options]
no-payload-scrambler;

```

To disable payload scrambling again (return to the default), delete the `payload-scrambler` statement from the configuration:

```

[edit]
user@host# delete interfaces e3-fpc/pic/port e3-options payload-scrambler

```

## Configuring the E3 Start and End Flags

---

By default, an E3 interface shares the transmission of the start and end flags

To configure an E3 interface to wait two idle cycles between the start and end flags, include the `filler` statement at the `[edit interfaces interface-name e3-options start-end-flag]` hierarchy level:

```

[edit interfaces interface-name e3-options]
start-end-flag filler;

```

To revert to the default behavior, sharing the transmission of start and end flags, include the `shared` statement at the `[edit interfaces interface-name e3-options start-end-flag]` hierarchy level:

```

[edit interfaces interface-name e3-options]
start-end-flag shared;

```

## Configuring E3 IQ and IQE Unframed Mode

---

For E3 IQ and IQE interfaces only, you can enable or disable unframed mode. In unframed mode, the E3 IQ and IQE interfaces do not detect yellow (ylw) or loss-of-frame (lof) alarms.

By default, unframed mode is disabled. To enable unframed mode, include the `unframed` statement at the `[edit interfaces interface-name e3-options]` hierarchy level:

```
[edit interfaces interface-name e3-options]
unframed;
```

To explicitly configure the default of framed mode, include the `no-unframed` statement:

```
[edit interfaces interface-name e3-options]
no-unframed;
```

## Chapter 28

# Configuring T1 Interfaces

This chapter includes an overview of T1 interfaces and configuration information as follows:

- T1 Interfaces Overview on page 485
- Configuring T1 Physical Interface Properties on page 486
- Configuring T1 BERT Properties on page 486
- Configuring the T1 Buildout on page 487
- Configuring T1 Byte Encoding on page 487
- Configuring T1 CRC Error Major Alarm Thresholds on page 487
- Configuring T1 CRC Error Minor Alarm Thresholds on page 488
- Configuring T1 Data Inversion on page 489
- Configuring the T1 Frame Checksum on page 489
- Configuring the T1 Remote Loopback Response on page 489
- Configuring T1 Framing on page 490
- Configuring T1 Line Encoding on page 490
- Configuring T1 Loopback Capability on page 490
- Configuring the T1 Idle Cycle Flag on page 492
- Configuring T1 Start and End Flags on page 492
- Configuring Fractional T1 Time Slots on page 493

## T1 Interfaces Overview

---

T1 is the basic physical layer protocol used by the Digital Signal level 1 (DS1) multiplexing method in North America. A T1 interface operates at a bit rate of 1.544 Mbps and can support 24 DS0 channels. Supported DS1 standards include:

- ANSI T1.107, T1.102
- GR 499-core, GR 253-core
- AT&T Pub 54014
- ITU G.751, G.703

## Configuring T1 Physical Interface Properties

---

To configure T1-specific physical interface properties, include the **t1-options** statement at the [edit interfaces *interface-name*] hierarchy level:

```
[edit interfaces interface-name]
t1-options {
 bert-algorithm algorithm;
 bert-error-rate rate;
 bert-period seconds;
 buildout value;
 byte-encoding (nx56 | nx64);
 crc-major-alarm-threshold (1e-3 | 5e-4 | 1e-4 | 5e-5 | 1e-5);
 crc-minor-alarm-threshold (1e-3 | 5e-4 | 1e-4 | 5e-5 | 1e-5 | 5e-6 | 1e-6);
 fcs (16 | 32);
 framing (esf | sf);
 idle-cycle-flag (flags | ones);
 invert-data;
 line-encoding (ami | b8zs);
 loopback (local | payload | remote);
 remote-loopback-respond;
 start-end-flag (filler | shared);
 timeslots time-slot-range;
}
```

## Configuring T1 BERT Properties

---

This section discusses BERT properties for the T1 interface specifically. For general information about the JUNOS implementation of the BERT procedure, see “Interface Diagnostics” on page 125.

You can configure a T1 interface to execute a bit error rate test (BERT) when the interface receives a request to run this test. You specify the duration of the test and the error rate to include in the bit stream by including the **bert-period** and **bert-error-rate** statements at the [edit interfaces *interface-name* t1-options] hierarchy level:

```
[edit interfaces interface-name t1-options]
bert-algorithm algorithm;
bert-error-rate rate;
bert-period seconds;
```

*seconds* is the duration of the BERT procedure. The test can last from 1 through 239 seconds; the default is 10 seconds.

*rate* is the bit error rate. This can be an integer from 0 through 7, which corresponds to a bit error rate from  $10^{-0}$  (1 error per bit) to  $10^{-7}$  (1 error per 10 million bits).

*algorithm* is the pattern to send in the bit stream. On T1 interfaces, you can also select the pattern to send in the bit stream by including the **bert-algorithm** statement at the [edit interfaces *interface-name* *interface-options*] hierarchy level:

```
[edit interfaces interface-name interface-options]
bert-algorithm algorithm;
```



For a list of supported algorithms, enter a ? after the **bert-algorithm** statement; for example:

```
[edit interfaces t1-0/0/0 t1-options]
user@host# set bert-algorithm ?
Possible completions:
pseudo-2e11-o152 Pattern is 2^11 - 1 (per 0.152 standard)
pseudo-2e15-o151 Pattern is 2^15 - 1 (per 0.152 standard)
pseudo-2e20-o151 Pattern is 2^20 - 1 (per 0.151 standard)
pseudo-2e20-o153 Pattern is 2^20 - 1 (per 0.153 standard)
```

For specific hierarchy information, see individual interface types. For information about running the BERT procedure, see the *JUNOS System Basics and Services Command Reference*.

## Configuring the T1 Buildout

---

A T1 interface has five possible setting ranges for the T1 line buildout: 0-132, 133-265, 266-398, 399-531, or 532-655 feet. By default, the T1 interface uses the shortest setting (0-132).

To have the interface drive a line at one of the longer distance ranges, include the buildout statement with the appropriate value at the [edit interfaces *interface-name* t1-options] hierarchy level:

```
[edit interfaces interface-name t1-options]
buildout value;
```

## Configuring T1 Byte Encoding

---

By default, T1 interfaces use a byte encoding of 8 bits per byte (nx64). You can configure an alternative byte encoding of 7 bits per byte (nx56).

To have the interface use 7 bits per byte encoding, include the **byte-encoding** statement at the [edit interfaces *interface-name* t1-options] hierarchy level, specifying the nx56 option:

```
[edit interfaces interface-name t1-options]
byte-encoding nx56;
```

To explicitly configure nx64 byte encoding, include the **byte-encoding** statement at the [edit interfaces *interface-name* t1-options] hierarchy level, specifying the nx64 option:

```
[edit interfaces interface-name t1-options]
byte-encoding nx64;
```

## Configuring T1 CRC Error Major Alarm Thresholds

---

JUNOS software collects CRC errors from PICs every second. On Channelized OC3 IQ and IQE PICs, Channelized OC12 IQ and IQE PICs, and Channelized T3 IQ PICs, you can configure major error thresholds for T1 CRC errors.

When the threshold is exceeded for 1 second, a defect condition is declared. If the defect condition continues for the monitoring period, an alarm condition is declared. You can display the CRC error threshold configuration, CRC errors count, and the alarm condition using the `show interfaces extensive` command.

To configure a CRC major error threshold, include the `crc-major-alarm-threshold` statement at the `[edit interfaces interface-name t1-options]` hierarchy level, specifying the errors per bits as `1e-3`, `5e-4`, `1e-4`, `5e-5` or `1e-5`:

```
[edit interfaces interface-name t1-options]
 crc-major-alarm-threshold (1e-3 | 5e-4 | 1e-4 | 5e-5 | 1e-5);
```

To configure a T1 CRC error major alarm for five errors in  $10^{-4}$  bits, include the `crc-major-alarm-threshold` statement at the `[edit interfaces interface-name t1-options]` hierarchy level, specifying the `5e-4` option:

```
[edit interfaces interface-name t1-options]
 crc-major-alarm-threshold 5e-4;
```

All settings except `1e-5` use a 10-second monitoring period. The `1e-5` value uses a 50-second monitoring period.

## Configuring T1 CRC Error Minor Alarm Thresholds

JUNOS software collects CRC errors from PICs every second. On Channelized OC3 IQ and IQE PICs, Channelized OC12 IQ and IQE PICs, and Channelized T3 IQ PICs, you can configure minor error thresholds for T1 CRC errors.

When the threshold is exceeded for 1 second, a defect condition is declared. If the defect condition continues for the monitoring period, an alarm condition is declared. You can display the CRC error threshold configuration, CRC errors count, and the alarm condition using the `show interfaces extensive` command.

To configure a CRC minor error threshold, include the `crc-minor-alarm-threshold` statement at the `[edit interfaces interface-name t1-options]` hierarchy level, specifying the errors per bits as `1e-3`, `5e-4`, `1e-4`, `5e-5`, `1e-5`, `5e-6`, or `1e-6`:

```
[edit interfaces interface-name t1-options]
 crc-minor-alarm-threshold (1e-3 | 5e-4 | 1e-4 | 5e-5 | 1e-5 | 5e-6 | 1e-6);
```

To configure a T1 CRC error minor alarm for five errors in  $10^{-4}$  bits, include the `crc-minor-alarm-threshold` statement at the `[edit interfaces interface-name t1-options]` hierarchy level, specifying the `5e-4` option:

```
[edit interfaces interface-name t1-options]
 crc-minor-alarm-threshold 5e-4;
```

The 10-second monitoring period is used for values `1e-3`, `5e-4`, `1e-4`, and `5e-5`. The `1e-5` value uses a 50-second monitoring period. The `5e-6` value uses a 100-second monitoring period. The `1e-6` value uses a 500-second monitoring period.

## Configuring T1 Data Inversion

---

By default, data inversion is disabled. To enable data inversion at the HDLC level, include the `invert-data` statement at the `[edit interfaces interface-name t1-options]` hierarchy level:

```
[edit interfaces interface-name t1-options]
invert-data;
```

When you enable data inversion, all data bits in the data stream are transmitted inverted; that is, zeroes are transmitted as ones and ones as zeroes. Data inversion is normally used only in AMI mode to guarantee ones density in the transmitted stream.

## Configuring the T1 Frame Checksum

---

By default, T1 interfaces use a 16-bit frame checksum. You can configure a 32-bit checksum, which provides more reliable packet verification. However, some older equipment might not support 32-bit checksums.

To configure a 32-bit checksum, include the `fcs 32` statement at the `[edit interfaces interface-name t1-options]` hierarchy level:

```
[edit interfaces interface-name t1-options]
fcs 32;
```

To return to the default 16-bit frame checksum, delete the `fcs 32` statement from the configuration:

```
[edit]
user@host# delete interfaces t1-fpc/pic/port t1-options fcs 32
```

To explicitly configure a 16-bit checksum, include the `fcs 16` statement at the `[edit interfaces interface-name t1-options]` hierarchy level:

```
[edit interfaces interface-name t1-options]
fcs 16;
```

## Configuring the T1 Remote Loopback Response

---

The T1 facilities data-link loop request signal is used to communicate various network information in the form of in-service monitoring and diagnostics. Extended superframe, through the facilities data link (FDL), supports nonintrusive signaling and control, thereby offering clear-channel communication. Remote loopback requests can be over the FDL or inband. To configure the routing platform to respond to remote loopback requests, include the `remote-loopback-respond` statement at the `[edit interfaces interface-name t1-options]` hierarchy level:

```
[edit interfaces interface-name t1-options]
remote-loopback-respond;
```

By default, the routing platform does not respond to remote loopback requests.

## Configuring T1 Framing

---

By default, T1 interfaces use extended superframe framing format. You can configure SF (superframe) as an alternative.

To have the interface use the SF framing format, include the **framing** statement at the [edit interfaces *interface-name* t1-options] hierarchy level, specifying the **sf** option:

```
[edit interfaces interface-name t1-options]
framing sf;
```

To explicitly configure ESF framing, include the **framing** statement at the [edit interfaces *interface-name* t1-options] hierarchy level, specifying the **esf** option:

```
[edit interfaces interface-name t1-options]
framing esf;
```

## Configuring T1 Line Encoding

---

By default, T1 interfaces use B8ZS line encoding. You can configure AMI line encoding if necessary.

To have the interface use AMI line encoding, include the **line-encoding** statement at the [edit interfaces *interface-name* t1-options] hierarchy level, specifying the **ami** option:

```
[edit interfaces interface-name t1-options]
line-encoding ami;
```

To explicitly configure B8ZS line encoding, include the **line-encoding** statement at the [edit interfaces *interface-name* t1-options] hierarchy level, specifying the **b8zs** option:

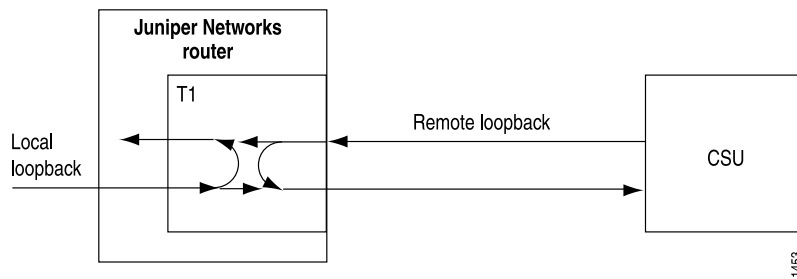
```
[edit interfaces interface-name t1-options]
line-encoding b8zs;
```

For M-series and T-series routing platforms, you must set the line encoding parameter for paired ports to the same value. Ports 0 and 1 must share the same value, and likewise ports 2 and 3 must share the same value, but ports 0 and 1 can have a different value from that of ports 2 and 3.

## Configuring T1 Loopback Capability

---

You can configure loopback capability between the local T1 interface and the remote channel service unit (CSU), as shown in Figure 43 on page 491. You can configure the loopback to be local or remote. With local loopback, the T1 interface can transmit packets to the CSU, but receives its own transmission back again and ignores data from the CSU. With remote loopback, packets sent from the CSU are received by the T1 interface, forwarded if there is a valid route, and immediately retransmitted to the CSU.

**Figure 43: Remote and Local T1 Loopback**

To configure loopback capability on a T1 interface, include the **loopback** statement at the [edit interfaces *interface-name* t1-options] hierarchy level:

```
[edit interfaces interface-name t1-options]
 loopback (local | payload | remote);
```

Packets can be looped on either the local routing platform or the remote CSU. Local and remote loopback loop back both data and clocking information.

To exchange BERT patterns between a local routing platform and a remote routing platform, include the **loopback remote** statement in the interface configuration at the remote end of the link. From the local routing platform, issue the **test interface** command.

For more information about configuring BERT, see “Interface Diagnostics” on page 125. For more information about using operational mode commands to test interfaces, see the *JUNOS System Basics and Services Command Reference*.

For channelized T3, T1, and NxDS0 intelligent queuing (IQ) interfaces only, you can include the **loopback payload** statement in the configuration to loop back data only (without clocking information) on the remote routing platform’s PIC. In payload loopback, overhead is recalculated. For T3 IQ interfaces, you can include the **loopback payload** statement at the [edit interfaces *ct3-fpc/pic/port*] and [edit interfaces *t3-fpc/pic/port:channel*] hierarchy levels. For T1 interfaces, you can include the **loopback payload** statement in the configuration at the [edit interfaces *t1-fpc/pic/port:channel*] hierarchy level; it is ignored if included at the [edit interfaces *ct1-fpc/pic/port*] hierarchy level. For NxDS0 interfaces, payload and remote loopback are the same. If you configure one, the other is ignored. NxDS0 IQ interfaces do not support local loopback.

To determine whether a problem is internal or external, you can loop packets on both the local and the remote routing platform. To do this, include the **no-keepalives** and **encapsulation cisco-hdlc** statements at the [edit interfaces *interface-name*] hierarchy level and the **loopback local** statement at the [edit interfaces *interface-name* t1-options] hierarchy level, as shown in the following example:

```
[edit interfaces]
 t1-1/0/0 {
 no-keepalives;
 encapsulation cisco-hdlc;
 t1-options {
 loopback local;
```

```

 }
 unit 0 {
 family inet {
 address 10.100.100.1/24;
 }
 }
}

```

With this configuration, the link stays up, so you can loop ping packets to a remote routing platform. The **loopback local** statement causes the interface to loop within the PIC just before the data reaches the transceiver.

To turn off the loopback capability, remove the **loopback** statement from the configuration:

```

[edit]
user@host# delete interfaces t1-fpc/pic/port t1-options loopback

```

You can determine whether there is an internal problem or an external problem by checking the error counters in the output of the **show interface *interface-name* extensive** command, for example:

```

user@host> show interfaces t1-fpc/pic/port extensive

```

## Configuring the T1 Idle Cycle Flag

---

By default, a T1 interface transmits the value 0x7E in the idle cycles. To have the interface transmit the value 0xFF (all ones) instead, include the **idle-cycle-flag** statement at the **[edit interfaces *interface-name* t1-options]** hierarchy level, specifying the **ones** option:

```

[edit interfaces interface-name t1-options]
idle-cycle-flag ones;

```

To explicitly configure the default value of 0x7E, include the **idle-cycle-flag** statement with the **flags** option:

```

[edit interfaces interface-name t1-options]
idle-cycle-flag flags;

```

## Configuring T1 Start and End Flags

---

By default, a T1 interface shares the transmission of the start and end flags

To configure a T1 interface to wait two idle cycles between the start and end flags, include the **start-end-flag** statement at the **[edit interfaces *interface-name* t1-options]** hierarchy level and specify the **filler** option:

```

[edit interfaces interface-name t1-options]
start-end-flag filler;

```

To revert to the default behavior, sharing the transmission of start and end flags, include the **start-end-flag** statement at the [edit interfaces *interface-name* t1-options] hierarchy level and specify the **shared** option:

```
[edit interfaces interface-name t1-options]
start-end-flag shared;
```

## Configuring Fractional T1 Time Slots

---

By default, all the time slots on a T1 interface are used. To configure the number of time slots allocated to a fractional T1 interface, include the **timeslots** statement at the [edit interfaces *interface-name* t1-options] hierarchy level:

```
[edit interfaces interface-name t1-options]
timeslots time-slot-range;
```

For T1 interfaces, the time-slot range is from 1 through 24. There are 24 time slots on a T1 interface. You can designate any combination of time slots. To configure ranges, use hyphens. To configure discontinuous time slots, use commas. Do not include spaces.

### Example: Configuring Fractional T1 Time Slots

|                                                           |                                                                            |
|-----------------------------------------------------------|----------------------------------------------------------------------------|
| <b>Use Time Slots<br/>1 Through 10</b>                    | [edit interfaces <i>interface-name</i> t1-options]<br>timeslots 1-10;      |
| <b>Use Time Slots<br/>1 Through 5, 10, and 24</b>         | [edit interfaces <i>interface-name</i> t1-options]<br>timeslots 1-5,10,24; |
| <b>Use the First Four<br/>Odd-Numbered Time<br/>Slots</b> | [edit interfaces <i>interface-name</i> t1-options]<br>timeslots 1,3,5,7;   |





## Chapter 29

# Configuring T3 Interfaces

This chapter includes an overview of T3 interfaces and configuration information as follows:

- T3 Interfaces Overview on page 495
- Configuring T3 Physical Interface Properties on page 496
- Configuring T3 BERT Properties on page 496
- Disabling T3 C-Bit Parity Mode on page 497
- Configuring the T3 CSU Compatibility Mode on page 498
- Configuring the T3 Frame Checksum on page 500
- Configuring the T3 FEAC Response on page 500
- Configuring the T3 Idle Cycle Flag on page 501
- Configuring the T3 Line Buildout on page 501
- Configuring the Channelized T3 Loop Timing on page 502
- Configuring T3 Loopback Capability on page 502
- Configuring T3 HDLC Payload Scrambling on page 504
- Configuring T3 Start and End Flags on page 505
- Examples: Configuring T3 Interfaces on page 505

## T3 Interfaces Overview

---

T3 is the physical layer protocol used by the Digital Signal level 3 (DS3) multiplexing method in North America. A T3 interface operates at a bit rate of 44.736 Mbps. The JUNOS software supports payload scrambling and subrate operation on each physical T3 interface. One encapsulation format—Point-to-Point Protocol (PPP), Frame Relay, or High-level Data Link Control (HDLC)—must be configured for the interface. DS3 standards supported include:

- ANSI T1.107, T1.102
- GR 499-core, GR 253-core
- Bellcore TR-TSY-000009
- AT&T Pub 5404
- ITU G.751, G.703, G823

## Configuring T3 Physical Interface Properties

To configure T3-specific physical interface properties, include the **t3-options** statement at the [edit interfaces *interface-name*] hierarchy level:

```
[edit interfaces interface-name]
t3-options {
 bert-algorithm algorithm;
 bert-error-rate rate;
 bert-period seconds;
 (cbit-parity | no-cbit-parity);
 compatibility-mode (adtran | digital-link | kentrox | larscom | verilink) <subrate value>;
 fcs (16 | 32);
 (feac-loop-respond | no-feac-loop-respond);
 idle-cycle-flag value;
 (long-buildout | no-long-buildout);
 (loop-timing | no-loop-timing);
 loopback (local | payload | remote);
 (payload-scrambler | no-payload-scrambler);
 start-end-flag value;
}
```

## Configuring T3 BERT Properties

This section discusses BERT properties for the T3 interface specifically. For general information about the JUNOS implementation of the BERT procedure, see “Interface Diagnostics” on page 125.

You can configure a T3 interface to execute a bit error rate test (BERT) when the interface receives a request to run this test. You specify the duration of the test, the pattern to send in the bit stream, and the error rate to include in the bit stream by including the **bert-period**, **bert-algorithm**, and **bert-error-rate** statements at the [edit interfaces *interface-name* t3-options] hierarchy level:

```
[edit interfaces interface-name t3-options]
bert-algorithm algorithm;
bert-error-rate rate;
bert-period seconds;
```

By default, the BERT period is 10 seconds. You can configure the BERT period to last from 1 through 239 seconds on some PICs and from 1 through 240 seconds on other PICs.

**rate** is the bit error rate. This can be an integer from 0 through 7, which corresponds to a bit error rate from  $10^{-0}$  (1 error per bit) to  $10^{-7}$  (1 error per 10 million bits).

**algorithm** is the pattern to send in the bit stream. The default algorithm for the DS3 BERT procedure is **pseudo-2e15-o151** (pattern is  $2^{15}-1$ , as defined in the CCITT/ITU O.151 standard).

On T3 interfaces, you can also select the pattern to send in the bit stream by including the **bert-algorithm** statement at the [edit interfaces *interface-name* *interface-options*] hierarchy level:

```
[edit interfaces interface-name interface-options]
bert-algorithm algorithm;
```

For a list of supported algorithms, enter a ? after the **bert-algorithm** statement; for example:

```
[edit interfaces t3-0/0/0 t3-options]
user@host# set bert-algorithm ?
Possible completions:
all-ones-repeating Repeating one bits
all-zeros-repeating Repeating zero bits
alternating-double-ones-zeros Alternating pairs of ones and zeros
alternating-ones-zeros Alternating ones and zeros
pseudo-2e10 Pattern is 2^10 - 1
...
```

For specific hierarchy information, see individual interface types. For information about running the BERT procedure, see the *JUNOS System Basics and Services Command Reference*.

## Disabling T3 C-Bit Parity Mode

C-bit parity mode controls the type of framing that is present on the transmitted T3 signal. When C-bit parity mode is enabled, the C-bit positions are used for the FEBE, FEAC, terminal data link, path parity, and mode indicator bits, as defined in ANSI T1.107a-1989. When C-bit parity mode is disabled, the basic T3 framing mode (M13) is used.

By default, C-bit parity mode is enabled. To disable C-bit parity mode and use M13 framing for your T3 link, include the **no-cbit-parity** statement at the `[edit interfaces interface-name t3-options]` hierarchy level:

```
[edit interfaces interface-name t3-options]
no-cbit-parity;
```



**NOTE:** For ATM and ATM2 IQ2 interfaces, M23 framing is used when the **no-cbit-parity** statement is included. For all other interfaces, M13 framing is used when the **no-cbit-parity** statement is included.

To return to the default, enabling C-bit parity mode, delete the **no-cbit-parity** statement from the configuration:

```
[edit]
user@host# delete interfaces t3-fpc/pic/port t3-options no-cbit-parity
```

To explicitly enable C-bit parity mode, include the **cbit-parity** statement at the `[edit interfaces interface-name t3-options]` hierarchy level:

```
[edit interfaces interface-name t3-options]
cbit-parity;
```

## Configuring the T3 CSU Compatibility Mode

Subrating a T3 interface reduces the maximum allowable peak rate by limiting the HDLC-encapsulated payload. Subrate modes configure the PIC to connect with channel service units (CSUs) that use proprietary methods of multiplexing.

You can configure T3 interfaces to be compatible with a Digital Link, Kentrox, or Larscom CSUs. For T3 intelligent queuing (IQ) channels only, you can also configure Adtran or Verilink CSU compatibility.



**NOTE:** To subrate an E3 interface to be compatible with a Kentrox CSU, you must have an IQ or IQE based PIC. Non-IQ or IQE PICs allow a commit of the configuration, but the interfaces remain at the full E3 rate for the Kentrox compatibility mode.

To configure a T3 interface so that it is compatible with the CSU at the remote end of the line, include the `compatibility` statement at the `[edit interfaces interface-name t3-options]` hierarchy level:

```
[edit interfaces interface-name t3-options]
 compatibility-mode (adtran | digital-link | kentrox | larscom | verilink) <subrate value>;
```

The subrate of a T3 interface must exactly match that of the remote CSU. To specify the subrate, include the `subrate` statement in the configuration:

- For Adtran CSUs, specify the subrate as a number from 1 through 588 that exactly matches the value configured on the CSU. A subrate value of 588 corresponds to 44.2 Mbps, or 100 percent of the HDLC-encapsulated payload. A subrate value of 1 corresponds to  $44.2 / 588$ , which is 75.17 Kbps, or 0.17 percent of the HDLC-encapsulated payload.
- For Digital Link CSUs, specify the subrate as the data rate you configured on the CSU in the format `xKb` or `x.xMb`. For Digital Link CSUs, you can specify the subrate value to match the data rate configured on the CSU in the format `xkb` or `x.xMb`. You can configure the subrate values shown in Table 45 on page 499.
- For Kentrox CSUs, specify the subrate as a number from 1 through 69 that exactly matches the value configured on the CSU. A subrate value of 69 corresponds to 34.995097 Mbps, or 79.17 percent of the HDLC-encapsulated payload (44.2 Mbps). A subrate value of 1 corresponds to 999.958 Kbps, which is 2.26 percent of the HDLC-encapsulated payload. Each increment of the subrate value corresponds to a rate increment of about 0.5 Mbps.
- For Larscom CSUs, specify the subrate as a number from 1 through 14 that exactly matches the value configured on the CSU. A subrate value of 14 corresponds to 44.2 Mbps, or 100 percent of the HDLC-encapsulated payload. A subrate value of 1 corresponds to  $44.2 / 14$ , which is 3.16 Mbps, 7.15 percent of the HDLC-encapsulated payload.
- For Verilink CSUs, specify the subrate as a number from 1 through 28 that exactly matches the value configured on the CSU. To calculate the maximum allowable peak rate, multiply the configured subrate by 1.578 Mbps. For example, a subrate value of 28 corresponds to  $28 \times 1.578$  Mbps, which is 44.2 Mbps, 100 percent of the HDLC-encapsulated payload. A subrate value of 1 corresponds to 1.578 Mbps, 3.57 percent of the HDLC-encapsulated payload. A subrate value of 20

corresponds to 20 x 1.578 Mbps, which is 31.56 Mbps, 71.42 percent of the HDLC-encapsulated payload.

**Table 45: Subrate Values for T3 Digital Link Compatibility Mode**

|          |           |           |           |           |
|----------|-----------|-----------|-----------|-----------|
| 301 Kbps | 9.3 Mbps  | 18.3 Mbps | 27.4 Mbps | 36.4 Mbps |
| 601 Kbps | 9.6 Mbps  | 18.6 Mbps | 27.7 Mbps | 36.7 Mbps |
| 902 Kbps | 9.9 Mbps  | 18.9 Mbps | 28.0 Mbps | 37.0 Mbps |
| 1.2 Mbps | 10.2 Mbps | 19.2 Mbps | 28.3 Mbps | 37.3 Mbps |
| 1.5 Mbps | 10.5 Mbps | 19.5 Mbps | 28.6 Mbps | 37.6 Mbps |
| 1.8 Mbps | 10.8 Mbps | 19.8 Mbps | 28.9 Mbps | 37.9 Mbps |
| 2.1 Mbps | 11.1 Mbps | 20.1 Mbps | 29.2 Mbps | 38.2 Mbps |
| 2.4 Mbps | 11.4 Mbps | 20.5 Mbps | 29.5 Mbps | 38.5 Mbps |
| 2.7 Mbps | 11.7 Mbps | 20.8 Mbps | 29.8 Mbps | 38.8 Mbps |
| 3.0 Mbps | 12.0 Mbps | 21.1 Mbps | 30.1 Mbps | 39.1 Mbps |
| 3.3 Mbps | 12.3 Mbps | 21.4 Mbps | 30.4 Mbps | 39.4 Mbps |
| 3.6 Mbps | 12.6 Mbps | 21.7 Mbps | 30.7 Mbps | 39.7 Mbps |
| 3.9 Mbps | 12.9 Mbps | 22.0 Mbps | 31.0 Mbps | 40.0 Mbps |
| 4.2 Mbps | 13.2 Mbps | 22.3 Mbps | 31.3 Mbps | 40.3 Mbps |
| 4.5 Mbps | 13.5 Mbps | 22.6 Mbps | 31.6 Mbps | 40.6 Mbps |
| 4.8 Mbps | 13.8 Mbps | 22.9 Mbps | 31.9 Mbps | 40.9 Mbps |
| 5.1 Mbps | 14.1 Mbps | 23.2 Mbps | 32.2 Mbps | 41.2 Mbps |
| 5.4 Mbps | 14.4 Mbps | 23.5 Mbps | 32.5 Mbps | 41.5 Mbps |
| 5.7 Mbps | 14.7 Mbps | 23.8 Mbps | 32.8 Mbps | 41.8 Mbps |
| 6.0 Mbps | 15.0 Mbps | 24.1 Mbps | 33.1 Mbps | 42.1 Mbps |
| 6.3 Mbps | 15.3 Mbps | 24.4 Mbps | 33.4 Mbps | 42.4 Mbps |
| 6.6 Mbps | 15.6 Mbps | 24.7 Mbps | 33.7 Mbps | 42.7 Mbps |
| 6.9 Mbps | 15.9 Mbps | 25.0 Mbps | 34.0 Mbps | 43.0 Mbps |
| 7.2 Mbps | 16.2 Mbps | 25.3 Mbps | 34.3 Mbps | 43.3 Mbps |
| 7.5 Mbps | 16.5 Mbps | 25.6 Mbps | 34.6 Mbps | 43.6 Mbps |
| 7.8 Mbps | 16.8 Mbps | 25.9 Mbps | 34.9 Mbps | 43.9 Mbps |

**Table 45: Subrate Values for T3 Digital Link Compatibility Mode** (*continued*)

|          |           |           |           |           |
|----------|-----------|-----------|-----------|-----------|
| 8.1 Mbps | 17.1 Mbps | 26.2 Mbps | 35.2 Mbps | 44.2 Mbps |
| 8.4 Mbps | 17.4 Mbps | 26.5 Mbps | 35.5 Mbps |           |
| 8.7 Mbps | 17.7 Mbps | 26.8 Mbps | 35.8 Mbps |           |
| 9.0 Mbps | 18.0 Mbps | 27.1 Mbps | 36.1 Mbps |           |

For information about subrating an E3 interface, see “Configuring the E3 CSU Compatibility Mode” on page 479.

## Configuring the T3 Frame Checksum

By default, T3 interfaces use a 16-bit frame checksum. You can configure a 32-bit checksum, which provides more reliable packet verification. However, some older equipment might not support 32-bit checksums.

On a channelized OC12 interface, the **fcs** statement is not supported. To configure FCS on each DS3 channel, you must include the **t3-options fcs** statement in the configuration for each channel.

To configure a 32-bit checksum, include the **fcs** statement at the [edit interfaces *interface-name* t3-options] hierarchy level:

```
[edit interfaces interface-name t3-options]
fcs 32;
```

To return to the default 16-bit frame checksum, delete the **fcs 32** statement from the configuration:

```
[edit]
user@host# delete interfaces t3-fpc/pic/port t3-options fcs 32
```

To explicitly configure a 16-bit checksum, include the **fcs** statement at the [edit interfaces *interface-name* t3-options] hierarchy level:

```
[edit interfaces interface-name t3-options]
fcs 16;
```

## Configuring the T3 FEAC Response

The T3 far-end alarm and control (FEAC) signal is used to send alarm or status information from the far-end terminal back to the near-end terminal and to initiate T3 loopbacks at the far-end terminal from the near-end terminal.

By default, the routing platform does not respond to FEAC requests. To allow the remote CSU to place the local routing platform into loopback, you must configure the routing platform to respond to the CSU's FEAC request by including the

`feac-loop-respond` statement at the [edit interfaces *interface-name* t3-options] hierarchy level:

```
[edit interfaces interface-name t3-options]
feac-loop-respond;
```

If you configure remote or local loopback with the T3 `loopback` statement, the routing platform does not respond to FEAC requests from the CSU even if you include the `feac-loop-respond` statement in the configuration. For the routing platform to respond, you must delete the `loopback` statement from the configuration.

To explicitly configure the routing platform not to respond to FEAC requests, include the `no-feac-loop` statement at the [edit interfaces *interface-name* t3-options] hierarchy level:

```
[edit interfaces interface-name t3-options]
no-feac-loop-respond;
```

## Configuring the T3 Idle Cycle Flag

---

By default, a T3 interface transmits the value 0x7E in the idle cycles. To have the interface transmit the value 0xFF (all ones) instead, include the `idle-cycle-flag` statement at the [edit interfaces *interface-name* t3-options] hierarchy level, specifying the `ones` option:

```
[edit interfaces interface-name t3-options]
idle-cycle-flag ones;
```

To explicitly configure the default value of 0x7E, include the `idle-cycle-flag` statement with the `flags` option:

```
[edit interfaces interface-name t3-options]
idle-cycle-flag flags;
```

## Configuring the T3 Line Buildout

---

A T3 interface has two settings for the T3 line buildout: a short setting, which is less than 255 feet (about 68 meters), and a long setting, which is greater than 255 feet and less than 450 feet (about 137 meters). By default, the interface uses the short setting.

The `long-buildout` and `no-long-buildout` statements apply only to copper-cable-based T3 interfaces. You cannot configure a line buildout for a DS3 channel on a channelized OC12 interface, which runs over fiber-optic cable. If you configure this statement on a channelized OC12 interface, it is ignored.

To have the interface drive a line that is longer than 255 feet and shorter than 450 feet, include the `long-buildout` statement at the [edit interfaces *interface-name* t3-options] hierarchy level:

```
[edit interfaces interface-name t3-options]
long-buildout;
```

To explicitly configure the default short line buildout, include the **no-long-buildout** statement at the [edit interfaces *interface-name* t3-options] hierarchy level:

```
[edit interfaces interface-name t3-options]
no-long-buildout;
```

## Configuring the Channelized T3 Loop Timing

---

By default, internal clocking (line timing) is used on channelized IQ and IQE interfaces. To configure SONET/SDH or DS3-level external clocking, include the **loop-timing** statement:

```
loop-timing;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *ct3-fpc/pic/port* t3-options]
- [edit interfaces *stm1-fpc/pic/port* sonet-options]

To explicitly configure the default line timing, include the **no-loop-timing** statement in the configuration:

```
no-loop-timing;
```

The **loop-timing** and **no-loop-timing** statements apply only to E1 and T1 interfaces you configure on channelized IQ and IQE PICs. If you attempt to include these statements on any other interface type, they are ignored.

For all channelized IQ and IQE PICs, the **clocking** statement is supported on all channels. To configure clocking on individual interfaces, include the **clocking** statement at the [edit interfaces *type-fpc/pic/port:channel*] hierarchy level. If you do not include the **clocking** statement, the individual interfaces use internal clocking by default.

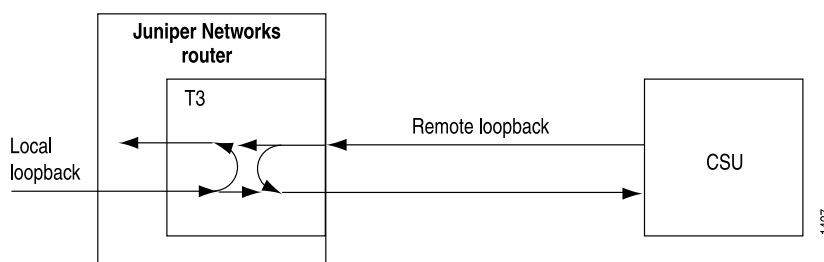
For more information, see “Configuring the Clock Source” on page 119 and “Clock Sources on Channelized Interfaces” on page 364.

## Configuring T3 Loopback Capability

---

You can configure loopback capability between the local T3 interface and the remote CSU, as shown in Figure 44 on page 503. You can configure the loopback to be local or remote. With local loopback, the T3 interface can transmit packets to the CSU, but receives its own transmission back again and ignores data from the CSU. With remote loopback, packets sent from the CSU are received by the T3 interface, forwarded if there is a valid route, and immediately retransmitted to the CSU.



**Figure 44: Remote and Local T3 Loopback**

To configure loopback capability on a T3 interface, include the **loopback** statement at the `[edit interfaces interface-name t3-options]` hierarchy level:

```
[edit interfaces interface-name t3-options]
 loopback (local | payload | remote);
```

Packets can be looped on either the local routing platform or the remote CSU. Local and remote loopback loop back both data and clocking information.

To exchange BERT patterns between a local routing platform and a remote routing platform, include the **loopback remote** statement in the interface configuration at the remote end of the link. From the local routing platform, you issue the **test interface** command.

For more information about configuring BERT, see “Interface Diagnostics” on page 125. For more information about using operational mode commands to test interfaces, see the *JUNOS System Basics and Services Command Reference*.

For channelized T3, T1, and NxDS0 IQ interfaces only, you can include the **loopback payload** statement in the configuration to loop back data only (without clocking information) on the remote routing platform’s PIC. In payload loopback, overhead is recalculated. For T3 IQ interfaces, you can include the **loopback payload** statement at the `[edit interfaces ct3-fpc/pic/port]` and `[edit interfaces t3-fpc/pic/port:channel]` hierarchy levels. For T1 interfaces, you can include the **loopback payload** statement in the configuration at the `[edit interfaces t1-fpc/pic/port:channel]` hierarchy level; it is ignored if included at the `[edit interfaces ct1-fpc/pic/port]` hierarchy level. For NxDS0 interfaces, payload and remote loopback are the same. If you configure one, the other is ignored. NxDS0 IQ interfaces do not support local loopback.

To determine whether a problem is internal or external, you can loop packets on both the local and the remote routing platform. To do this, include the **no-keepalives** and **encapsulation cisco-hdlc** statements at the `[edit interfaces interface-name]` hierarchy level and the **loopback local** statement at the `[edit interfaces interface-name t3-options]` hierarchy level, as shown in the following example:

```
[edit interfaces]
 t3-1/0/0 {
 no-keepalives;
 encapsulation cisco-hdlc;
 t3-options {
 loopback local;
 }
 }
 unit 0 {
```

```

 family inet {
 address 10.100.100.1/24;
 }
 }
}

```

With this configuration, the link stays up, so you can loop ping packets to a remote routing platform. The **loopback local** statement causes the interface to loop within the PIC just before the data reaches the transceiver.

To turn off the loopback capability, remove the **loopback** statement from the configuration:

```

[edit]
user@host# delete interfaces t3-fpc/pic/port t3-options loopback

```

You can determine whether there is an internal problem or an external problem by checking the error counters in the output of the **show interface *interface-name* extensive** command, for example:

```

user@host> show interfaces t3-fpc/pic/port extensive

```

For channel 0 on channelized interfaces only, you can include the **loopback** statement at the **[edit interfaces *interface-name* *interface-type-options*]** hierarchy level. The loopback setting configured for channel 0 applies to all channels on the channelized interface. The **loopback** statement is ignored if you include it at this hierarchy level in the configuration of other channels. To configure loopbacks on individual channels, you must include the ***channel-type-options* loopback** statement in the configuration for each channel. This allows each channel to be put in loopback mode independently.

For example, for DS3 channels on a channelized OC12 interface, the **sonet-options loopback** statement is supported only for channel 0; it is ignored if included in the configuration for channels 1 through 11. The SONET loopback configured for channel 0 applies to all 12 channels equally. To configure loopbacks on the individual DS3 channels, you must include the **t3-options loopback** statement in the configuration for each channel. This allows each DS3 channel can be put in loopback mode independently.

## Configuring T3 HDLC Payload Scrambling

---

T3 HDLC payload scrambling, which is disabled by default, provides better link stability. Both sides of a connection must either use or not use scrambling.

On a channelized OC12 interface, the SONET **payload-scrambler** statement is ignored. To configure scrambling on the DS3 channels on the interface, you can include the **t3-options payload-scrambler** statement at the **[edit interfaces *interface-name* t3-options]** hierarchy level for each DS3 channel.

If you enable HDLC payload scrambling on a T3 interface, you must also configure the interface to be compatible with the channel service unit (CSU) at the remote end of the line before you commit the interface configuration. For information about subrating a T3 interface, see “Configuring the T3 CSU Compatibility Mode” on page 498.

```
[edit interfaces interface-name t3-options]
compatibility-mode (adtran | digital-link | kentrox | larscom | verilink) <subrate value>;
payload-scrambler;
```

To explicitly disable HDLC payload scrambling, include the `no-payload-scrambler` statement at the `[edit interfaces interface-name t3-options]` hierarchy level:

```
[edit interfaces interface-name t3-options]
no-payload-scrambler;
```

To disable payload scrambling again (return to the default), delete the `payload-scrambler` statement from the configuration:

```
[edit]
user@host# delete interfaces t3-fpc/pic/port t3-options payload-scrambler
```

## Configuring T3 Start and End Flags

---

By default, a T3 interface shares the transmission of the start and end flags.

To configure a T3 interface to wait two idle cycles between the start and end flags, include the `start-end-flag` statement at the `[edit interfaces interface-name t3-options]` hierarchy level and specify the `filler` option:

```
[edit interfaces interface-name t3-options]
start-end-flag filler;
```

To revert to the default behavior, sharing the transmission of start and end flags, include the `start-end-flag` statement at the `[edit interfaces interface-name t3-options]` hierarchy level and specify the `shared` option:

```
[edit interfaces interface-name t3-options]
start-end-flag shared;
```

## Examples: Configuring T3 Interfaces

---

T3 interfaces can use PPP, Cisco HDLC, or Frame Relay encapsulation.

### PPP Encapsulation on a DS3 PIC

```
[edit]
interfaces {
 t3-fpc/pic/port {
 encapsulation ppp;
 t3-options {
 no-long-buildout;
 compatibility-mode larscom;
 payload-scrambler;
 }
 }
 unit 0 {
 family inet {
 address 10.0.0.1/32 {
 destination 10.0.0.2;
 }
 }
 family iso;
```

**Cisco HDLC  
Encapsulation on a DS3  
PIC**

```

 }
 }
}

[edit]
interfaces {
 t3-fpc/pic/port {
 encapsulation cisco-hdlc;
 t3-options {
 no-long-buildout;
 compatibility-mode larscom;
 payload-scrambler;
 }
 unit 0 {
 family inet {
 address 10.0.0.1/32 {
 destination 10.0.0.2;
 }
 }
 family iso;
 }
 }
}

```

Configure Frame Relay encapsulation on two platforms, where one platform is a DTE device and the other is a DCE device:

**On DTE Router**

```

[edit]
interfaces {
 t3-fpc/pic/port {
 encapsulation frame-relay;
 t3-options {
 no-long-buildout;
 compatibility-mode larscom;
 payload-scrambler;
 }
 }
 unit 1 {
 dlci 1;
 family inet {
 address 10.0.0.1/32 {
 destination 10.0.0.2;
 }
 }
 family iso;
 }
 unit 2 {
 dlci 2;
 family inet {
 address 10.0.0.3/32 {
 destination 10.0.0.4;
 }
 }
 family iso;
 }
}

```

```
}

```

**On DCE Router**

```
[edit]
interfaces {
 t3-fpc/pic/port {
 dce;
 encapsulation frame-relay;
 t3-options {
 no-long-buildout;
 compatibility-mode larscom;
 payload-scrambler;
 }
 unit 1 {
 dlci 1;
 family inet {
 address 10.0.0.2/32 {
 destination 10.0.0.1;
 }
 }
 family iso;
 }
 unit 2 {
 dlci 2;
 family inet {
 address 10.0.0.4/32 {
 destination 10.0.0.3;
 }
 }
 family iso;
 }
 }
}
```



## Part 9

# Configuring Ethernet Interfaces

- Configuring Ethernet Interfaces on page 511
- Configuring 802.1Q VLANs on page 525
- Configuring Aggregated Ethernet Interfaces on page 535
- Stacking and Rewriting Gigabit Ethernet IQ VLAN Tags on page 547
- Configuring Layer 2 Bridging Interfaces on page 567
- Configuring TCC and Layer 2.5 Switching on page 569
- Configuring Static ARP Table Entries on page 573
- Configuring Unrestricted Proxy ARP on page 575
- Configuring MAC Address Validation on Static Ethernet Interfaces on page 579
- Enabling Passive Monitoring on Ethernet Interfaces on page 581
- Configuring IEEE 802.1ag OAM Connectivity-Fault Management on page 583
- Configuring IEEE 802.1x Port-Based Network Access Control on page 591
- Configuring IEEE 802.3ah OAM Link-Fault Management on page 595
- Configuring VRRP and VRRP for IPv6 on page 603
- Specifying the IP Demux Underlying Interface Family Type on page 605
- Configuring Gigabit Ethernet Accounting and Policing on page 607
- Configuring Gigabit Ethernet Autonegotiation on page 619
- Configuring the Management Ethernet Interface on page 627
- Configuring the 10-Gigabit Ethernet DWDM Interface Wavelength on page 631
- Configuring 10-Gigabit Ethernet Framing on page 633
- Configuring 10-Gigabit Ethernet Notification of Link Down Alarm on page 635
- Configuring Point-to-Point Protocol over Ethernet on page 637
- Example Ethernet Configurations on page 651





## Chapter 30

# Configuring Ethernet Interfaces

You can configure the following properties specific to aggregated Ethernet, Fast Ethernet, Tri-Rate Ethernet copper, Gigabit Ethernet, and 10-Gigabit Ethernet interfaces:

- Overview of Ethernet Interfaces on page 511
- Configuring Ethernet Physical Interface Properties on page 512
- Configuring J-series Services Router Switching Interfaces on page 515
- MX-series Router Interface Identifiers on page 517
- Enabling Ethernet MAC Address Filtering on page 517
- Configuring Ethernet Loopback Capability on page 519
- Configuring Flow Control on page 520
- Ignoring Layer 3 Incomplete Errors on page 520
- Configuring the Link Characteristics on page 520
- Configuring Gratuitous ARP on page 521
- Adjusting the ARP Aging Timer on page 522
- Configuring the Interface Speed on page 522
- Configuring the Ingress Rate Limit on page 523

## Overview of Ethernet Interfaces

---

Ethernet was developed in the early 1970s at the Xerox Palo Alto Research Center (PARC) as a data-link control layer protocol for interconnecting computers. It was first widely used at 10 megabits per second (Mbps) over coaxial cables and later over unshielded twisted pairs using 10Base-T. More recently, 100Base-TX (Fast Ethernet, 100 Mbps), Gigabit Ethernet (1 gigabit per second [Gbps]), and 10-Gigabit Ethernet (10 Gbps) have become available.

Juniper Networks routing platforms support the following types of Ethernet interfaces:

- Fast Ethernet
- Tri-Rate Ethernet copper
- Gigabit Ethernet
- Gigabit Ethernet intelligent queuing (IQ)
- Gigabit Ethernet IQ2

- 10-Gigabit Ethernet IQ2
- 10-Gigabit Ethernet
- 10-Gigabit Ethernet dense wavelength-division multiplexing (DWDM)
- Management Ethernet interface, which is an out-of-band management interface within the routing platform
- Internal Ethernet interface, which connects the Routing Engine to the packet forwarding components
- Aggregated Ethernet interface, a logical linkage of Fast Ethernet, Gigabit Ethernet, or 10-Gigabit Ethernet physical connections

## Configuring Ethernet Physical Interface Properties

---

To configure Fast Ethernet-specific physical interface properties, include the `fastether-options` statement at the `[edit interfaces fe-fpc/pic/port]` hierarchy level:

```
[edit interfaces fe-fpc/pic/port]
link-mode (full-duplex | half-duplex);
speed (10m | 100m);
vlan-tagging;
fastether-options {
 802.3ad aex (primary | backup);
 (flow-control | no-flow-control);
 ignore-l3-incompletes;
 ingress-rate-limit rate;
 (loopback | no-loopback);
 source-address-filter {
 mac-address;
 }
 (source-filtering | no-source-filtering);
}
```



**NOTE:** The `speed` statement applies to the management Ethernet interface (`fxp0`), the Fast Ethernet 12-port and 48-port Physical Interface Card (PIC) interfaces, the J-series Gigabit Ethernet uPIM interfaces and the MX-series Tri-Rate Ethernet copper interfaces. The Fast Ethernet and `fxp0` interfaces can be configured for 10 Mbps or 100 Mbps (`10m` | `100m`). The J-series Gigabit Ethernet uPIM interfaces and the MX-series Tri-Rate Ethernet copper interfaces can be configured for 10 Mbps, 100 Mbps, or 1 Gbps (`10m` | `100m` | `1g`). The 4-port and 8-port Fast Ethernet PICs support a speed of 100 Mbps only.

To configure physical interface properties specific to Gigabit Ethernet and 10-Gigabit Ethernet, include the `gigether-options` statement at the `[edit interfaces ge-fpc/pic/port]` or `[edit interfaces xe-fpc/pic/port]` hierarchy level:

```
[edit interfaces ge-fpc/pic/port]
gigether-options {
 802.3ad aex (primary | backup);
```

```

auto-negotiation | no-auto-negotiation) remote-fault <local-interface-online |
 local-interface-offline>
(flow-control | no-flow-control);
ignore-l3-incompletes;
(loopback | no-loopback);
source-address-filter {
 mac-address;
}
(source-filtering | no-source-filtering);
}

```

Additionally, for 10-Gigabit Ethernet DWDM-specific physical interface properties, include the `optics-options` statement at the `[edit interfaces ge-fpc/pic/port]` hierarchy level:

```

[edit interfaces ge-fpc/pic/port]
optics-options {
 wavelength nm;
}

```

To configure Gigabit Ethernet IQ-specific physical interface properties, include the `gigether-options` statement at the `[edit interfaces ge-fpc/pic/port]` hierarchy level. These statements are supported on 10-Gigabit Ethernet IQ2 PIC. Some of these statements are also supported on Gigabit Ethernet PICs with small form-factor pluggable transceivers (SFPs) (except the 10-port Gigabit Ethernet PIC and the built-in Gigabit Ethernet port on the M7i platform). For more information, see “Example: Configuring Gigabit Ethernet Interfaces” on page 651.

```

[edit interfaces ge-fpc/pic/port]
flexible-vlan-tagging;
gigether-options {
 802.3ad aex (primary | backup);
 auto-negotiation | no-auto-negotiation) remote-fault <local-interface-online |
 local-interface-offline>
(flow-control | no-flow-control);
ignore-l3-incompletes;
(loopback | no-loopback);
(source-filtering | no-source-filtering);
ethernet-switch-profile {
 (mac-learn-enable | no-mac-learn-enable);
 tag-protocol-id [tpids];
 ethernet-policer-profile {
 input-priority-map {
 ieee802.1p premium [values];
 }
 output-priority-map {
 classifier {
 premium {
 forwarding-class class-name {
 loss-priority (high | low);
 }
 }
 }
 }
 }
 policer cos-policer-name {

```

```

 aggregate {
 bandwidth-limit bps;
 burst-size-limit bytes;
 }
 premium {
 bandwidth-limit bps;
 burst-size-limit bytes;
 }
 }
}
}
native-vlan-id number;
}

```

To configure 10-Gigabit Ethernet IQ2-specific physical interface properties, include the `lan-phy` or `wan-phy` statement at the `[edit interfaces xe-fpc/pic/port framing]` hierarchy level. For more information, see “Configuring 10-Gigabit Ethernet Framing” on page 633.

```

[edit interfaces]
xe-0/0/0 {
 framing {
 (lan-phy | wan-phy);
 }
}

```

To configure OAM 802.3ah support for Ethernet interfaces, include the `oam` statement at the `[edit protocols]` hierarchy level.

```

oam {
 ethernet {
 link-fault-management {
 interfaces {
 interface-name {
 pdu-interval interval;
 link-discovery (active | passive);
 pdu-threshold count;
 }
 }
 }
 }
}

```

To configure Gigabit Ethernet IQ-specific logical interface properties, include the `input-vlan-map`, `output-vlan-map`, and `layer2-policer` statements:

```

input-vlan-map {
 (pop | pop-pop | pop-swap | push | push-push | swap | swap-push | swap-swap);
 inner-tag-protocol-id tpid;
 inner-vlan-id number;
 tag-protocol-id tpid;
 vlan-id number;
}
output-vlan-map {
 (pop | pop-pop | pop-swap | push | push-push | swap | swap-push | swap-swap);
}

```

```

 inner-tag-protocol-id tpid;
 inner-vlan-id number;
 tag-protocol-id tpid;
 vlan-id number;
}
layer2-policer {
 input-policer policer-name;
 input-three-color policer-name;
 output-policer policer-name;
 output-three-color policer-name;
}
vlan-tags inner tpid.vlan-id outer tpid.vlan-id;

```

You can include these statements at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

To configure aggregated Ethernet-specific physical interface properties, include the `aggregated-ether-options` statement at the [edit interfaces *aex*] hierarchy level:

```

[edit interfaces aex]
aggregated-ether-options {
 ethernet-switch-profile {
 tag-protocol-id tpid;
 }
 (flow-control | no-flow-control);
 lacp mode {
 periodic interval;
 }
 link-protection;
 link-speed speed;
 (loopback | no-loopback);
 minimum-links number;
 source-address-filter {
 mac-address;
 }
 (source-filtering | no-source-filtering);
}

```

## Configuring J-series Services Router Switching Interfaces

The J-series services routers with multiport Gigabit Ethernet uPIMs can support Ethernet access switching. This functionality provides the ability to switch traffic at Layer 2 in addition to routing traffic at Layer 3.

J-series services routers with multiport Gigabit Ethernet uPIMs can be deployed in branch offices as an access or desktop switch with integrated routing capability. The multiport Gigabit Ethernet uPIM provides Ethernet switching, while the Routing Engine provides routing functionality.

Routed traffic is forwarded from any port of the multiport Gigabit Ethernet uPIM to the WAN interface. Switched traffic is forwarded from one port of the multiport Gigabit Ethernet uPIM to another port on the same the multiport Gigabit Ethernet uPIM. Switched traffic is not forwarded from a port on one multiport Gigabit Ethernet uPIM to a port on a different multiport Gigabit Ethernet uPIM. For more information about configuring the multiport Gigabit Ethernet uPIM switching mode, see the *JUNOS System Basics Configuration Guide*.

In access switching mode, only one physical interface is configured for the entire multiport Gigabit Ethernet uPIM. The single physical interface serves as a Virtual Router Interface (VRI). Configuration of the physical port characteristics is done under the single physical interface.

To configure multiport Gigabit Ethernet uPIM Ethernet port properties, include the `switch-port` statement at the `[edit interfaces ge-pim/0/0]` hierarchy level:

```
[edit interfaces ge-pim/0/0]
switch-options {
 switch-port port-number {
 (auto-negotiation | no-auto-negotiation);
 speed 1g;
 link-mode (full-duplex | half-duplex);
 }
}
```

Access switching mode is supported on the 6-port, 8-port, and 16-port Gigabit Ethernet uPIMs.

The multiport Gigabit Ethernet uPIMs are supported on the J2320, J2350, J4350, and J6350 Services Routers.

The 6-port and 8-port multiport Gigabit Ethernet uPIM occupies a single slot and can be installed in any slot. Because the 16-port Gigabit Ethernet uPIM is two slots high, you cannot install a 16-port uPIM in the top slots (slots 1 and 4). Ports are numbered 0 through 5 on the 6-port Gigabit Ethernet uPIM, 0 through 7 on the 8-port Gigabit Ethernet uPIM, and 0 through 15 on the 16-port Gigabit Ethernet uPIM.

### **Example: Configuring J-series Services Router Switching Interfaces**

Configure a single physical interface for the uPIM and set the port parameters for port 0 and port 1:

```
[edit interfaces]
ge-2/0/0 {
 switch-options {
 switch-port 0 {
 no-auto-negotiation;
 speed 1g;
 link-mode full-duplex;
 }
 switch-port 1 {
 no-auto-negotiation;
 speed 10m;
 link-mode half-duplex;
 }
 }
}
```

```

 }
 }
}

```

## MX-series Router Interface Identifiers

The MX-series routers use the convention *ge-fpc/pic/port* to identify interfaces.

The FPC slot number is the slot number of the Dense Port Concentrator (DPC). If two Switch Control Boards (SCBs) are installed in an MX960 router, the FPC range is from 0 through 11. If three SCBs are installed, the range is from 0 through 5 and from 7 through 11. On the MX480 router, the range is 0 through 6. On the MX240 router, the range is 0 through 2 with one SCB installed. With two SCBs installed, the DPC can be installed in any of two consecutive interface card slots.

The PIC number is identified on the DPC front panel. Use the PIC number that corresponds to the port you are configuring. PICs are numbered from 0 through 3.

Use the port number identified on the DPC front panel that corresponds to the port you are configuring. Ports are numbered from 0 through 9 for Gigabit Ethernet and Tri-Rate Ethernet copper interfaces. Port numbers are always 0 for 10-Gigabit Ethernet interfaces.



**NOTE:** In certain displays, the MX-series routers identify the Packet Forwarding Engine (PFE) rather than the PIC number. PFE 0 corresponds to PIC 0, PFE 1 corresponds to PIC 2, PFE 2 corresponds to PIC 1, and PFE 3 corresponds to PIC 3.

## Enabling Ethernet MAC Address Filtering

By default, source address filtering is disabled. On aggregated Ethernet interfaces, Fast Ethernet, Gigabit Ethernet, Gigabit Ethernet IQ, and Gigabit Ethernet PICs with SFPs (except the 10-port Gigabit Ethernet PIC and the built-in Gigabit Ethernet port on the M7i platform), you can enable source address filtering, which blocks all incoming packets to an interface.



**NOTE:** Source address filtering is not supported on J-series Services Routers.

To enable the filtering, include the **source-filtering** statement:

```
source-filtering;
```

To explicitly disable filtering, include the **no-source-filtering** statement:

```
no-source-filtering;
```

You can include these statements at the following hierarchy levels:

- [edit interfaces *interface-name* aggregated-ether-options]

- [edit interfaces *interface-name* fastether-options]
- [edit interfaces *interface-name* gigether-options]



**NOTE:** When you integrate a standalone T640 routing node into a routing matrix, the PIC media access control (MAC) addresses for the integrated T640 routing node are derived from a pool of MAC addresses maintained by the TX Matrix platform. For each MAC address you specify in the configuration of a formerly standalone T640 routing node, you must specify the same MAC address in the configuration of the TX Matrix platform.

## Filtering Specific MAC Addresses

When source address filtering is enabled, you can configure the interface to receive packets from specific MAC addresses. To do this, specify the MAC addresses in the `source-address-filter` statement:

```
source-address-filter {
 mac-address;
 <additional-mac-address>;
}
```

You can include these statements at the following hierarchy levels:

- [edit interfaces *interface-name* aggregated-ether-options]
- [edit interfaces *interface-name* fastether-options]
- [edit interfaces *interface-name* gigether-options]

You can specify the MAC address as `nn:nn:nn:nn:nn:nn` or `nnnn .nnnn.nnnn`, where `n` is a hexadecimal number. You can configure up to 64 source addresses. To specify more than one address, include the `source-address-filter` statement multiple times.



**NOTE:** The `source-address-filter` statement is not supported on Gigabit Ethernet IQ and Gigabit Ethernet PICs with SFPs (except the 10-port Gigabit Ethernet PIC and the built-in Gigabit Ethernet port on the M7i platform); instead, include the `accept-source-mac` statement. For more information, see “Configuring MAC Address Filtering” on page 613.

If the remote Ethernet card is changed, the interface cannot receive packets from the new card because it has a different MAC address.

Source address filtering does not work when Link Aggregation Control Protocol (LACP) is enabled. For more information about LACP, see “Configuring Aggregated Ethernet LACP” on page 539.





**NOTE:** On untagged Gigabit Ethernet interfaces, you should not configure the `source-address-filter` statement at the [edit interfaces *ge-fpc/pic/port* *gigether-options*] hierarchy level and the `accept-source-mac` statement at the [edit interfaces *ge-fpc/pic/port* *gigether-options* unit *logical-unit-number*] hierarchy level simultaneously. If these statements are configured for the same interfaces at the same time, an error message is displayed.

On tagged Gigabit Ethernet interfaces, you should not configure the `source-address-filter` statement at the [edit interfaces [edit interfaces *ge-fpc/pic/port* *gigether-options*] hierarchy level and the `accept-source-mac` statement at the [edit interfaces *ge-fpc/pic/port* *gigether-options* unit *logical-unit-number*] hierarchy level with an identical MAC address specified in both filters. If these statements are configured for the same interfaces with an identical MAC address specified, an error message is displayed.

## Configuring Ethernet Loopback Capability

By default, local aggregated Ethernet, Fast Ethernet, Tri-Rate Ethernet copper, Gigabit Ethernet, and 10-Gigabit Ethernet interfaces connect to a remote system. To place an interface in loopback mode, include the `loopback` statement:

```
loopback;
```



**NOTE:** If you configure a local loopback on a 1-port 10-Gigabit IQ2 PIC using the `loopback` statement at the [edit interfaces *interface-name* *gigether-options*] hierarchy level, the transmit-path stops working, causing the remote end to detect a link down.

To return to the default—that is, to disable loopback mode—delete the `loopback` statement from the configuration:

```
[edit]
user@host# delete interfaces fe-fpc/pic/port fastether-options loopback
```

To explicitly disable loopback mode, include the `no-loopback` statement:

```
no-loopback;
```

You can include the `loopback` and `no-loopback` statements at the following hierarchy levels:

- [edit interfaces *interface-name* *aggregated-ether-options*]
- [edit interfaces *interface-name* *fastether-options*]
- [edit interfaces *interface-name* *gigether-options*]

## Configuring Flow Control

---

By default, the routing platform imposes flow control to regulate the amount of traffic sent out on a Fast Ethernet, Tri-Rate Ethernet copper, Gigabit Ethernet, and 10-Gigabit Ethernet interface. Flow control is not supported on the 4-port Fast Ethernet PIC. This is useful if the remote side of the connection is a Fast Ethernet or Gigabit Ethernet switch.

You can disable flow control if you want the routing platform to permit unrestricted traffic. To disable flow control, include the **no-flow-control** statement:

```
no-flow-control;
```

To explicitly reinstate flow control, include the **flow-control** statement:

```
flow-control;
```

You can include these statements at the following hierarchy levels:

- [edit interfaces *interface-name* aggregated-ether-options]
- [edit interfaces *interface-name* fastether-options]
- [edit interfaces *interface-name* gigether-options]

## Ignoring Layer 3 Incomplete Errors

---

By default, Fast Ethernet, Gigabit Ethernet, and 10-Gigabit Ethernet interfaces count Layer 3 incomplete errors. You can configure the interface to ignore Layer 3 incomplete errors.

To ignore Layer 3 incomplete errors, include the **ignore-l3-incompletes** statement:

```
ignore-l3-incompletes;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* fastether-options]
- [edit interfaces *interface-name* gigether-options]

## Configuring the Link Characteristics

---

*Full-duplex* communication means that both ends of the communication can send and receive signals at the same time. *Half-duplex* is also bidirectional communication, but signals can flow in only one direction at a time.

By default, the routing platform's management Ethernet interface, **fxp0**, autonegotiates whether to operate in full-duplex or half-duplex mode. J-series Gigabit Ethernet interfaces and Fast Ethernet interfaces, except the J-series ePIM Fast Ethernet interfaces, can operate in either full-duplex or half-duplex mode, and all other interfaces can operate only in full-duplex mode. For Gigabit Ethernet and 10-Gigabit Ethernet, the link partner must also be set to full duplex.



**NOTE:** When you configure the Tri-Rate Ethernet copper interface to operate at 1 Gbps, autonegotiation must be enabled.



**NOTE:** On a J-series ePIM Fast Ethernet interface, if you specify half-duplex (or if full-duplex mode is not autonegotiated), the following message is written to the system log: "Half-duplex mode not supported on this PIC, forcing full-duplex mode."



**NOTE:** When you manually configure Fast Ethernet interfaces on the M-series and T-series routers, link mode and speed must both be configured. If both these values are not configured, the router uses autonegotiation for the link and ignores the user-configured settings.

To explicitly configure an Ethernet interface to operate in either full-duplex or half-duplex mode, include the `link-mode` statement at the `[edit interfaces interface-name]` hierarchy level:

```
[edit interfaces interface-name]
link-mode (full-duplex | half-duplex);
```

## Configuring Gratuitous ARP

Gratuitous Address Resolution Protocol (ARP) requests provide duplicate IP address detection. A gratuitous ARP request is a broadcast request for a routing platform's own IP address. If a routing platform sends an ARP request for its own IP address and no ARP replies are received, the routing platform's assigned IP address is not being used by other nodes. If a routing platform sends an ARP request for its own IP address and an ARP reply is received, the routing platform's assigned IP address is already being used by another node.

By default, the routing platform responds to gratuitous ARP requests. On Ethernet interfaces, you can disable responses to gratuitous ARP requests. To disable responses to gratuitous ARP requests, include the `no-gratuitous-arp-request` statement at the `[edit interfaces interface-name]` hierarchy level:

```
[edit interfaces interface-name]
no-gratuitous-arp-request;
```

To return to the default—that is, to respond to gratuitous ARP requests—delete the `no-gratuitous-arp-request` statement from the configuration:

```
[edit]
user@host# delete interfaces interface-name no-gratuitous-arp-request
```

Gratuitous ARP replies are reply packets sent to the broadcast MAC address with the target IP address set to be the same as the sender's IP address. When the routing platform receives a gratuitous ARP reply, the routing platform can insert an entry for that reply in the ARP cache.

By default, updating the ARP cache on gratuitous ARP replies is disabled on the routing platform. On Ethernet interfaces, you can enable handling of gratuitous ARP replies on a specific interface by including the `gratuitous-arp-reply` statement at the `[edit interfaces interface-name]` hierarchy level:

```
[edit interfaces interface-name]
gratuitous-arp-reply;
```

To restore the default behavior, include the `no-gratuitous-arp-reply` statement at the `[edit interfaces interface-name]` hierarchy level:

```
[edit interfaces interface-name]
no-gratuitous-arp-reply;
```

## Adjusting the ARP Aging Timer

---

By default, the ARP aging timer is set at 20 minutes. In most network environments, this default value does not cause a problem. However, in environments with many directly attached hosts, such as metro Ethernet, the number of ARP entries to update can be high. In such environments, you might want to increase the amount of time between ARP updates by configuring the ARP aging timer.

To configure the ARP aging timer, include the `aging-timer` statement at the `[edit system arp]` hierarchy level:

```
[edit system arp]
aging-timer minutes;
```

The aging timer range is from 20 through 240 minutes. The timer value you configure takes effect as ARP entries expire. In other words, each subsequent refreshed ARP entry receives the new timer value. The new timer value does not apply to ARP entries that exist at the time you commit the configuration.

For more information about statements you can configure at the `[edit system]` hierarchy level, see the *JUNOS System Basics Configuration Guide*.

## Configuring the Interface Speed

---

For M-series and T-series Fast Ethernet 12-port and 48-port PIC interfaces, the management Ethernet interface (`fxp0`), the J-series Gigabit Ethernet uPIM interfaces, and the MX-series Tri-Rate Ethernet copper interfaces, you can explicitly set the interface speed. The Fast Ethernet and `fxp0` interfaces can be configured for 10 Mbps or 100 Mbps (`10m` | `100m`). The J-series Gigabit Ethernet uPIM interfaces and the MX-series Tri-Rate Ethernet copper interfaces can be configured for 10 Mbps, 100 Mbps, or 1 Gbps (`10m` | `100m` | `1g`).



**NOTE:** When you configure the Tri-Rate Ethernet copper interface to operate at 1 Gbps, autonegotiation must be enabled.

---

To explicitly configure the speed, include the **speed** statement at the [edit interfaces *interface-name*] hierarchy level:

```
[edit interfaces interface-name]
speed (10m | 100m | 1g);
```

## Configuring the Ingress Rate Limit

---

On Fast Ethernet 8-port, 12-port, and 48-port PIC interfaces only, you can apply port-based rate limiting to the ingress traffic that arrives at the PIC.

To configure an ingress rate limit on a Fast Ethernet 8-port, 12-port, or 48-port PIC interface, include the **ingress-rate-limit** statement at the [edit interfaces *interface-name* **fastether-options**] hierarchy level:

```
[edit interfaces interface-name fastether-options]
ingress-rate-limit rate;
```

*rate* can range in value from 1 through 100 Mbps.



## Chapter 31

# Configuring 802.1Q VLANs

For examples of 802.1Q VLAN configuration, see the following sections:

- Overview of 802.1Q VLANs on page 525
- Enabling VLAN Tagging on page 525
- Configuring a Logical Interface for Trunk Mode on page 528
- Configuring the VLAN ID List for a Trunk Interface on page 529
- Configuring a Logical Interface for Access Mode on page 529
- Binding a VLAN ID to a Logical Interface on page 530
- Configuring VLAN Encapsulation on page 532
- Configuring Extended VLAN Encapsulation on page 533

### Overview of 802.1Q VLANs

---

For Ethernet, Fast Ethernet, Tri-Rate Ethernet copper, Gigabit Ethernet, 10-Gigabit Ethernet, and aggregated Ethernet interfaces supporting VPLS, the JUNOS software supports a subset of the IEEE 802.1Q standard for channelizing an Ethernet interface into multiple logical interfaces, allowing many hosts to be connected to the same Gigabit Ethernet switch, but preventing them from being in the same routing or bridging domain.

### Enabling VLAN Tagging

---

The JUNOS software supports receiving and forwarding routed or bridged Ethernet frames with 802.1Q VLAN tags, and running Virtual Router Redundancy Protocol (VRRP) over 802.1Q-tagged interfaces.

You can configure the routing platform to receive and forward single-tag frames, dual-tag frames, or a mixture of single-tag and dual-tag frames. For more information, see the following sections:

- Configuring Single-Tag or Dual-Tag Framing on page 526
- Configuring Mixed Tagging on page 526
- Configuring Mixed Tagging Support for Untagged Packets on page 527
- Example: Configuring Mixed Tagging on page 527
- Example: Configuring Mixed Tagging to Support Untagged Packets on page 528



**NOTE:** If you configure VLAN tagging on Gigabit Ethernet IQ and IQ2 interfaces on M320, M120, and T-series routing platforms, the JUNOS software creates an internal logical interface that reserves 50 Kbps of bandwidth from Gigabit Ethernet IQ interfaces and 2 Mbps of bandwidth from Gigabit Ethernet IQ2 interfaces. As a result, the effective available bandwidth for these interface types is now 999.5 Mbps and 998 Mbps, respectively.

## Configuring Single-Tag or Dual-Tag Framing

To configure the routing platform to receive and forward single-tag frames with 802.1Q VLAN tags, include the `vlan-tagging` statement at the `[edit interfaces interface-name]` hierarchy level:

```
[edit interfaces interface-name]
vlan-tagging;
```

## Configuring Mixed Tagging

Mixed tagging is supported for Gigabit Ethernet interfaces on Gigabit Ethernet IQ2 and IQ or IQE PICs on M-series and T-series routing platforms, for all MX-series router Gigabit and 10-Gigabit Ethernet interfaces, and for aggregated Ethernet interfaces with member links in IQ2 PICs or in MX-series DPCs. Mixed tagging lets you configure two logical interfaces on the same Ethernet port, one with single-tag framing and one with dual-tag framing.



**NOTE:** Mixed tagging is not supported on Fast Ethernet interfaces or on J-series Services Routers.

To configure mixed tagging, include the `flexible-vlan-tagging` statement at the `[edit interfaces ge-fpc/pic/port ]` hierarchy level. You must also include the `vlan-tags` statement with `inner` and `outer` options or the `vlan-id` statement at the `[edit interfaces ge-fpc/pic/port unit logical-unit-number]` hierarchy level:

```
[edit interfaces ge-fpc/pic/port]
flexible-vlan-tagging;
unit logical-unit-number {
 vlan-id number;
 family family {
 address address;
 }
}
unit logical-unit-number {
 vlan-tags inner tpid.vlan-id outer tpid.vlan-id;
 family family {
 address address;
 }
}
```





**NOTE:** When you configure the physical interface MTU for mixed tagging, you must increase the MTU to 4 bytes more than the MTU value you would configure for a standard VLAN-tagged interface.

For example, if the MTU value is configured to be 1018 on a VLAN-tagged interface, then the MTU value on a flexible VLAN tagged interface must be 1022—4 bytes more. The additional 4 bytes accommodates the future addition of a stacked VLAN tag configuration on the same physical interface.

If the same physical interface MTU value is configured on both the VLAN and flexible VLAN-tag routers, the L2 circuit configuration does not come up and a MTU mismatch is logged. However, normal traffic flow is unaffected.

### Configuring Mixed Tagging Support for Untagged Packets

For 1-, 4-, and 8-port Gigabit Ethernet IQ2 PICs, for 1-port 10-Gigabit Ethernet IQ2 PICs, for all MX-series router Gigabit Ethernet, Tri-Rate Ethernet copper, and 10-Gigabit Ethernet interfaces configured for 802.1Q flexible VLAN tagging, and for aggregated Ethernet interfaces on IQ2 PICs or MX-series DPCs, you can configure mixed tagging support for untagged packets on a port. Untagged packets are accepted on the same mixed VLAN-tagged port. To accept untagged packets, include the `native-vlan-id` statement and the `flexible-vlan-tagging` statement at the `[edit interfaces interface-name]` hierarchy level:

```
[edit interfaces ge-fpc/pic/port]
flexible-vlan-tagging;
native-vlan-id number;
```

The logical interface on which untagged packets are to be received must be configured with the same native VLAN ID as that configured on the physical interface. To configure the logical interface, include the `vlan-id` statement (matching the `native-vlan-id` statement on the physical interface) at the `[edit interface interface-name unit logical-unit-number]` hierarchy level.

### Example: Configuring Mixed Tagging

The following example configures mixed tagging. Dual-tag and single-tag logical interfaces are under the same physical interface:

```
[edit interfaces ge-3/0/1]
flexible-vlan-tagging;
unit 0 {
 vlan-id 232;
 family inet {
 address 10.66.1.2/30;
 }
}
unit 1 {
 vlan-tags outer 0x8100.222 inner 0x8100.221;
 family inet {
 address 10.66.1.2/30;
 }
}
```

```
}
}
```

For information about binding VLAN IDs to a logical interface using the `vlan-id` statement, see “Binding a VLAN ID to a Logical Interface” on page 530. For information about configuring dual VLAN tags using the `vlan-tag` statement, see “Stacking a VLAN Tag” on page 554.

### Example: Configuring Mixed Tagging to Support Untagged Packets

The following example configures untagged packets to be mapped to logical unit number 0:

```
[edit interfaces ge-0/2/0]
flexible-vlan-tagging;
native-vlan-id 232;
unit 0 {
 vlan-id 232;
 family inet {
 address 10.66.1.2/30;
 }
}
unit 1 {
 vlan-tags outer 0x8100.222 inner 0x8100.221;
 family inet {
 address 10.66.1.2/30;
 }
}
```

## Configuring a Logical Interface for Trunk Mode

As an alternative to configuring a logical interface for each VLAN, enterprise network administrators can configure a single logical interface to accept untagged packets or packets tagged with any VLAN ID specified in a list of VLAN IDs. Using a VLAN ID list conserves switch resources and simplifies configuration. A logical interface configured to accept packets tagged with any VLAN ID specified in a list is called a *trunk interface* or *trunk port*. Trunk interface configuration is supported on MX-series routers only. Trunk interfaces support integrated routing and bridging (IRB).

To configure a logical interface to accept any packet tagged with a VLAN ID that matches the list of VLAN IDs, include the `interface-mode` statement and specify the `trunk` option:

```
interface-mode trunk;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* family bridge]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family bridge]

## Configuring the VLAN ID List for a Trunk Interface

---

To configure the list of VLAN IDs to be accepted by the trunk port, include the `vlan-id-list` statement and specify the list of VLAN IDs. You can specify individual VLAN IDs with a space separating the ID numbers, specify a range of VLAN IDs with a dash separating the ID numbers, or specify a combination of individual VLAN IDs and a range of VLAN IDs.

```
vlan-id-list [number number-number];
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* family bridge interface-mode trunk]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family bridge interface-mode trunk]

When a packet is received that is tagged with a VLAN ID specified in the trunk interface list of VLAN IDs, the packet is accepted and forwarded within the bridge domain that is configured with the matching VLAN ID.

When a packet is received that is tagged with a VLAN ID not specified in the trunk interface list of VLAN IDs, the native VLAN ID is pushed in front of the existing VLAN tag or tags and the packet is forwarded within the bridge domain that is configured with the matching VLAN ID.

When a untagged packet is received on a trunk interface, the native VLAN ID is added to the packet and the packet is forwarded within the bridge domain that is configured with the matching VLAN ID.

A bridge domain configured with a matching VLAN ID must be configured before the trunk interface is configured. To learn more about configuring bridge domains, see the *JUNOS Routing Protocols Configuration Guide*.

## Configuring a Logical Interface for Access Mode

---

Enterprise network administrators can configure a single logical interface to accept untagged packets and forward the packets within a specified bridge domain. A logical interface configured to accept untagged packets is called an *access interface* or *access port*. Access interface configuration is supported on MX-series routers only.

```
interface-mode access;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* family bridge]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family bridge]

When an untagged or tagged packet is received on an access interface, the packet is accepted, the VLAN ID is added to the packet, and the packet is forwarded within the bridge domain that is configured with the matching VLAN ID.

### Example: Configuring a Logical Interface for Access Mode

The following example configures a logical interface as an access port with a VLAN ID of 20:

```
[edit interfaces ge-1/2/0]
unit 1 {
 family bridge {
 interface-mode access;
 vlan-id 20;
 }
}
```

### Binding a VLAN ID to a Logical Interface

---

Ethernet interfaces can be partitioned; you can assign up to 4095 different logical interfaces, one for each VLAN.

VLAN ID 0 is reserved for tagging the priority of frames. To bind a VLAN ID to a logical interface, include the `vlan-id` or `vlan-id-range` statement:

```
vlan-id number;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]



**NOTE:** For Gigabit Ethernet IQ and Gigabit Ethernet PICs with SFPs (except the built-in Gigabit Ethernet port on the M7i platform), VLAN IDs on a single interface can differ from each other.

Because Intermediate System-to-Intermediate System (IS-IS) has an 8-bit limit for broadcast multiaccess media, you cannot set up more than 255 adjacencies over Gigabit Ethernet using VLAN tagging. For more information, see the *JUNOS Routing Protocols Configuration Guide*.

---

VLAN IDs 1 through 511 are reserved for normal VLANs. VLAN IDs 512 and above are reserved for VLAN circuit cross-connect (CCCs).

For Gigabit Ethernet IQ interfaces and Gigabit Ethernet PICs with SFPs (except the 10-port Gigabit Ethernet PIC and the built-in Gigabit Ethernet port on the M7i platform), you can configure flexible Ethernet services encapsulation on the physical interface. With flexible Ethernet services encapsulation, VLAN IDs from 1 through 511 are no longer reserved for normal VLANs.

Table 46 on page 531 lists VLAN ID range by interface type.

**Table 46: VLAN ID Range by Interface Type**

| Interface Type                              | VLAN ID Range  |
|---------------------------------------------|----------------|
| Aggregated Ethernet for Fast Ethernet       | 1 through 1023 |
| Aggregate Ethernet for Gigabit Ethernet     | 1 through 4094 |
| 4-port, 8-port, and 12-port Fast Ethernet   | 1 through 1023 |
| 48-port Fast Ethernet                       | 1 through 4094 |
| Tri-Rate Ethernet copper                    | 1 through 4094 |
| Gigabit Ethernet                            | 1 through 4094 |
| Gigabit Ethernet IQ                         | 1 through 4094 |
| 10-Gigabit Ethernet                         | 1 through 4094 |
| Management and internal Ethernet interfaces | 1 through 1023 |

### Binding a VLAN ID Range to a Logical Interface

The `vlan-id-range` statement allows a range of VLAN IDs to be bound to a single logical port. A VLAN range can be used by service providers to interconnect multiple VLANs belonging to a particular customer over multiple sites. Using a VLAN ID range conserves switch resources and simplifies configuration.

To configure mixed tagging, include the `vlan-id-range` statement at the `[edit interfaces ge-fpc/pic/port]` hierarchy level:

```
[edit interfaces ge-fpc/pic/port]
unit logical-unit-number{
 encapsulation vlan-bridge;
 vlan-id-range number-number;
}
```

### Example: Binding a VLAN ID Range to a Logical Interface

The following example configures two different ranges of VLAN IDs on two different logical ports:

```
[edit interfaces]
ge-3/0/0 {
 flexible-vlan-tagging;
 unit 0 {
 encapsulation vlan-bridge;
 vlan-id-range 500-600;
 }
}
ge-3/0/1 {
 flexible-vlan-tagging;
```

```

 unit 0 {
 encapsulation vlan-bridge;
 vlan-id-range 200-300;
 }
 }

```

## Configuring VLAN Encapsulation

---

Gigabit Ethernet IQ, Gigabit Ethernet PICs with small form-factor pluggable optics (SFPs), and MX-series router Gigabit Ethernet, Tri-Rate Ethernet copper, and 10-Gigabit Ethernet interfaces with VLAN tagging enabled can use flexible Ethernet services, VLAN CCC, or VLAN virtual private LAN service (VPLS) encapsulation.

Aggregated Ethernet interfaces configured for VPLS can use Ethernet VPLS or VLAN VPLS.

To configure the encapsulation on a Gigabit Ethernet IQ or Gigabit Ethernet physical interface, include the `encapsulation` statement at the `[edit interfaces interface-name]` hierarchy level, specifying `flexible-ethernet-services`, `vlan-ccc`, or `vlan-vpls`:

```

[edit interfaces interface-name]
encapsulation (flexible-ethernet-services | vlan-ccc | vlan-vpls);

```

To configure the encapsulation on an aggregated Ethernet interface, include the `encapsulation` statement at the `[edit interfaces interface-name]` hierarchy level, specifying `ethernet-vpls` or `vlan-vpls`:

```

[edit interfaces interface-name]
encapsulation (ethernet-vpls | vlan-vpls);

```

Ethernet interfaces in VLAN mode can have multiple logical interfaces. In CCC and VPLS modes, VLAN IDs from 1 through 511 are reserved for normal VLANs, and VLAN IDs 512 through 4094 are reserved for CCC or VPLS VLANs. For 4-port Fast Ethernet interfaces, you can use VLAN IDs 512 through 1024 for CCC or VPLS VLANs.

For encapsulation type `flexible-ethernet-services`, all VLAN IDs are valid.

In general, you configure an interface's encapsulation at the `[edit interfaces interface-name]` hierarchy level. However, for some encapsulation types, including flexible Ethernet services, Ethernet VLAN CCC and VLAN VPLS, you can also configure the encapsulation type that is used inside the VLAN circuit itself. To do this, include the `encapsulation` statement:

```

encapsulation (vlan-ccc | vlan-tcc | vlan-vpls);

```

You can include this statement at the following hierarchy levels:

- `[edit interfaces interface-name unit logical-unit-number]`
- `[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number]`

You cannot configure a logical interface with VLAN CCC or VLAN VPLS encapsulation unless you also configure the physical device with the same encapsulation or with

flexible Ethernet services encapsulation. In general, the logical interface must have a VLAN ID of 512 or higher; if the VLAN ID is 511 or lower, it will be subject to the normal destination filter lookups in addition to source address filtering. However if you configure flexible Ethernet services encapsulation, this VLAN ID restriction is removed.

### **Example: Configuring VLAN Encapsulation on a Gigabit Ethernet Interface**

Configure VLAN CCC encapsulation on a Gigabit Ethernet interface:

```
interfaces ge-2/1/0 {
 vlan-tagging;
 encapsulation vlan-ccc;
 unit 0 {
 encapsulation vlan-ccc;
 vlan-id 600;
 }
}
```

### **Example: Configuring VLAN Encapsulation on an Aggregated Ethernet Interface**

Configure VLAN CCC encapsulation on an aggregated Gigabit Ethernet interface:

```
interfaces ae0 {
 vlan-tagging;
 encapsulation vlan-vpls;
 unit 0 {
 vlan-id 100;
 }
}
```

## **Configuring Extended VLAN Encapsulation**

Gigabit Ethernet, 4-port Fast Ethernet, MX-series router Gigabit Ethernet, Tri-Rate Ethernet copper, 10-Gigabit Ethernet, and aggregated Ethernet interfaces with VLAN tagging enabled can use extended VLAN CCC or VLAN VPLS, which allow 802.1Q tagging. To configure the encapsulation on a physical interface, include the `encapsulation` statement at the `[edit interfaces interface-name]` hierarchy level, specifying `extended-vlan-ccc` or `extended-vlan-vpls`:

```
[edit interfaces interface-name]
encapsulation (extended-vlan-ccc | extended-vlan-vpls);
```

For extended VLAN CCC and extended VLAN VPLS encapsulation, all VLAN IDs 1 and higher are valid. VLAN ID 0 is reserved for tagging the priority of frames.



**NOTE:** For extended VLAN CCC, the VLAN IDs on ingress and egress interfaces must be the same. For back-to-back connections, all VLAN IDs must be the same.

**Example: Configuring Extended VLAN Encapsulation on a Gigabit Ethernet Interface**

Configure extended VLAN CCC encapsulation on Gigabit Ethernet ingress and egress interfaces:

```

interfaces ge-0/0/0 {
 vlan-tagging;
 encapsulation extended-vlan-ccc;
 unit 0 {
 vlan-id 2;
 family ccc;
 }
}
interfaces ge-1/0/0 {
 vlan-tagging;
 encapsulation extended-vlan-ccc;
 unit 0 {
 vlan-id 2;
 family ccc;
 }
}

```

**Example: Configuring Extended VLAN Encapsulation on an Aggregated Ethernet Interface**

Configure extended VLAN VPLS encapsulation on an aggregated Ethernet interface:

```

interfaces ae0 {
 vlan-tagging;
 encapsulation extended-vlan-vpls;
 unit 0 {
 vlan-id 100;
 }
}

```



## Chapter 32

# Configuring Aggregated Ethernet Interfaces

This chapter contains the following sections:

- Overview of Aggregated Ethernet Interfaces on page 535
- Configuring Aggregated Ethernet Interfaces on page 535
- Configuring Ethernet Link Aggregation on page 537
- Configuring Aggregated Ethernet Link Protection on page 537
- Setting the Number of Aggregated Ethernet Interfaces on the Chassis on page 538
- Configuring Aggregated Ethernet LACP on page 539
- Configuring Tagged Aggregated Ethernet Interfaces on page 544
- Configuring Untagged Aggregated Ethernet Interfaces on page 544
- Configuring Aggregated Ethernet Link Speed on page 546
- Configuring Aggregated Ethernet Minimum Links on page 546

## Overview of Aggregated Ethernet Interfaces

---

Link aggregation of Ethernet interfaces is defined in the IEEE 802.3ad standard. The JUNOS implementation of 802.3ad balances traffic across the member links within an aggregated Ethernet bundle based on the Layer 3 information carried in the packet. This implementation uses the same load-balancing algorithm used for per-packet load balancing. For information about per-packet load balancing, see the *JUNOS Routing Protocols Configuration Guide*.



**NOTE:** For information about configuring circuit cross-connects over aggregated Ethernet, see “Examples: Configuring Switching Cross-Connects” on page 213.

---

## Configuring Aggregated Ethernet Interfaces

---

You configure an aggregated Ethernet virtual link by specifying the link number as a physical device and then associating a set of ports that have the same speed and are in full-duplex mode. The physical interfaces can be Fast Ethernet, Tri-Rate Ethernet copper, Gigabit Ethernet, Gigabit Ethernet IQ, 10-Gigabit Ethernet IQ, Gigabit Ethernet IQ2, or 10-Gigabit Ethernet IQ2 interfaces. Generally, you cannot use a

combination of these interfaces within the same aggregated link; however, you can combine Gigabit Ethernet and Gigabit Ethernet IQ interfaces in a single aggregated Ethernet bundle.

The following routing platforms support a maximum of 16 physical interfaces per single aggregated Ethernet bundle:

- M120
- M320
- MX960
- MX480
- MX240
- All T-series routing platforms

All other routing platforms support a maximum of 8 physical interfaces per aggregated Ethernet bundle.

Aggregated Ethernet interfaces can use interfaces from different FPCs, DPCs, or PICs.

Simple filters are not supported for interfaces in aggregated Ethernet bundles:

- in M-series routing platforms, simple filters are supported in Gigabit Ethernet Enhanced Intelligent Queuing interfaces only, except when the interface is part of an aggregated Ethernet bundle.
- in MX-series routing platforms, simple filters are supported in Enhanced Queuing Dense Port Concentrator (EQ DPC) interfaces only, except when the interface is part of an aggregated Ethernet bundle.

On the aggregated bundle, no IQ-specific capabilities such as MAC accounting, VLAN rewrites, and VLAN queuing are available. For more information about IQ-specific capabilities, see “Configuring Gigabit Ethernet Accounting and Policing” on page 607.

Aggregated Ethernet interfaces can be either tagged or untagged, with LACP enabled or disabled. Aggregated Ethernet interfaces on Ethernet IQ2 PICs In MX-series routing platforms support the configuration of **flexible-vlan-tagging**, **native-vlan-id**, and rewrite operations on dual-tagged frames, which consist of the following configuration statements:

- `inner-tag-protocol-id`
- `inner-vlan-id`
- `pop-pop`
- `pop-swap`
- `push-push`
- `swap-push`
- `swap-swap`

In all cases, you must set the number of aggregated Ethernet interfaces on the chassis. You can also set the link speed and the minimum links in a bundle.

## Configuring Ethernet Link Aggregation

On Fast Ethernet, Tri-Rate Ethernet copper, Gigabit Ethernet, and 10-Gigabit Ethernet interfaces on M-series and T-series routing platforms, you can associate a physical interface with an aggregated Ethernet interface. To enable the aggregated link, include the `802.3ad` statement at the `[edit interfaces interface-name fastether-options]` or `[edit interfaces interface-name gigether-options]` hierarchy level:

```
[edit interfaces interface-name (fastether-options | gigether-options)]
802.3ad aex;
```

You specify the interface instance number *x* to complete the link association; *x* can be from 0 through 127, for a total of 128 aggregated interfaces. You must also include a statement defining *aex* at the `[edit interfaces]` hierarchy level. You can optionally specify other physical properties that apply specifically to the aggregated Ethernet interfaces; for details, see “Configuring Ethernet Interfaces” on page 511, and for a sample configuration, see “Example: Configuring Aggregated Ethernet Interfaces” on page 652.



**NOTE:** In general, aggregated Ethernet bundles support the features available on all supported interfaces that can become a member link within the bundle. As an exception, Gigabit Ethernet IQ features and some newer Gigabit Ethernet features are not supported in aggregated Ethernet bundles.

Gigabit Ethernet IQ and SFP interfaces can be member links, but IQ- and SFP-specific features are not supported on the aggregated Ethernet bundle even if all the member links individually support those features.

To delete an aggregated Ethernet interface from the configuration, issue the `delete interfaces aex` command at the `[edit]` hierarchy level in configuration mode:

```
[edit]
user@host# delete interfaces aex
```

If you delete an aggregated Ethernet interface from the configuration, the JUNOS software removes the configuration statements related to *aex* and sets this interface to down state. However, the aggregated Ethernet interface is not deleted until you delete the chassis `aggregated-devices ethernet device-count` configuration statement.

## Configuring Aggregated Ethernet Link Protection

To support JUNOS QoS features, aggregated Ethernet interfaces support link protection. On aggregated Ethernet interfaces, you designate a primary and backup link. Egress traffic passes only through the designated primary link. This includes transit traffic and locally generated traffic on the router. When the primary link fails, traffic is routed through the backup link. Because some traffic loss is unavoidable, egress traffic is not automatically routed back to the primary link when the primary

link is reestablished. Instead, you manually control when traffic should be diverted back to the primary link from the designated backup link by issuing the **request interface revert aex** operational command.

To enable link protection on aggregated Ethernet interfaces, include the **link-protection** statement at the **[edit interfaces aex aggregated-ether-options]** hierarchy level:

```
[edit interfaces]
aex {
 aggregated-ether-options {
 link-protection;
 }
}
```

You also must specify a primary and a secondary, or backup, link. To configure a primary and a backup link, include the primary and backup statement at the **[edit interfaces ge-fpc/pic/port gigether-options 802.3ad aex]** hierarchy level or the **[edit interfaces fe-fpc/pic/port fastether-options 802.3ad aex]** hierarchy level:

```
[edit interfaces]
interface-name {
 (gigether-options | fastether-options) {
 802.3ad aex (primary | backup);
 }
}
```

To revert back to sending traffic to the primary designated link when traffic is passing through the designated backup link, issue the **request interface revert aex** operational command:

```
user@host# request interface revert aex
```

To disable link protection, delete the **link-protection** statement from the configuration by issuing the **delete link-protection** configuration command in operational mode:

```
[edit]
user@host# delete link-protection
```

For a sample configuration, see “Example: Configuring Aggregated Ethernet Link Protection” on page 653.

## Setting the Number of Aggregated Ethernet Interfaces on the Chassis

By default, no aggregated Ethernet interfaces are created. You must define the number of aggregated Ethernet interfaces by including the **device-count** statement at the **[edit chassis aggregated-devices ethernet]** hierarchy level:

```
[edit chassis]
aggregated-devices {
 ethernet {
 device-count number;
 }
}
```

The maximum number of aggregated devices you can configure is 128. The aggregated interfaces are numbered from `ae0` through `ae127`. For information about configuring aggregated devices, see the *JUNOS System Basics Configuration Guide*.

You must also specify the constituent physical links by including the `802.3ad` statement at the `[edit interfaces interface-name fastether-options]` or `[edit interfaces interface-name gigether-options]` hierarchy level; for more information, see “Configuring Ethernet Link Aggregation” on page 537. For a sample configuration, see “Example: Configuring Aggregated Ethernet Interfaces” on page 652.

## Configuring Aggregated Ethernet LACP

For aggregated Ethernet interfaces, you can configure the Link Aggregation Control Protocol (LACP). LACP is one method of bundling several physical interfaces to form one logical interface. You can configure both VLAN-tagged and untagged aggregated Ethernet with or without LACP enabled.

LACP exchanges are made between actors and partners. An actor is the local interface in an LACP exchange. A partner is the remote interface in an LACP exchange.

LACP is defined in IEEE 802.3ad, *Aggregation of Multiple Link Segments*.

LACP was designed to achieve the following:

- Automatic addition and deletion of individual links to the aggregate bundle without user intervention
- Link monitoring to check whether both ends of the bundle are connected to the correct group

The JUNOS implementation of LACP provides link monitoring but not automatic addition and deletion of links.

The LACP mode can be active or passive. If the actor and partner are both in passive mode, they do not exchange LACP packets, which results in the aggregated Ethernet links not coming up. If either the actor or partner is active, they do exchange LACP packets. By default, LACP is in passive mode on aggregated Ethernet interfaces. To initiate transmission of LACP packets and response to LACP packets, you must enable LACP active mode.

To enable LACP active mode, include the `lACP` statement at the `[edit interfaces interface-name aggregated-ether-options]` hierarchy level, and specify the `active` option:

```
[edit interfaces interface-name aggregated-ether-options]
lACP {
 active;
}
```

To restore the default behavior, include the `lACP` statement at the `[edit interfaces interface-name aggregated-ether-options]` hierarchy level, and specify the `passive` option:

```
[edit interfaces interface-name aggregated-ether-options]
lACP {
 passive;
```

```
}
```

For more information, see the following sections:

- Configuring the LACP Interval on page 540
- Configuring LACP Link Protection on page 540
- Tracing LACP Operations on page 542
- Example: Configuring Aggregated Ethernet LACP on page 543

## Configuring the LACP Interval

By default, the actor and partner send LACP packets every second. You can configure the interval at which the interfaces send LACP packets by including the **periodic** statement at the `[edit interfaces interface-name aggregated-ether-options lacp]` hierarchy level:

```
[edit interfaces interface-name aggregated-ether-options lacp]
 periodic interval;
```

The interval can be fast (every second) or slow (every 30 seconds). You can configure different periodic rates on active and passive interfaces. When you configure the active and passive interfaces at different rates, the transmitter honors the receiver's rate.



**NOTE:** Source address filtering does not work when LACP is enabled. For more information about source address filtering, see “Enabling Ethernet MAC Address Filtering” on page 517.

Percentage policers are not supported on aggregated Ethernet interfaces with the CCC protocol family configured. For more information about percentage policers, see the *JUNOS Policy Framework Configuration Guide*.

Generally, LACP is supported on all untagged aggregated Ethernet interfaces. For more information, see “Configuring Untagged Aggregated Ethernet Interfaces” on page 544.

For M-series routers with enhanced Flexible PIC Concentrators (FPCs) and T-series routing platforms, LACP over VLAN-tagged aggregated Ethernet interfaces is supported. For 8-port, 12-port, and 48-port Fast Ethernet PICs, LACP over VLAN-tagged interfaces is not supported.

---

## Configuring LACP Link Protection



**NOTE:** When using LACP link protection, you can configure only two member links to an aggregated Ethernet interface: one active and one standby.

---

To force active and standby links within an aggregated Ethernet, you can configure LACP link protection and system priority at the aggregated Ethernet interface level using the **link-protection** and **system-priority** statements. Configuring values at this level results in only the configured interfaces using the defined configuration. LACP interface configuration also enables you to override global (chassis) LACP settings.

LACP link protection also uses port priority. You can configure port priority at the Ethernet interface [**gigether-options**] hierarchy level using the **port-priority** statement. If you choose not to configure port priority, LACP link protection uses the default value for port priority (127).



**NOTE:** LACP link protection supports per-unit scheduling configuration on aggregated Ethernet interfaces.

---

### Enabling LACP Link Protection

To enable LACP link protection for an aggregated Ethernet interfaces, use the **link-protection** statement at the [**edit interfaces aeX aggregated-ether-options lacp**] hierarchy level:

```
[edit interfaces aeX aggregated-ether-options lacp]
link-protection;
 disable;
 revertive;
 non-revertive;
}
```

By default, LACP link protection reverts to a higher-priority (lower-numbered) link when that higher-priority link becomes operational or a link is added to the aggregator that is determined to be higher in priority. However, you can suppress link calculation by adding the **non-revertive** statement to the LACP link protection configuration. In nonrevertive mode, once a link is active and collecting and distributing packets, the subsequent addition of a higher-priority (better) link does not result in a switch and the current link remains active.

If LACP link protection is configured to be nonrevertive at the global ([**edit chassis**] hierarchy) level, you can add the **revertive** statement to the LACP link protection configuration to override the nonrevertive setting for the interface. In revertive mode, the addition of a higher-priority link to the aggregator results in LACP performing a priority recalculation and switching from the current active link to the new active link.



**CAUTION:** If both ends of an aggregator have LACP link protection enabled, make sure to configure both ends of the aggregator to use the same mode. Mismatching LACP link protection modes can result in lost traffic.

---

## Configuring LACP System Priority

To configure LACP system priority for aggregated Ethernet interfaces on the interface, use the `system-priority` statement at the [edit interfaces aeX aggregated-ether-options lacp] hierarchy level:

```
[edit interfaces aeX aggregated-ether-options lacp]
system-priority;
```

The system priority is a 2-octet binary value that is part of the LACP system ID. The LACP system ID consists of the system priority as the two most-significant octets and the interface MAC address as the six least-significant octets. The system with the numerically lower value for system priority has the higher priority. By default, system priority is 127, with a range of 0 to 65,535.

## Configuring LACP Port Priority

To configure LACP port priority for aggregated Ethernet interfaces, use the `port-priority` statement at the [edit interfaces *interface-name* gigether-options 802.3ad aeX lacp] or [edit interfaces *interface-name* fastether-options 802.3ad aeX lacp] hierarchy levels:

```
[edit interfaces interface-name gigether-options 802.3ad aeX lacp]
port-priority priority;
```

The port priority is a 2-octet field that is part of the LACP port ID. The LACP port ID consists of the port priority as the two most-significant octets and the port number as the two least-significant octets. The system with the numerically lower value for port priority has the higher priority. By default, port priority is 127, with a range of 0 to 65,535.

Port aggregation selection is made by each system based on the highest port priority and are assigned by the system with the highest priority. Ports are selected and assigned starting with the highest priority port of the highest priority system and working down in priority from there.

## Tracing LACP Operations

To trace the operations of the LACP process, include the `traceoptions` statement at the [edit protocols lacp] hierarchy level:

```
[edit protocols lacp traceoptions]
file filename <files number> <size size> <(world-readable | no-world-readable)>;
flag flag <disable>;
```

You can specify the following flags in the `protocols lacp traceoptions` statement:



- all—All LACP tracing operations
- configuration—Configuration code
- packet—Packets sent and received
- process—LACP process events
- protocol—LACP protocol state machine
- routing-socket—Routing socket events
- startup—Process startup events

For general information about tracing, see the tracing and logging information in the *JUNOS System Basics Configuration Guide*.

### Example: Configuring Aggregated Ethernet LACP

Configure aggregated Ethernet LACP over a VLAN-tagged interface:

#### LACP with VLAN-Tagged Aggregated Ethernet

```
[edit interfaces]
fe-5/0/1 {
 fastether-options {
 802.3ad ae0;
 }
}
ae0 {
 aggregated-ether-options {
 lacp {
 active;
 }
 }
 vlan-tagging;
 unit 0 {
 vlan-id 100;
 family inet {
 address 10.1.1.2/24 {
 vrrp-group 0 {
 virtual-address 10.1.1.4;
 priority 200;
 }
 }
 }
 }
}
```

Configure aggregated Ethernet LACP over an untagged interface:

#### LACP with Untagged Aggregated Ethernet

```
[edit interfaces]
fe-5/0/1 {
 fastether-options {
 802.3ad ae0;
 }
}
```

```

 }
 ae0 {
 aggregated-ether-options {
 lacp {
 active;
 }
 }
 unit 0 {
 family inet {
 address 10.1.1.2/24 {
 vrrp-group 0 {
 virtual-address 10.1.1.4;
 priority 200;
 }
 }
 }
 }
 }
}

```

## Configuring Tagged Aggregated Ethernet Interfaces

---

To specify aggregated Ethernet interfaces, include the `vlan-tagging` statement at the [edit interfaces aeX] hierarchy level:

```
[edit interfaces aex]
vlan-tagging;
```

You must also include the `vlan-id` statement:

```
vlan-id number;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

For more information about the `vlan-tagging` and `vlan-id` statements, see “Configuring 802.1Q VLANs” on page 525.

## Configuring Untagged Aggregated Ethernet Interfaces

---

When you configure an untagged Aggregated Ethernet interface, the existing rules for untagged interfaces apply. These rules are as follows:

- You can configure only one logical interface (unit 0) on the port. The logical unit 0 is used to send and receive LACP or marker protocol data units (PDUs) to and from the individual links.
- You cannot include the `vlan-id` statement in the configuration of the logical interface.

Table 47 on page 545 lists untagged aggregated Ethernet and LACP support by PIC and platform.

**Table 47: Untagged Aggregated Ethernet and LACP Support by PIC and Platform**

| PIC Type                              | M-series         | LACP | T-series | LACP |
|---------------------------------------|------------------|------|----------|------|
| 4-port Fast Ethernet PIC Type 1       | Yes              | Yes  | Yes      | Yes  |
| 1-port Gigabit Ethernet PIC Type 1    | Yes              | Yes  | Yes      | Yes  |
| 2-port Gigabit Ethernet PIC Type 2    | Yes              | Yes  | Yes      | Yes  |
| 4-port Gigabit Ethernet PIC Type 2    | Yes              | Yes  | Yes      | Yes  |
| 1-port 10-Gigabit Ethernet M160       | Yes              | Yes  | NA       | NA   |
| 10-port Gigabit Ethernet PIC Type 3   | Yes (M120, M320) | Yes  | Yes      | Yes  |
| 1-port 10-Gigabit Ethernet PIC Type 3 | N/A              | NA   | Yes      | Yes  |
| 8-port Gigabit Ethernet PIC Type 3    | Yes              | Yes  | Yes      | Yes  |

The 8-port Fast Ethernet PIC does not support untagged aggregated Ethernet or LACP.

Syslog messages are logged if you try to configure an untagged aggregated Ethernet interface using an unsupported PIC type.

For more information about configuring LACP, see “Configuring Aggregated Ethernet LACP” on page 539.

### **Example: Configuring Untagged Aggregated Ethernet Interfaces**

Configure an untagged aggregated Ethernet interface by omitting the `vlan-tagging` and `vlan-id` statements from the configuration:

```
[edit interfaces]
fe-5/0/1 {
 fastether-options {
 802.3ad ae0;
 }
}
ae0 {
 unit 0 {
 family inet {
 address 13.1.1.2/24 {
 vrrp-group 0 {
 virtual-address 13.1.1.4;
 priority 200;
 }
 }
 }
 }
}
```

```

 }
 }
}

```

## Configuring Aggregated Ethernet Link Speed

---

On aggregated Ethernet interfaces, you can set the required link speed for all interfaces included in the bundle. All interfaces that make up a bundle must be the same speed. If you include in the aggregated Ethernet interface an individual link that has a speed different from the speed you specify in the `link-speed` parameter, an error message will be logged. To set the required link speed, include the `link-speed` statement at the `[edit interfaces interface-name aggregated-ether-options]` hierarchy level:

```

[edit interfaces interface-name aggregated-ether-options]
link-speed speed ;

```

*speed* can be in bits per second either as a complete decimal number or as a decimal number followed by the abbreviation **k** (1000), **m** (1,000,000), or **g** (1,000,000,000).

Aggregated Ethernet interfaces on the M120 routing platform can have one of the following speed values:

- 100m—Links are 100 Mbps.
- 10g—Links are 10 Gbps.
- 1g—Links are 1 Gbps.
- OC192—Links are OC192 or STM64c.

## Configuring Aggregated Ethernet Minimum Links

---

On aggregated Ethernet interfaces, you can configure the minimum number of links that must be up for the bundle as a whole to be labeled up. By default, only one link must be up for the bundle to be labeled up.

To configure the minimum number of links, include the `minimum-links` statement at the `[edit interfaces interface-name aggregated-ether-options]` hierarchy level:

```

[edit interfaces interface-name aggregated-ether-options]
minimum-links number;

```

The number can be from one through eight. The maximum number of links supported in an aggregate is eight or for Ethernet or SONET interfaces on a MX-series, M320, M120, T-series or TX matrix routing platforms, from 1 through 16.

If the number of links configured in an aggregated Ethernet interface is less than the minimum link value configured under the `aggregated-ether-options` statement, the configuration commit fails and an error message is displayed.

## Chapter 33

# Stacking and Rewriting Gigabit Ethernet IQ VLAN Tags

This section discusses the following topics:

- Overview of Stacking and Rewriting Gigabit Ethernet IQ VLAN Tags on page 547
- Stacking and Rewriting Gigabit Ethernet IQ VLAN Tags on page 548
- Configuring Frames with Particular TPIDs to Be Processed as Tagged Frames on page 550
- Configuring Stacked VLAN Tagging on page 551
- Configuring Dual VLAN Tags on page 551
- Configuring Inner and Outer TPIDs and VLAN IDs on page 551
- Stacking a VLAN Tag on page 554
- Removing a VLAN Tag on page 555
- Removing the Outer and Inner VLAN Tags on page 555
- Removing the Outer VLAN Tag and Rewriting the Inner VLAN Tag on page 556
- Stacking Two VLAN Tags on page 557
- Rewriting the VLAN Tag on page 557
- Rewriting a VLAN Tag and Adding a New Tag on page 558
- Rewriting the Inner and Outer VLAN Tags on page 559
- Examples: Stacking and Rewriting Gigabit Ethernet IQ VLAN Tags on page 559

## Overview of Stacking and Rewriting Gigabit Ethernet IQ VLAN Tags

---

On Gigabit Ethernet, Gigabit Ethernet IQ, Gigabit Ethernet IQ2, 10-Gigabit Ethernet IQ2 interfaces, and MX-series router Gigabit Ethernet, Tri-Rate Ethernet copper, and 10-Gigabit Ethernet interfaces with the VLAN encapsulation type configured to support Layer 2 tunneling protocols such as CCC or VPLS (as described in “Configuring 802.1Q VLANs” on page 525), you can stack and rewrite VLAN tags. Stacking and rewriting VLAN tags allows you to use an additional (outer) VLAN tag to differentiate between customer edge (CE) routing platforms that share one VLAN ID. A frame can be received on an interface, or it can be internal to the system (as a result of the `input-vlan-map` statement).



**NOTE:** On IQ2 interfaces and MX-series interfaces, when a VLAN tag is pushed, the inner VLAN IEEE 802.1p bits are copied to the IEEE bits of the VLAN or VLANs being pushed. If the original packet is untagged, the IEEE bits of the VLAN or VLANs being pushed are set to 0.

## Stacking and Rewriting Gigabit Ethernet IQ VLAN Tags

You can configure rewrite operations to stack (**push**), remove (**pop**), or rewrite (**swap**) tags on single-tagged frames and dual-tagged frames. If a port is not tagged, rewrite operations are not supported on any logical interface on that port.

You can configure the following VLAN rewrite operations:

- **pop**—Remove a VLAN tag from the top of the VLAN tag stack. The outer VLAN tag of the frame is removed.
- **pop-pop**—For Ethernet IQ2 interfaces, remove both the outer and inner VLAN tags of the frame.
- **pop-swap**—For Ethernet IQ2 interfaces, remove the outer VLAN tag of the frame, and replace the inner VLAN tag of the frame with a user-specified VLAN tag value. The inner tag becomes the outer tag in the final frame.
- **push**—Add a new VLAN tag to the top of the VLAN stack. An outer VLAN tag is pushed in front of the existing VLAN tag.
- **push-push**—For Ethernet IQ2 interfaces, push two VLAN tags in front of the frame.
- **swap-push**—For Ethernet IQ2 interfaces, replace the outer VLAN tag of the frame with a user-specified VLAN tag value. A user-specified outer VLAN tag is pushed in front. The outer tag becomes an inner tag in the final frame.
- **swap-swap**—For Ethernet IQ2 interfaces, replace both the inner and the outer VLAN tags of the incoming frame with a user-specified VLAN tag value.

You configure VLAN rewrite operations for logical interfaces in the input VLAN map for incoming frames and in the output VLAN map for outgoing frames. To configure the input VLAN map, include the **input-vlan map** statement. To configure the output VLAN map, include the **output-vlan-map** statement. Configure both statements at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

The type of VLAN rewrite operation permitted depends upon whether the frame is single-tagged or dual-tagged. Table 48 on page 549 shows supported rewrite operations and whether they can be applied to single-tagged frames or dual-tagged frames. The table also indicates the number of tags being added or removed during the operation.

**Table 48: Rewrite Operations on Not Tagged, Single-Tagged, and Dual-Tagged Frames**

| Rewrite Operation | Not Tagged | Single-Tagged | Dual-Tagged | Number of Tags |
|-------------------|------------|---------------|-------------|----------------|
| <b>pop</b>        | No         | Yes           | Yes         | – 1            |
| <b>push</b>       | Sometimes  | Yes           | Yes         | + 1            |
| <b>swap</b>       | No         | Yes           | Yes         | 0              |
| <b>push-push</b>  | Sometimes  | Yes           | Yes         | + 2            |
| <b>swap-push</b>  | No         | Yes           | Yes         | + 1            |
| <b>swap-swap</b>  | No         | No            | Yes         | 0              |
| <b>pop-pop</b>    | No         | No            | Yes         | – 2            |
| <b>pop-swap</b>   | No         | No            | Yes         | – 1            |

The rewrite operations **push** and **push-push** can be valid in certain circumstances on frames that are not tagged. For example, a single-tagged logical interface (interface 1) and a dual-tagged logical interface (interface 2) have the following configurations:

```

Interface 1 [edit interfaces interface-name unit logical-unit-number]
 input-vlan-map {
 pop;
 }
 output-vlan-map {
 push;
 }

Interface 2 [edit interfaces interface-name unit logical-unit-number]
 input-vlan-map {
 pop-pop;
 }
 output-vlan-map {
 push-push;
 }

```

When a frame is received on the interface as a result of the **input-vlan-map** operation, the frame is not tagged. As it goes out of the second interface, the **output-vlan-map** operation **push-push** is applied to it. The resulting frame will be dual-tagged at the logical interface output.

Depending on the VLAN rewrite operation, you configure the rewrite operation for the interface in the input VLAN map, the output VLAN map, or in both the input VLAN map and the output VLAN map. Table 49 on page 550 shows what rewrite operation combinations you can configure. “None” means that no rewrite operation is specified for the VLAN map.

**Table 49: Applying Rewrite Operations to VLAN Maps**

| Input VLAN Map | Output VLAN Map |      |     |      |           |           |           |         |          |
|----------------|-----------------|------|-----|------|-----------|-----------|-----------|---------|----------|
|                | none            | push | pop | swap | push-push | swap-push | swap-swap | pop-pop | swap-pop |
| none           | Yes             | No   | No  | Yes  | No        | No        | Yes       | No      | No       |
| push           | No              | No   | Yes | No   | No        | No        | No        | No      | No       |
| pop            | No              | Yes  | No  | No   | No        | No        | No        | No      | No       |
| swap           | Yes             | No   | No  | Yes  | No        | No        | No        | No      | No       |
| push-push      | No              | No   | No  | No   | No        | No        | No        | Yes     | No       |
| swap-push      | No              | No   | No  | No   | No        | No        | No        | No      | Yes      |
| swap-swap      | Yes             | No   | No  | No   | No        | No        | Yes       | No      | No       |
| pop-pop        | No              | No   | No  | No   | Yes       | No        | No        | No      | No       |
| pop-swap       | No              | No   | No  | No   | No        | Yes       | No        | No      | No       |

As well as knowing if the VLAN rewrite operation is valid, and whether it is applied to the input VLAN map or the output VLAN map, you must also know whether the rewrite operation requires you to include statements to configure the inner and outer TPIDs and inner and outer VLAN IDs in the input VLAN map or output VLAN map. For information about configuring inner and outer TPIDs and inner and outer VLAN IDs, see “Configuring Inner and Outer TPIDs and VLAN IDs” on page 551.

## Configuring Frames with Particular TPIDs to Be Processed as Tagged Frames

For Gigabit Ethernet IQ interfaces, aggregated Ethernet with Gigabit Ethernet IQ interfaces, Gigabit Ethernet PICs with SFPs (except the 10-port Gigabit Ethernet PIC and the built-in Gigabit Ethernet port on the M7i platform), and MX-series router Gigabit Ethernet, Tri-Rate Ethernet copper, and 10-Gigabit Ethernet interfaces, you can configure frames with particular TPIDs to be processed as tagged frames. To do this, you specify up to eight IEEE 802.1Q TPID values per port; a frame with any of the specified TPIDs is processed as a tagged frame; however, with IQ2 interfaces, only the first four IEEE 802.1Q TPID values per port are supported. To configure the TPID values, include the `tag-protocol-id` statement:

```
tag-protocol-id [tpids];
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* *gigether-options* ethernet-switch-profile]
- [edit interfaces *interface-name* aggregated-ether-options ethernet-switch-profile]  
tag-protocol-id [ > *tpids* ]



All TPIDs you include in input and output VLAN maps must be among those you specify at the [edit interfaces *interface-name* *gigether-options* ethernet-switch-profile tag-protocol-id [ *tpids* ]] or [edit interfaces *interface-name* aggregated-ether-options ethernet-switch-profile tag-protocol-id [ *tpids* ]] hierarchy level.

## Configuring Stacked VLAN Tagging

---

To configure stacked VLAN tagging for all logical interfaces on a physical interface, include the `stacked-vlan-tagging` statement at the [edit interfaces *interface-name*] hierarchy level:

```
[edit interfaces interface-name]
stacked-vlan-tagging;
```

If you include the `stacked-vlan-tagging` statement in the configuration, you must configure dual VLAN tags for all logical interfaces on the physical interface. For more information, see “Stacking a VLAN Tag” on page 554.

## Configuring Dual VLAN Tags

---

To configure dual VLAN tags on a logical interface, include the `vlan-tags` statement:

```
vlan-tags inner tpid.vlan-id outer tpid.vlan-id;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

The outer tag VLAN ID range is from 1 through 511 for normal interfaces, and from 512 through 4094 for VLAN CCC or VLAN VPLS interfaces. The inner tag is not restricted.

You must also include the `stacked-vlan-tagging` statement in the configuration. See “Examples: Stacking and Rewriting Gigabit Ethernet IQ VLAN Tags” on page 559.

## Configuring Inner and Outer TPIDs and VLAN IDs

---

For some rewrite operations, you must configure the inner or outer TPID values and inner or outer VLAN ID values. These values can be applied to either the input VLAN map or the output VLAN map.

On Ethernet IQ and IQ2 interfaces, on MX-series router Gigabit Ethernet, Tri-Rate Ethernet copper, and 10-Gigabit Ethernet interfaces, and on aggregated Ethernet interfaces using Gigabit Ethernet IQ2 or 10-Gigabit Ethernet PICs on MX-series routing platforms, include the `inner-tag-protocol-id` statement to configure the inner TPID. For the inner VLAN ID, include the `inner-vlan-id` statement. For the outer TPID, include the `tag-protocol-id` statement. For the outer VLAN ID, include the `vlan-id` statement:

```
input-vlan-map {
```

```

 (pop | pop-pop | pop-swap | push | push-push | swap | swap-push | swap-swap);
 inner-tag-protocol-id tpid;
 inner-vlan-id number;
 tag-protocol-id tpid;
 vlan-id number;
}
output-vlan-map {
 (pop | pop-pop | pop-swap | push | push-push | swap | swap-push | swap-swap);
 inner-tag-protocol-id tpid;
 inner-vlan-id number;
 tag-protocol-id tpid;
 vlan-id number;
}

```

For aggregated Ethernet interfaces using Gigabit Ethernet IQ interfaces, include the `tag-protocol-id` statement for the outer TPID. For the outer VLAN ID, include the `vlan-id` statement:

```

input-vlan-map {
 (pop | push | swap);
 tag-protocol-id tpid;
 vlan-id number;
}
output-vlan-map {
 (pop | push | swap);
 tag-protocol-id tpid;
 vlan-id number;
}

```

For the input VLAN map, include these statements at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* input-vlan-map]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* input-vlan-map]

For the output VLAN map, include these statements at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* output-vlan-map]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* output-vlan-map]

The VLAN IDs you define in the input VLAN maps are stacked on top of the VLAN ID bound to the logical interface. For more information about binding a VLAN ID to the logical interface, see “Configuring 802.1Q VLANs” on page 525.

All TPIDs you include in input and output VLAN maps must be among those you specify at the [edit interfaces *interface-name* `gigether-options ethernet-switch-profile tag-protocol-id [ tpids ]`] hierarchy level or [edit interfaces *interface-name* `aggregated-ether-options ethernet-switch-profile tag-protocol-id [ tpids ]`] hierarchy level. For more information, see “Configuring Frames with Particular TPIDs to Be Processed as Tagged Frames” on page 550.

Table 50 on page 553 and Table 51 on page 553 specify when these statements are required. Table 50 on page 553 indicates valid statement combinations for rewrite operations for the input VLAN map. “No” means the statement must not be included in the input VLAN map for the rewrite operation. “Optional” means the statement may be optionally specified for the rewrite operation in the input VLAN map. “Any” means that you must include the `vlan-id` statement, `tag-protocol-id` statement, `inner-vlan-id` statement, or `inner-tag-protocol-id` statement.

**Table 50: Rewrite Operations and Statement Usage for Input VLAN Maps**

| Input VLAN Map Statements |          |                 |               |                       |
|---------------------------|----------|-----------------|---------------|-----------------------|
| Rewrite Operation         | vlan-id  | tag-protocol-id | inner-vlan-id | inner-tag-protocol-id |
| <b>push</b>               | Optional | Optional        | No            | No                    |
| <b>pop</b>                | No       | No              | No            | No                    |
| <b>swap</b>               | Any      | Any             | No            | No                    |
| <b>push-push</b>          | Optional | Optional        | Optional      | optional              |
| <b>swap-push</b>          | Optional | Optional        | Any           | Any                   |
| <b>swap-swap</b>          | Optional | Optional        | Any           | Any                   |
| <b>pop-swap</b>           | No       | No              | Any           | Any                   |
| <b>pop-pop</b>            | No       | No              | No            | No                    |

Table 51 on page 553 indicates valid statement combinations for rewrite operations for the output VLAN map. “No” means the statement must not be included in the output VLAN map for the rewrite operation. “Optional” means the statement may be optionally specified for the rewrite operation in the output VLAN map.

**Table 51: Rewrite Operations and Statement Usage for Output VLAN Maps**

| Output VLAN Map Statements |         |                 |               |                       |
|----------------------------|---------|-----------------|---------------|-----------------------|
| Rewrite Operation          | vlan-id | tag-protocol-id | inner-vlan-id | inner-tag-protocol-id |
| <b>push</b>                | No      | Optional        | No            | No                    |
| <b>pop</b>                 | No      | No              | No            | No                    |
| <b>swap</b>                | No      | Optional        | No            | No                    |
| <b>push-push</b>           | No      | Optional        | No            | Optional              |
| <b>swap-push</b>           | No      | Optional        | No            | Optional              |
| <b>swap-swap</b>           | No      | Optional        | No            | Optional              |

**Table 51: Rewrite Operations and Statement Usage for Output VLAN Maps** (*continued*)

| Output VLAN Map Statements |    |    |    |          |
|----------------------------|----|----|----|----------|
| <b>pop-swap</b>            | No | No | No | Optional |
| <b>pop-pop</b>             | No | No | No | No       |

The following examples use Table 50 on page 553 and Table 51 on page 553 and show how the **pop-swap** operation can be configured in an input VLAN map and an output VLAN map:

|                                                                                                                           |                                                                                                                                                                                                                             |
|---------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Input VLAN Map with inner-vlan-id Statement, Output VLAN Map with Optional inner-tag-protocol-id Statement</b>         | <pre>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i>] input-vlan-map {   pop-swap;   inner-vlan-id <i>number</i>; } output-vlan-map {   pop-swap;   inner-tag-protocol-id <i>tpid</i>; }</pre>       |
| <b>Input VLAN Map with inner-tag-protocol-id Statement, Output VLAN map with Optional inner-tag-protocol-id Statement</b> | <pre>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i>] input-vlan-map {   pop-swap;   inner-tag-protocol-id <i>tpid</i>; } output-vlan-map {   pop-swap;   inner-tag-protocol-id <i>tpid</i>; }</pre> |
| <b>Input VLAN Map with inner-tag-protocol-id and inner-vlan-id Statements</b>                                             | <pre>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i>] input-vlan-map {   pop-swap;   inner-vlan-id <i>number</i>;   inner-tag-protocol-id <i>tpid</i>; }</pre>                                       |

## Stacking a VLAN Tag

To stack a VLAN tag on all tagged frames entering or exiting the interface, include the **push**, **vlan-id**, and **tag-protocol-id** statements in the input VLAN map or the output VLAN map:

```
input-vlan-map {
 push;
 vlan-id number;
 tag-protocol-id tpid;
}
output-vlan-map {
 push;
```

```
 tag-protocol-id tpid;
}
```

You can include these statements at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* input-vlan-map]
- [edit interfaces *interface-name* unit *logical-unit-number* output-vlan-map]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* input-vlan-map]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* output-vlan-map]

If you include the **push** statement in an interface's input VLAN map, see Table 49 on page 550 for information about permissible rewrite operations,

The VLAN IDs you define in the input VLAN maps are stacked on top of the VLAN ID bound to the logical interface. For more information about binding a VLAN ID to the logical interface, see “Configuring 802.1Q VLANs” on page 525.

All TPIDs you include in input and output VLAN maps must be among those you specify at the [edit interfaces *interface-name* **gigether-options ethernet-switch-profile tag-protocol-id** [ *tpids* ]] hierarchy level. For more information, see “Configuring Inner and Outer TPIDs and VLAN IDs” on page 551.

## Removing a VLAN Tag

---

To remove a VLAN tag from all tagged frames entering or exiting the interface, include the **pop** statement in the input VLAN map or output VLAN map:

```
input-vlan-map {
 pop;
}
output-vlan-map {
 pop;
}
```

You can include these statements at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

## Removing the Outer and Inner VLAN Tags

---

On Ethernet IQ and IQ2 interfaces, on MX-series router Gigabit Ethernet, Tri-Rate Ethernet copper, and 10-Gigabit Ethernet interfaces, and on aggregated Ethernet interfaces using Gigabit Ethernet IQ2 or 10-Gigabit Ethernet PICs on MX-series routing platforms, to remove both the outer and inner VLAN tags of the frame, include the **pop-pop** statement in the input VLAN map or output VLAN map:

```

input-vlan-map {
 pop-pop;
}
output-vlan-map {
 pop-pop;
}

```

You can include these statements at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* input-vlan-map]
- [edit interfaces *interface-name* unit *logical-unit-number* output-vlan-map]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* input-vlan-map]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* output-vlan-map]

See Table 50 on page 553 and Table 51 on page 553 for information about configuring inner and outer VLAN ID values and inner and outer TPID values required for VLAN maps.

## Removing the Outer VLAN Tag and Rewriting the Inner VLAN Tag

On Ethernet IQ and IQ2 interfaces, on MX-series router Gigabit Ethernet, Tri-Rate Ethernet copper, and 10-Gigabit Ethernet interfaces, and on aggregated Ethernet interfaces using Gigabit Ethernet IQ2 or 10-Gigabit Ethernet PICs on MX-series routing platforms, to remove the outer VLAN tag of the frame and replace the inner VLAN tag of the frame with a user-specified VLAN tag value, include the **pop-swap** statement in the input VLAN map or output VLAN map:

```

input-vlan-map {
 pop-swap;
}
output-vlan-map {
 pop-swap;
}

```

The inner tag becomes the outer tag in the final frame.

You can include this statements a the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* input-vlan-map]
- [edit interfaces *interface-name* unit *logical-unit-number* output-vlan-map]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* input-vlan-map]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* output-vlan-map]

See Table 50 on page 553 and Table 51 on page 553 for information about configuring inner and outer VLAN ID values and inner and outer TPID values required for VLAN maps.

## Stacking Two VLAN Tags

---

On Ethernet IQ and IQ2 interfaces, on MX-series router Gigabit Ethernet, Tri-Rate Ethernet copper, and 10-Gigabit Ethernet interfaces, and on aggregated Ethernet interfaces using Gigabit Ethernet IQ2 or 10-Gigabit Ethernet PICs on MX-series routing platforms, to push two VLAN tags in front of tagged frames entering or exiting the interface, include the **push-push** statement in the input VLAN map or the output VLAN map:

```
input-vlan-map {
 push-push;
}
output-vlan-map {
 push-push;
}
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* input-vlan-map]
- [edit interfaces *interface-name* unit *logical-unit-number* output-vlan-map]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* input-vlan-map]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* output-vlan-map]

See Table 50 on page 553 and Table 51 on page 553 for information about configuring inner and outer VLAN ID values and inner and outer TPID values required for VLAN maps.

## Rewriting the VLAN Tag

---

To rewrite the VLAN tag on all tagged frames entering the interface to a specified VLAN ID and TPID, include the **swap**, **tag-protocol-id**, and **vlan-id** statements in the input VLAN map:

```
input-vlan-map {
 swap;
 vlan-id number;
 tag-protocol-id tpid;
}
```

To rewrite the VLAN tag on all tagged frames exiting the interface to a specified VLAN ID and TPID, include the **swap** and **tag-protocol-id** statements in the output VLAN map:

```
output-vlan-map {
 swap;
 vlan-id number;
 tag-protocol-id tpid;
}
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* input-vlan-map]
- [edit interfaces *interface-name* unit *logical-unit-number* output-vlan-map]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* input-vlan-map]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* output-vlan-map]

You cannot include both the **swap** statement and the **vlan-id** statement in the output VLAN map configuration. If you include the **swap** statement in the configuration, the VLAN ID in outgoing frames is rewritten to the VLAN ID bound to the logical interface. For more information about binding a VLAN ID to the logical interface, see “Configuring 802.1Q VLANs” on page 525.

The swap operation works on the outer tag only, whether or not you include the **stacked-vlan-tagging** statement in the configuration. For more information, see “Examples: Stacking and Rewriting Gigabit Ethernet IQ VLAN Tags” on page 559.

## Rewriting a VLAN Tag and Adding a New Tag

---

On Ethernet IQ and IQ2 interfaces, on MX-series router Gigabit Ethernet, Tri-Rate Ethernet copper, and 10-Gigabit Ethernet interfaces, and on aggregated Ethernet interfaces using Gigabit Ethernet IQ2 or 10-Gigabit Ethernet PICs on MX-series routing platforms, to replace the outer VLAN tag of the incoming frame with a user-specified VLAN tag value, include the **swap-push** statement in the input VLAN map or output VLAN map:

```
input-vlan-map {
 swap-push;
}
output-vlan-map {
 swap-push;
}
```

A user-specified outer VLAN tag is pushed in front. The outer tag becomes an inner tag in the final frame.

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

See Table 50 on page 553 and Table 51 on page 553 for information about configuring inner and outer VLAN ID values and inner and outer TPID values required for VLAN maps.



## Rewriting the Inner and Outer VLAN Tags

---

On Ethernet IQ and IQ2 interfaces, on MX-series router Gigabit Ethernet, Tri-Rate Ethernet copper, and 10-Gigabit Ethernet interfaces, and on aggregated Ethernet interfaces using Gigabit Ethernet IQ2 or 10-Gigabit Ethernet PICs on MX-series routing platforms, to replace both the inner and the outer VLAN tags of the incoming frame with a user-specified VLAN tag value, include the **swap-swap** statement in the input VLAN map or output VLAN map:

```
input-vlan-map {
 swap-swap;
}
output-vlan-map {
 swap-swap;
}
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* output-vlan-map]
- [edit interfaces *interface-name* unit *logical-unit-number* input-vlan-map]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* output-vlan-map]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* input-vlan-map]

See Table 50 on page 553 and Table 51 on page 553 for information about configuring inner and outer VLAN ID values and inner and outer TPID values required for VLAN maps.

## Examples: Stacking and Rewriting Gigabit Ethernet IQ VLAN Tags

---

Configure a VLAN CCC tunnel in which Ethernet frames enter the tunnel at interface **ge-4/0/0** and exit the tunnel at interface **ge-4/2/0**.

The following examples show how to perform the following tasks:

- Push a TPID and VLAN ID pair on ingress.
- Stack inner and outer VLAN tags.
- Swap a VLAN ID on ingress.
- Swap a VLAN ID on egress.
- Swap a VLAN ID on both ingress and egress.
- Swap the outer VLAN tag and push a new VLAN tag on ingress; pop the outer VLAN tag and swap the inner VLAN tag on egress.
- Swap a VLAN ID and TPID pair for both VLAN tags on ingress and on egress.

- Pop the outer VLAN tag and swap the inner VLAN tag on ingress; swap the outer VLAN tag and push a new VLAN tag on egress.
- Pop two VLAN ID and TPID pairs on ingress; push two VLAN ID and TPID pairs on egress.

**Push a TPID and VLAN ID Pair on Ingress**

```
[edit interfaces]
ge-4/0/0 {
 vlan-tagging;
 encapsulation vlan-ccc;
 gigether-options {
 ethernet-switch-profile {
 tag-protocol-id 0x9909;
 }
 }
 unit 0 {
 encapsulation vlan-ccc;
 vlan-id 512;
 input-vlan-map {
 push;
 tag-protocol-id 0x9909;
 vlan-id 520;
 }
 output-vlan-map pop;
 }
}
ge-4/2/0 {
 vlan-tagging;
 encapsulation vlan-ccc;
 unit 0 {
 encapsulation vlan-ccc;
 vlan-id 515;
 input-vlan-map {
 swap-push;
 vlan-id 520;
 inner-vlan-id 512;
 }
 output-vlan-map {
 pop-swap;
 }
 }
}
[edit protocols]
mpls {
 interface ge-4/0/0.0;
 interface ge-4/2/0.0;
}
connections {
 interface-switch vlan-tag-push {
 interface ge-4/0/0.0;
 interface ge-4/2/0.0;
 }
}
}
```

**Stack Inner and Outer VLAN Tags**

```
[edit interfaces]
ge-0/2/0 {
```

```

stacked-vlan-tagging;
mac 00.01.02.03.04.05;
gigether-options {
 loopback;
}
unit 0 {
 vlan-tags outer 0x8100.200 inner 0x8100.200;
}
}

```

**Swap a VLAN ID on  
Ingress**

```

[edit interfaces]
ge-4/0/0 {
 vlan-tagging;
 encapsulation vlan-ccc;
 gigether-options {
 ethernet-switch-profile {
 tag-protocol-id 0x9100;
 }
 }
}
...
unit 1 {
 encapsulation vlan-ccc;
 vlan-id 1000;
 input-vlan-map {
 swap;
 tag-protocol-id 0x9100;
 vlan-id 2000;
 }
}
}
ge-4/2/0 {
 vlan-tagging;
 encapsulation vlan-ccc;
 ...
 unit 1 {
 encapsulation vlan-ccc;
 vlan-id 2000;
 input-vlan-map {
 swap;
 tag-protocol-id 0x9100;
 vlan-id 1000;
 }
 }
}
[edit protocols]
mpls {
 ...
 interface ge-4/0/0.1;
 interface ge-4/2/0.1;
}
connections {
 ...
 interface-switch vlan-tag-swap {
 interface ge-4/2/0.1;
 interface ge-4/0/0.1;
 }
}

```

```

 }
 }

```

**Swap a VLAN ID on  
Egress**

```

[edit interfaces]
ge-4/0/0 {
 vlan-tagging;
 encapsulation vlan-ccc;
 ...
 unit 1 {
 encapsulation vlan-ccc;
 vlan-id 1000;
 }
}
ge-4/2/0 {
 vlan-tagging;
 encapsulation vlan-ccc;
 gigether-options {
 ethernet-switch-profile {
 tag-protocol-id 0x8800;
 }
 }
 ...
 unit 1 {
 encapsulation vlan-ccc;
 vlan-id 2000;
 output-vlan-map {
 swap;
 tag-protocol-id 0x8800;
 }
 }
}
[edit protocols]
mpls {
 ...
 interface ge-4/0/0.1;
 interface ge-4/2/0.1;
}
connections {
 ...
 interface-switch vlan-tag-swap {
 interface ge-4/2/0.1;
 interface ge-4/0/0.1;
 }
}

```

**Swap a VLAN ID on Both  
Ingress and Egress**

```

[edit interfaces]
ge-4/0/0 {
 vlan-tagging;
 encapsulation vlan-ccc;
 gigether-options {
 ethernet-switch-profile {
 tag-protocol-id [0x8800 0x9100];
 }
 }
 ...

```

```

unit 1 {
 encapsulation vlan-ccc;
 vlan-id 1000;
 input-vlan-map {
 swap;
 tag-protocol-id 0x9100;
 vlan-id 2000;
 }
}
}
ge-4/2/0 {
 vlan-tagging;
 encapsulation vlan-ccc;
 gigether-options {
 ethernet-switch-profile {
 tag-protocol-id [0x8800 0x9100];
 }
 }
 unit 1 {
 encapsulation vlan-ccc;
 vlan-id 2000;
 output-vlan-map {
 swap;
 tag-protocol-id 0x8800;
 }
 }
}
[edit protocols]
mpls {
 ...
 interface ge-4/0/0.1;
 interface ge-4/2/0.1;
}
connections {
 ...
 interface-switch vlan-tag-swap {
 interface ge-4/2/0.1;
 interface ge-4/0/0.1;
 }
}
}

```

**Swap the Outer VLAN Tag and Push a New VLAN Tag on Ingress; Pop the Outer VLAN Tag and Swap the Inner VLAN Tag on Egress**

```

[edit interfaces]
ge-1/1/0 {
 unit 1 {
 vlan-id 200;
 input-vlan-map {
 swap-push;
 tag-protocol-id 0x9100;
 vlan-id 400;
 inner-tag-protocol-id 0x9100;
 inner-vlan-id 500;
 }
 output-vlan-map {
 pop-swap;
 inner-tag-protocol-id 0x9100;
 }
 }
}

```

```

 }
 }
}

```

**Swap a TPID and VLAN ID Pair for Both VLAN Tags on Ingress and on Egress**

```

[edit interfaces]
ge-1/1/0 {
 unit 0 {
 vlan-tags {
 inner 0x9100.425;
 outer 0x9200.525;
 }
 input-vlan-map {
 swap-swap;
 tag-protocol-id 0x9100;
 vlan-id 400;
 inner-tag-protocol-id 0x9100;
 inner-vlan-id 500;
 }
 output-vlan-map {
 swap-swap;
 tag-protocol-id 0x9200;
 inner-tag-protocol-id 0x9100;
 }
 }
}

```

**Pop the Outer VLAN Tag and Swap the Inner VLAN Tag on Ingress; Swap the Outer VLAN Tag and Push a New VLAN Tag on Egress**

```

[edit interfaces]
ge-1/1/0 {
 unit 0 {
 vlan-tags {
 inner 0x9100.425;
 outer 0x9200.525;
 }
 input-vlan-map {
 pop-swap;
 tag-protocol-id 0x9100;
 vlan-id 400;
 }
 output-vlan-map {
 swap-push;
 tag-protocol-id 0x9200;
 inner-tag-protocol-id 0x9100;
 }
 }
}

```

**Pop a TPID and VLAN ID Pair on Ingress; Push a VLAN ID and TPID Pair on Egress**

```

[edit interfaces]
ge-1/1/0 {
 unit 0 {
 vlan-tags {
 inner 0x9100.425;
 outer 0x9200.525;
 }
 input-vlan-map {
 pop-pop;
 }
 }
}

```

```

 }
 output-vlan-map {
 push-push;
 tag-protocol-id 0x9200;
 inner-tag-protocol-id 0x9100;
 }
}
}

```

**POP an Outer VLAN Tag  
to Connect an Untagged  
VPLS Interface to  
tagged VPLS Interfaces**

```

[edit interfaces]
ge-1/1/0 {
 vlan-tagging;
 encapsulation extended-vlan-vpls;
 unit 0 {
 vlan-id 0;
 input-vlan-map {
 push;
 vlan-id 0;
 }
 output-vlan-map pop;
 family vpls;
 }
}

```





## Chapter 34

# Configuring Layer 2 Bridging Interfaces

This section contains the following topics:

- Overview of Layer 2 Bridging Interfaces on page 567
- Configuring Layer 2 Bridging Interfaces on page 567

## Overview of Layer 2 Bridging Interfaces

---

Bridging operates at Layer 2 of the OSI reference model while routing operates at Layer 3. A set of logical ports configured for bridging can be said to constitute a bridging domain.

A bridging domain can be created by configuring a routing instance and specifying the instance-type as **bridge**.

Integrated routing and bridging (IRB) is the ability to:

- Route a packet if the destination MAC address is the MAC address of the router and the packet **ethertype** is IPv4, IPv6, or MPLS.
- Switch all multicast and broadcast packets within a bridging domain at layer 2.
- Route a copy of the packet if the destination MAC address is a multicast address and the **ethertype** is IPv4 or IPv6.
- Switch all other unicast packets at Layer 2.
- Handle supported Layer 2 control packets such as STP and LACP.
- Handle supported Layer 3 control packets such as OSPF and RIP.

## Configuring Layer 2 Bridging Interfaces

---

You can configure an IRB logical interface at the [edit interfaces *ge-fpc /pic/port* unit *logical-unit-number*] hierarchy level:

```
[edit interfaces ge-fpc/pic/port]
unit logical-unit-number {
}
```

You can configure Layer 3 information on the IRB logical interface at the [edit interfaces *irb* ] hierarchy level:

```
[edit interfaces]
irb {
 unit logical-unit-number {
 family inet {
 address address {
 }
 }
 }
}
```

For examples of Layer 2 bridging configuration, see the *JUNOS Routing Protocols Configuration Guide*.

### **Example: Configuring Layer 2 Bridging Interfaces**

The following example configures an IRB logical interface and Layer 3 information on the interface.

```
[edit interfaces]
ge-1/0/0 {
 unit 0 {
 }
}
irb {
 unit 0 {
 family inet {
 address 192.168.12.1/28;
 }
 }
}
```

## Chapter 35

# Configuring TCC and Layer 2.5 Switching

This section contains the following topics:

- Overview of TCC and Layer 2.5 Switching on page 569
- Configuring VLAN TCC Encapsulation on page 569
- Configuring Ethernet TCC on page 570

## Overview of TCC and Layer 2.5 Switching

---

Translational cross-connect (TCC) is a switching concept that allows you to forward traffic between a variety of Layer 2 protocols or circuits. It is similar to its predecessor, CCC. However, while CCC requires the same Layer 2 encapsulations on both sides of a routing platform (such as Point-to-Point Protocol [PPP] or Frame Relay-to-Frame Relay), TCC lets you connect different types of Layer 2 protocols interchangeably. With TCC, combinations such as PPP-to-ATM and Ethernet-to-Frame Relay cross-connections are possible.

## Configuring VLAN TCC Encapsulation

---

VLAN TCC encapsulation allows circuits to have different media on either side of the forwarding path. VLAN TCC encapsulation supports TPID 0x8100 only. You must include configuration statements at the logical and physical interface hierarchy levels.

To configure VLAN TCC encapsulation, include the **encapsulation** statement and specify the **vlan-tcc** option:

```
[edit interfaces interface-name unit logical-unit-number]
encapsulation vlan-tcc;
```

You can include the **encapsulation vlan-tcc** statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* ]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

Additionally, configure the logical interface by including the **proxy** and **remote** statements:

```
proxy {
 inet-address;
```

```

}
remote {
 (inet-address | mac-address);
}

```

You can include these statements at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* family tcc]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family tcc]

The proxy address is the IP address of the non-Ethernet TCC neighbor for which the TCC routing platform is acting as a proxy.

The remote address is the IP or MAC address of the remote routing platform. The **remote** statement provides ARP capability from the TCC switching routing platform to the Ethernet neighbor. The MAC address is the physical Layer 2 address of the Ethernet neighbor.

When VLAN TCC encapsulation is configured on the logical interface, you also must specify flexible Ethernet services on the physical interface. To specify flexible Ethernet services, include the **encapsulation** at the [edit interfaces *interface-name*] hierarchy level and specify the **flexible-ethernet-services** option:

```

[edit interfaces interface-name]
encapsulation flexible-ethernet-services;

```

Extended VLAN TCC encapsulation supports TPIDs 0x8100 and 0x9901. Extended VLAN TCC is specified at the physical interface level. When configured, all units on that interface must use VLAN TCC encapsulation, and no explicit configuration is needed on logical interfaces.

One-port Gigabit Ethernet, 2-port Gigabit Ethernet, and 4-port Fast Ethernet PICs with VLAN tagging enabled can use VLAN TCC encapsulation. To configure the encapsulation on a physical interface, include the **encapsulation** statement at the [edit interfaces *interface-name*] hierarchy level and specify the **extended-vlan-tcc** option:

```

[edit interfaces interface-name]
encapsulation extended-vlan-tcc;

```

For VLAN TCC encapsulation, all VLAN IDs from 1 through 1024 are valid. VLAN ID 0 is reserved for tagging the priority of frames.

Extended VLAN TCC is not supported on 4-port Gigabit Ethernet PICs.

## Configuring Ethernet TCC

---

For Layer 2.5 virtual private networks (VPNs) using an Ethernet interface as the TCC routing platform, you can configure an Ethernet TCC.

To configure an Ethernet TCC, include the **encapsulation** statement and specify the **ethernet-tcc** option at the [edit interfaces *interface-name*] hierarchy level:

```
[edit interfaces interface-name]
encapsulation ethernet-tcc;
```

For Ethernet TCC encapsulation, you must also configure the logical interface by including the **proxy** and **remote** statements:

```
proxy {
 inet-address;
}
remote {
 (inet-address | mac-address);
}
```

You can include these statements at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* family tcc]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family tcc]

The proxy address is the IP address of the non-Ethernet TCC neighbor for which the TCC routing platform is acting as a proxy.

The remote address is the IP or MAC address of the remote routing platform. The **remote** statement provides ARP capability from the TCC switching routing platform to the Ethernet neighbor. The MAC address is the physical Layer 2 address of the Ethernet neighbor.

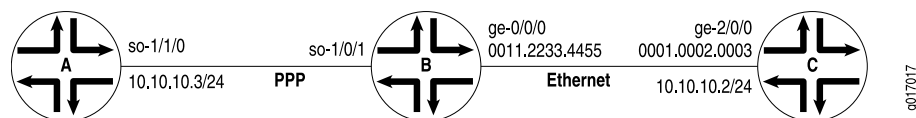
Ethernet TCC is supported on interfaces that carry IPv4 traffic only. For 8-port, 12-port, and 48-port Fast Ethernet PICs, TCC and extended VLAN CCC are not supported. For 4-port Gigabit Ethernet PICs, extended VLAN CCC and extended VLAN TCC are not supported.

### **Example: Configuring an Ethernet TCC or Extended VLAN TCC**

Configure a full-duplex Layer 2.5 translational cross-connect between Router A and Router C, using a Juniper Networks routing platform, Router B, as the TCC interface. Ethernet TCC encapsulation provides an Ethernet wide area circuit for interconnecting IP traffic. (See the topology in Figure 45 on page 572.)

The Router A-to-Router B circuit is PPP, and the Router B-to-Router C circuit accepts packets carrying standard TPID values.

If traffic flows from Router A to Router C, the JUNOS software strips all PPP encapsulation data from incoming packets and adds Ethernet encapsulation data before forwarding the packets. If traffic flows from Router C to Router A, the JUNOS software strips all Ethernet encapsulation data from incoming packets and adds PPP encapsulation data before forwarding the packets.

**Figure 45: Topology of Layer 2.5 Translational Cross-Connect**

**On Router B**

```

interfaces ge-0/0/0 {
 encapsulation ethernet-tcc;
 unit 0 {
 family tcc {
 proxy {
 inet-address 10.10.10.3;
 }
 remote {
 inet-address 10.10.10.2;
 }
 }
 }
}

```

Configure a full-duplex Layer 2.5 translational cross-connect between Router A and Router C, using a Juniper Networks routing platform, Router B, as the TCC interface. Extended VLAN TCC encapsulation provides an Ethernet wide area circuit for interconnecting IP traffic. (See the topology in Figure 45 on page 572.)

**Configuring an Extended VLAN TCC** The Router A-to-Router B circuit is PPP, and the Router B-to-Router C circuit is Ethernet with VLAN tagging enabled.

**On Router B**

```

interfaces ge-0/0/0 {
 vlan-tagging;
 encapsulation extended-vlan-tcc;
 unit 0 {
 vlan-id 1;
 family tcc {
 proxy {
 inet-address 10.10.10.3/24;
 }
 remote {
 inet-address 10.10.10.2/24;
 }
 }
 }
}

```

## Chapter 36

# Configuring Static ARP Table Entries

This section contains the following topics:

- Overview of Static ARP Table Entries on page 573
- Configuring Static ARP Table Entries on page 573

### Overview of Static ARP Table Entries

---

For Fast Ethernet, Gigabit Ethernet, Tri-Rate Ethernet copper, and 10-Gigabit Ethernet interfaces, you can configure static ARP table entries, defining mappings between IP and MAC addresses.

### Configuring Static ARP Table Entries

---

To configure static ARP table entries, include the **arp** statement:

```
arp ip-address (mac | multicast-mac) mac-address <publish>;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* family inet address *address* ]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family inet address *address*]

The IP address that you specify must be part of the subnet defined in the enclosing **address** statement.

To associate a multicast MAC address with a unicast IP address, include the **multicast-mac** statement.

Specify the MAC address as six hexadecimal bytes in one of the following formats: *nnnn.nnnn.nnnn* or *nn:nn:nn:nn:nn:nn*. For example, 0011.2233.4455 or 00:11:22:33:44:55.

For unicast MAC addresses only, if you include the **publish** option, the routing platform replies to proxy ARP requests.



**NOTE:** By default, an ARP policer is installed that is shared among all the Ethernet interfaces on which you have configured the `family inet` statement. By including the `arp` statement at the `[edit interfaces interface-name unit logical-unit-number family inet policer]` hierarchy level, you can apply a specific ARP-packet policer to an interface. For more information, see “Applying Policers” on page 181.

When you need to conserve IP addresses, you can configure an Ethernet interface to be unnumbered by including the `unnumbered-address` statement at the `[edit interfaces interface-name unit logical-unit-number family inet]` hierarchy level. For more information, see “Configuring an Unnumbered Interface” on page 172.

### Example: Configuring Static ARP Table Entries

Configure two static ARP table entries on the routing platform’s management interface:

```
[edit interfaces]
fxp0 {
 unit 0 {
 family inet {
 address 10.10.0.11/24 {
 arp 10.10.0.99 mac 0001.0002.0003;
 arp 10.10.0.101 mac 00:11:22:33:44:55 publish;
 }
 }
 }
}
```



## Chapter 37

# Configuring Unrestricted Proxy ARP

This section contains the following topics:

- Overview of Unrestricted Proxy ARP on page 575
- Configuring Unrestricted Proxy ARP on page 576

### Overview of Unrestricted Proxy ARP

---

By default, the JUNOS software responds to an ARP request only if the destination address of the ARP request is local to the incoming interface.

For Ethernet interfaces, you can configure unrestricted proxy ARP, which enables the router to respond to any ARP request, on condition that the router has an active route to the destination address of the ARP request. The route is not limited to the incoming interface of the request, nor is it required to be a direct route.

You might want to configure unrestricted proxy ARP for routers that are acting as provider edge (PE) devices in Ethernet Layer 2 LAN switching domains.



**WARNING:** If you configure unrestricted proxy ARP, the proxy router replies to ARP requests for the target IP address on the same interface as the incoming ARP request. This behavior is appropriate for cable modem termination system (CMTS) environments, but might cause Layer 2 reachability problems if you enable unrestricted proxy ARP in other environments.

---

When an IP client broadcasts the ARP request across the Ethernet wire, the end node with the correct IP address responds to the ARP request and provides the correct MAC address. If the unrestricted proxy ARP feature is enabled, the router response is redundant and might fool the IP client into determining that the destination MAC address within its own subnet is the same as the address of the router.

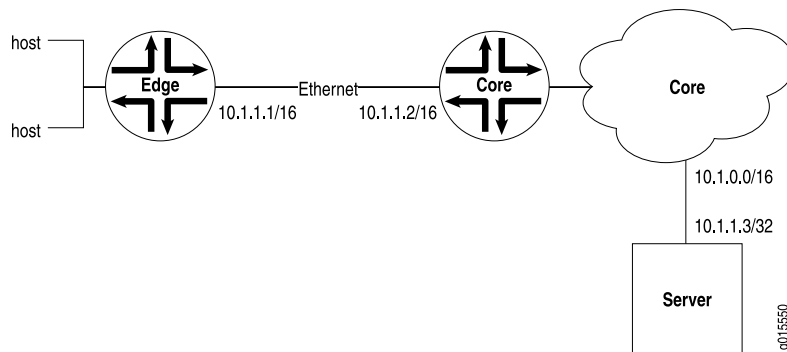
While the destination address can be remote, the source address of the ARP request must be on the same subnet as the interface upon which the ARP request is received. For security reasons, this rule applies to both unrestricted and restricted proxy ARP.

In most situations, you should not configure the router to perform unrestricted proxy ARP. Do so only for special situations, such as when cable modems are used. Figure 46 on page 576 and Figure 47 on page 576 show examples of situations in which you might want to configure unrestricted proxy ARP.

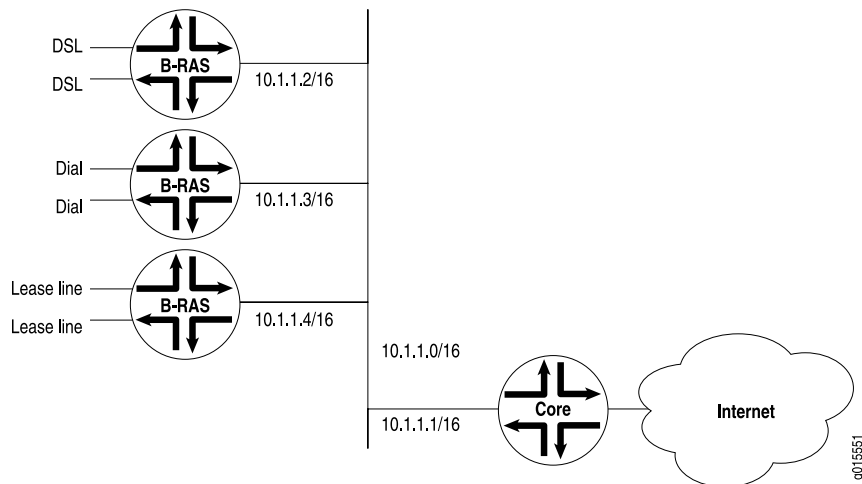
In Figure 46 on page 576, the edge device is not running any IP protocols. In this case, you configure the core router to perform unrestricted proxy ARP. The edge device is the client of the proxy.

In Figure 47 on page 576, the Broadcast Remote Access Server (B-RAS) routers are not running any IP protocols. In this case, you configure unrestricted proxy ARP on the B-RAS interfaces. This allows the core device to behave as though it is directly connected to the end users.

**Figure 46: Edge Device Case for Unrestricted Proxy ARP**



**Figure 47: Core Device Case for Unrestricted Proxy ARP**



## Configuring Unrestricted Proxy ARP

To configure unrestricted proxy ARP, include the `proxy-arp` statement:

```
proxy-arp;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* ]

- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

To return to the default—that is, to disable unrestricted proxy ARP—delete the `proxy-arp` statement from the configuration:

```
[edit]
user@host# delete interfaces interface-name unit logical-unit-number proxy-arp
```

You can track the number of unrestricted proxy ARP requests processed by the router by issuing the `show system statistics arp operational mode` command.



## Chapter 38

# Configuring MAC Address Validation on Static Ethernet Interfaces

This section contains the following topics:

- Overview of MAC Address Validation on Static Ethernet Interfaces on page 579
- Configuring MAC Address Validation on Static Ethernet Interfaces on page 579

## Overview of MAC Address Validation on Static Ethernet Interfaces

---

MAC address validation enables the router to validate that received packets contain a trusted IP source and an Ethernet MAC source address.

MAC address validation is supported on AE, Fast Ethernet, Gigabit Ethernet, and 10-Gigabit Ethernet interfaces (with or without VLAN tagging) on MX-series routers only.

There are two types of MAC address validation that you can configure:

- Loose—Forwards packets when both the IP source address and the MAC source address match one of the trusted address tuples.

Drops packets when the IP source address matches one of the trusted tuples, but the MAC address does not support the MAC address of the tuple

Continues to forward packets when the source address of the incoming packet does not match any of the trusted IP addresses.

- Strict—Forwards packets when both the IP source address and the MAC source address match one of the trusted address tuples.

Drops packets when the MAC address does not match the tuple's MAC source address, or when IP source address of the incoming packet does not match any of the trusted IP addresses.

## Configuring MAC Address Validation on Static Ethernet Interfaces

---

To configure MAC address validation on static Ethernet interfaces, include the `mac-validate (loose | strict)` statement in the `[edit interfaces interface-name unit logical-unit-number family family]` hierarchy.

**Example of Strict MAC Validation on a Static Ethernet Interface**

This example shows strict MAC address validation on a static Ethernet interface without VLAN tagging.

```
[edit interfaces]
ge-2/1/9 {
 unit 0 {
 proxy-arp;
 family inet {
 mac-validate strict;
 address 88.22.100.1/24 {
 arp 88.22.100.3 mac 00:00:58:16:64:03;
 }
 }
 }
}
```

## Chapter 39

# Enabling Passive Monitoring on Ethernet Interfaces

This section contains the following topics:

- Overview of Passive Monitoring on Ethernet Interfaces on page 581
- Enabling Passive Monitoring on Ethernet Interfaces on page 581

## Overview of Passive Monitoring on Ethernet Interfaces

---

The Monitoring Services I and Monitoring Services II PICs are designed to enable IP services. If you have a Monitoring Services PIC and a 4-port Fast Ethernet, 4-port Gigabit Ethernet PIC with SFPs, 10-port Gigabit Ethernet PIC with SFPs, or 1-port 10-Gigabit Ethernet PIC installed in an M40e, M160, MX-series, or T-series routing platform, you can monitor IP version 4 (IPv4) traffic from another routing platform.

## Enabling Passive Monitoring on Ethernet Interfaces

---

On Ethernet interfaces, enable packet flow monitoring by including the `passive-monitor-mode` statement at the `[edit interfaces interface-name ]` hierarchy level:

```
[edit interfaces interface-name]
passive-monitor-mode;
```

When you configure an interface in passive monitoring mode, the Packet Forwarding Engine silently drops packets coming from that interface and destined to the router itself. Passive monitoring mode also stops the Routing Engine from transmitting any packet from that interface. Packets received from the monitored interface can be forwarded to monitoring interfaces. If you include the `passive-monitor-mode` statement in the configuration:

- Gigabit and Fast Ethernet interfaces can support both per-port passive monitoring and per-VLAN passive monitoring. The destination MAC filter on the receive port of the Ethernet interfaces is disabled.
- Ethernet encapsulation options are not allowed.

On monitoring services interfaces, enable packet flow monitoring by including the `family` statement at the `[edit interfaces mo-fpc/pic/port unit logical-unit-number]` hierarchy level, specifying the `inet` option:

```
[edit interfaces mo-fpc/pic/port unit logical-unit-number]
family inet;
```

For conformity with cflowd record structure, you must include the `receive-options-packets` and `receive-ttl-exceeded` statements at the `[edit interfaces mo-fpc/pic/port unit logical-unit-number family inet]` hierarchy level:

```
[edit interfaces mo-fpc/pic/port unit logical-unit-number family inet]
receive-options-packets;
receive-ttl-exceeded;
```

For the monitoring services interface, you can configure multiservice physical interface properties. For more information, see “Configuring Multiservice Physical Interface Properties” on page 129 and the *JUNOS Services Interfaces Configuration Guide*.



## Chapter 40

# Configuring IEEE 802.1ag OAM Connectivity-Fault Management

This section contains the following topics:

- Overview of IEEE 802.1ag OAM Connectivity-Fault Management on page 584
- Connectivity Fault Management Key Elements on page 584
- Continuity Check Protocol on page 585
- Linktrace Protocol on page 585
- Creating the Maintenance Domain on page 585
- Configuring the Maintenance Domain Name Format on page 586
- Configuring the Maintenance Domain Level on page 586
- Creating the Maintenance Association on page 586
- Configuring the Maintenance Association Short Name Format on page 586
- Configuring the Continuity Check on page 586
- Configuring the Continuity Check Hold Interval on page 587
- Configuring the Continuity Check Interval on page 587
- Configuring the Continuity Check Loss Threshold on page 587
- Creating a Maintenance End Point on page 587
- Enabling Maintenance End Point Automatic Discovery on page 588
- Configuring the Maintenance End Point Direction on page 588
- Configuring the Maintenance End Point Interface on page 588
- Configuring the Maintenance End Point Priority on page 588
- Creating a Remote Maintenance End Point on page 589
- Configuring the Remote Maintenance End Point Action Profile on page 589
- Creating a Connectivity-Fault Management Action Profile on page 589
- Configuring a CFM Action Profile Action on page 589
- Configuring a CFM Interface Down Action Profile Action on page 589
- Configuring the Linktrace Path Age Timer on page 590
- Configuring the Linktrace Database Size on page 590

## Overview of IEEE 802.1ag OAM Connectivity-Fault Management

Ethernet interfaces on M120, M320, MX-series, and T-series routing platforms support the IEEE 802.1ag standard for Operation, Administration, and Management (OAM). The IEEE 802.1ag specification provides for Ethernet connectivity-fault management (CFM). The goal of CFM is to monitor an Ethernet network that may comprise one or more service instances. JUNOS software supports IEEE 802.1ag connectivity fault management.

Network entities such as operators, providers, and customers may be part of different administrative domains. Each administrative domain is mapped into one maintenance domain. Maintenance domains are configured with different level values to keep them separate. Each domain provides enough information for the entities to perform their own management, perform end-to-end monitoring, and still avoid security breaches.



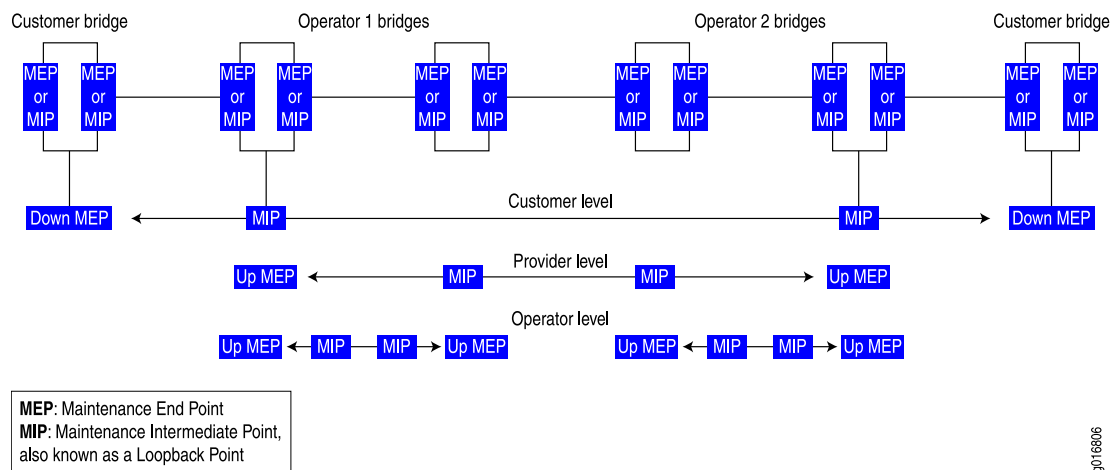
**NOTE:** As a requirement for Ethernet OAM 802.1ag to work, you must enable distributed periodic packet management (PPM) by including the `delegate-processing` statement at the `[edit routing-options ppm]` hierarchy level.

IEEE 802.1ag OAM supports graceful Routing Engine switchover. IEEE 802.1ag OAM is supported on untagged, single tagged, and stacked VLAN interfaces.

## Connectivity Fault Management Key Elements

Figure 48 on page 584 shows the relationships between the customer, provider, and operator Ethernet bridges, maintenance domains, maintenance association end points (MEPs), and maintenance intermediate points (MIPs).

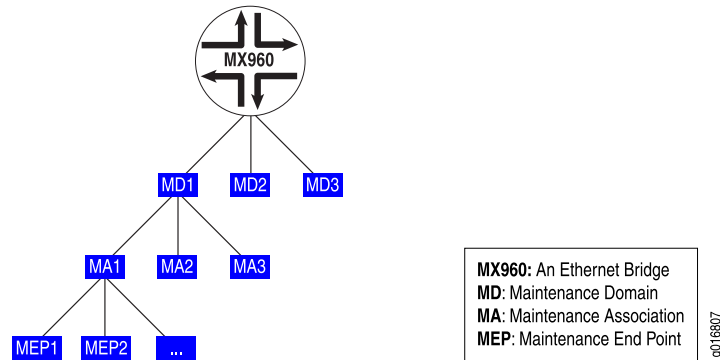
**Figure 48: Relationship of MEPs, MIPs, and Maintenance Domain Levels**



A maintenance association is a set of MEPs configured with the same maintenance association identifier and maintenance domain level. Figure 49 on page 585 shows

the hierarchical relationships between the Ethernet bridge, maintenance domains, maintenance associations, and MEPs.

**Figure 49: Relationship of Bridges, Maintenance Domains, Maintenance Associations, and MEPs**



## Continuity Check Protocol

The continuity check protocol is used for fault detection by a MEP within a maintenance association. The MEP periodically sends continuity check multicast messages. The receiving MEPs use the CC messages to build a MEP database of all MEPs in the maintenance association.

The continuity check protocol packets use the ethertype value 0x8902 and the multicast destination MAC address 01:80:c2:00:00:30.

## Linktrace Protocol

The linktrace protocol is used for path discovery between a pair of maintenance points. Linktrace messages are triggered by an administrator using the **traceroute** command to verify the path between a pair of MEPs under the same maintenance association. Linktrace messages can also be used to verify the path between an MEP and an MIP under the same maintenance domain. The operation of IEEE 802.1ag linktrace request and response messages is similar to the operation of Layer 3 **traceroute** commands. For more information about the **traceroute** command, see the *JUNOS System Basics Configuration Guide*.

## Creating the Maintenance Domain

To enable CFM on an Ethernet interface, maintenance domains, maintenance associations, and MEPs must be created and configured.

To create a maintenance domain, include the **maintenance-domain** *domain-name* statement at the [edit protocols oam ethernet connectivity-fault-management] hierarchy level.

Give the maintenance domain a name. Names can be in one of several formats.

## Configuring the Maintenance Domain Name Format

---

You can specify the maintenance domain name format as plain ASCII character string, domain name service (DNS) format, MAC address plus a two-octet identifier in the range from 0 through 65,535, or none. If none is specified, the maintenance domain name is not used. The default name format is ASCII character string

To configure the maintenance domain name format, include the `name-format` (`character-string` | `none` | `dns` | `mac+2octet`) statement at the `[edit protocols oam ethernet connectivity-fault-management maintenance-domain domain-name]` hierarchy level.

## Configuring the Maintenance Domain Level

---

The maintenance domain level is a mandatory parameter to indicate the nesting relationship between various maintenance domains. The level is embedded in each of the CFM frames. CFM messages with a given level are processed by MEPs at that same level. For example, the operator domain can be level 0, the provider domain at level 3, and the customer domain at level 7.

To configure the maintenance domain level, include the `level number` statement at the `[edit protocols oam ethernet connectivity-fault-management maintenance-domain domain-name]` hierarchy level.

## Creating the Maintenance Association

---

To create a maintenance association, include the `maintenance-association ma-name` statement at the `[edit protocols oam ethernet connectivity-fault-management maintenance-domain domain-name]` hierarchy level.

Give the maintenance association a name. The names can be in one of several formats.

## Configuring the Maintenance Association Short Name Format

---

You can specify the maintenance association short name format as a plain ASCII character string, the VLAN identifier of the VLAN you primarily associate with the maintenance association, a two-octet identifier in the range from 0 through 65,535, or a name in the format specified by RFC 2685. The default short name format is ASCII character string.

To configure the maintenance association short name format, include the `short-name-format` (`character-string` | `vlan` | `2octet` | `rfc-2685-vpn-id`) statement at the `[edit protocols oam ethernet connectivity-fault-management maintenance-domain domain-name maintenance-association ma-name]` hierarchy level.

## Configuring the Continuity Check

---

You can configure continuity check protocol parameters.

To enable the continuity check protocol, include the `continuity-check` statement at the `[edit protocols oam ethernet connectivity-fault-management maintenance-domain domain-name maintenance-association ma-name]` hierarchy level.

## Configuring the Continuity Check Hold Interval

---

You can specify the continuity check hold interval. The hold interval is the number of minutes to wait before flushing the MEP database if no updates occur. The default value is 10 minutes.

To configure the hold interval, include the `hold-interval` statement at the `[edit protocols oam ethernet connectivity-fault-management maintenance-domain domain-name maintenance-association ma-name continuity-check]` hierarchy level.

## Configuring the Continuity Check Interval

---

You can specify the continuity check message (CCMs) interval. The interval is the time between the transmission of CCMs. You can specify 10 minutes (`10m`), 1 minute (`1m`), 10 seconds (`10s`), 1 second (`1s`), 100 milliseconds (`100ms`), or 10 milliseconds (`10ms`). The default value is 1 minute.



**NOTE:** For the continuity check message interval to be configured for 10 milliseconds, the `delegate-processing` statement must also be included at the `[edit routing-options ppm]` hierarchy level.

To configure the interval, include the `interval` statement at the `[edit protocols oam ethernet connectivity-fault-management maintenance-domain domain-name maintenance-association ma-name continuity-check]` hierarchy level.

## Configuring the Continuity Check Loss Threshold

---

You can specify number of continuity check messages that can be lost before marking the MEP as down. The default value is 3 PDUs.

To configure the loss threshold, include the `loss-threshold` statement at the `[edit protocols oam ethernet connectivity-fault-management maintenance-domain domain-name maintenance-association ma-name continuity-check]` hierarchy level.

## Creating a Maintenance End Point

---

You can configure an MEP.

To configure the maintenance end point, include the `mep mep-id` statement at the `[edit protocols oam ethernet connectivity-fault-management maintenance-domain domain-name maintenance-association ma-name]` hierarchy level.

## Enabling Maintenance End Point Automatic Discovery

---

You can enable the MEP to accept continuity check messages from all remote MEPs of the same maintenance association.

To configure the automatic discovery, include the **auto-discovery** statement at the [edit protocols oam ethernet connectivity-fault-management maintenance-domain *domain-name* maintenance-association *ma-name* mep *mep-id*] hierarchy level:

## Configuring the Maintenance End Point Direction

---

You can specify the direction in which CFM packets are transmitted for the MEP.

Direction up CCMs are transmitted out of every logical interface which is part of the same bridging or VPLS instance except for the interface configured on this MEP.

Direction down CCMs are transmitted only out of the interface configured on this MEP.



**NOTE:** Ports in the STP blocking state do not block CFM packets destined to a down MEP. Ports in STP blocking state without the continuity check protocol configured, do block CFM packets.

To configure the direction, include the **direction** statement at the [edit protocols oam ethernet connectivity-fault-management maintenance-domain *domain-name* maintenance-association *ma-name* mep *mep-id*] hierarchy level.

## Configuring the Maintenance End Point Interface

---

You must specify the interface to which the MEP is attached. It can be a physical interface or logical interface.

To configure the interface, include the **interface** statement at the [edit protocols oam ethernet connectivity-fault-management maintenance-domain *domain-name* maintenance-association *ma-name* mep *mep-id*] hierarchy level.

## Configuring the Maintenance End Point Priority

---

You can specify the IEEE 802.1 priority bits that are used by continuity check and link trace messages.

To configure the priority, include the **priority** statement at the [edit protocols oam ethernet connectivity-fault-management maintenance-domain *domain-name* maintenance-association *ma-name* mep *mep-id*] hierarchy level.

## Creating a Remote Maintenance End Point

---

You can configure a remote MEP from which CCM messages are expected. If autodiscovery is not enabled, the remote MEP must be configured under the **mep** statement. If the remote MEP is not configured under the **mep** statement, the CCMs from the remote MEP are treated as errors.

To configure the remote MEP, include the **remote-mep** statement at the [edit protocols oam ethernet connectivity-fault-management maintenance-domain *domain-name* maintenance-association *ma-name* mep *mep-id*] hierarchy level.

## Configuring the Remote Maintenance End Point Action Profile

---

You can specify the name of the action profile to use for the remote MEP.

To configure the action profile, include the **action-profile** *profile-name* statement at the [edit protocols oam ethernet connectivity-fault-management maintenance-domain *domain-name* maintenance-association *ma-name* mep *mep-id* remote-mep *mep-id*] hierarchy level. The profile must already be defined at the [edit protocols oam ethernet connectivity-fault-management] hierarchy level.

## Creating a Connectivity-Fault Management Action Profile

---

You can create an action profile and configure the action to be taken when connectivity to a remote MEP fails.

To configure the action profile name, include the **action-profile** statement at the [edit protocols oam ethernet connectivity-fault-management] hierarchy level.

## Configuring a CFM Action Profile Action

---

You can configure the action to be taken when connectivity to a remote MEP fails.

To configure the action profile action, include the **default-action** statement at the [edit protocols oam ethernet connectivity-fault-management maintenance-domain *domain-name* maintenance-association *ma-name* mep *mep-id* remote-mep *mep-id* action-profile ] hierarchy level.



**NOTE:** The action profile is supported only on the physical interface level, and not on the logical interface level.

---

## Configuring a CFM Interface Down Action Profile Action

---

You can enable the interface down action to be taken when connectivity to a remote MEP fails.

To enable the interface down action, include the `interface-down` statement at the `[edit protocols oam ethernet connectivity-fault-management action-profile profile-name default-action]` hierarchy level.

```
[edit]
protocols {
 oam {
 ethernet {
 connectivity-fault-management {
 action-profile bring-down {
 default-actions {
 interface-down;
 }
 }
 }
 maintenance-domain md1 {
 level 0;
 maintenance-association ma1 {
 continuity-check {
 interval 100 ms;
 }
 mep 4001 {
 interface ge-4/1/0;
 direction down;
 remote-mep 1 {
 action-profile bring-down;
 }
 }
 }
 }
 }
 }
}
```



**NOTE:** The action profile is supported only on the physical interface level, and not on the logical interface level.

---

## Configuring the Linktrace Path Age Timer

---

If no response to a linktrace request is received, the request and response entry is deleted after the age timer expires. The timer is configured in seconds.

## Configuring the Linktrace Database Size

---

Configure the number of linktrace reply entries to be stored per linktrace request. The linktrace database is displayed using the `show oam ethernet connectivity-fault-management path-database` command.



## Chapter 41

# Configuring IEEE 802.1x Port-Based Network Access Control

This section contains the following topics:

- Overview of IEEE 802.1x Port-Based Network Access Control on page 591
- Administrative State of the Authenticator Port on page 592
- Administrative Mode of the Authenticator Port on page 592
- Configuring the Authenticator on page 592
- Viewing the dot1x Configuration on page 593

## Overview of IEEE 802.1x Port-Based Network Access Control

---

MX-series platforms support the IEEE 802.1x Port-Based Network Access Control (dot1x) protocol on Ethernet interfaces for validation of client and user credentials to prevent unauthorized access to a specified router port. Before authentication is complete, only 802.1x control packets are allowed and forwarded to the router control plane for processing. All other packets are dropped.

Authentication methods used must be 802.1x compliant. Authentication using RADIUS and Microsoft Active Directory servers is supported. The following user/client authentication methods are allowed:

- EAP-MD5 (RFC 3748)
- EAP-TTLS Requires client and server certificates (RFC 2716)
- EAP-TLS Requires only server certificate
- PEAP Requires only server certificate



**NOTE:** On the MX-series platform, 802.1x can be enabled on bridged ports only and not on routed ports.

---

Dynamic changes to a user session are supported to allow the router administrator to terminate an already authenticated session by using the “RADIUS disconnect” message defined in RFC 3576.

## Administrative State of the Authenticator Port

---

The administrative state of an authenticator port can take any of the following three states:

- Force authorized—Allows network access to all users of the port without requiring them to be authenticated. This is equivalent to not having any authentication enabled on the port.
- Force unauthorized—Denies network access to all users of the port. This is equivalent to disabling the port.
- Automatic—This is the default mode where the authentication server response determines if the port is opened for traffic or not. Only the successfully authenticated clients are allowed access, all others are denied.

In JUNOS software, the default mode is “automatic”. The “force authorized” and “force unauthorized” admin modes are not supported. You can achieve the functionality of “force authorized” mode by disabling `dot1x` on the required port. You can achieve the functionality of “force unauthorized” mode by disabling the port itself.

## Administrative Mode of the Authenticator Port

---

JUNOS software supports the supplicant mode of “Single” and not the “Single Secure” or “Multiple” modes. The “Single” mode option authenticates only the first client that connects to a port. All other clients that connect later (802.1x compliant or noncompliant) are allowed free access on that port without any further authentication. If the first authenticated client logs out, all other users are locked out until a client authenticates again.

## Configuring the Authenticator

---

To configure IEEE 802.1x Port-Based Network Access Control protocol on Ethernet interfaces you must configure the `authenticator` statement at the `[edit protocols dot1x]` hierarchy level. Use the `authentication-profile-name access-profile-name` statement to specify the authenticating RADIUS server, and use the `interface` statement to specify and configure the Gigabit Ethernet or Fast Ethernet interface on the router specifically for IEEE 802.1x protocol use; both at the `[edit protocols dot1x authenticator]` hierarchy level.

```
[edit protocols dot1x]
authenticator {
 authentication-profile-name access-profile-name;
 interface (xe-fpc/pic/port | ge-fpc/pic/port | fe-fpc/pic/port) {
 maximum-requests seconds;
 quiet-period seconds;
 reauthentication (disable | interval seconds);
 retries integer;
 server-timeout seconds;
 supplicant (single);
 supplicant-timeout seconds;
 transmit-period seconds;
```

```
}
}
```

## Viewing the dot1x Configuration

---

To view all dot1x configurations, use the **show dot1x interface** operational mode command. To view a dot1x configuration for a specific interface, use the **show dot1x interface (xe-fpc/pic/port | ge-fpc/pic/port | fe-fpc/pic/port) detail** operational mode command. See the *Network Interfaces Command Reference* for more information about this command.



## Chapter 42

# Configuring IEEE 802.3ah OAM Link-Fault Management

This section includes the following topics:

- Overview of IEEE 802.3ah OAM Link-Fault Management on page 595
- Configuring IEEE 802.3ah OAM Link-Fault Management on page 596
- Enabling IEEE 802.3ah OAM Support on page 596
- Configuring Link Discovery on page 596
- Configuring the OAM PDU Interval on page 597
- Configuring the OAM PDU Threshold on page 597
- Configuring Threshold Values for Local Fault Events on an Interface on page 597
- Disabling the Sending of Link Event TLVs on page 598
- Detecting Remote Faults on page 598
- Configuring an OAM Action Profile on page 598
- Specifying the Actions to Be Taken for Link-Fault Management Events on page 599
- Monitoring the Loss of Link Adjacency on page 600
- Monitoring Protocol Status on page 600
- Configuring Threshold Values for Fault Events in an Action Profile on page 600
- Applying an Action Profile on page 601
- Setting a Remote Interface into Loopback Mode on page 601
- Enabling Remote Loopback Support on the Local Interface on page 601
- Example: Configuring IEEE 802.3ah OAM Support on an Interface on page 602

## Overview of IEEE 802.3ah OAM Link-Fault Management

---

Ethernet interfaces capable of running at 100 Mbps or faster on MX-series, M-series (except M10 and M7 routers), and T-series routing platforms support the IEEE 802.3ah standard for Operation, Administration, and Management (OAM). You can configure IEEE 802.3ah OAM on Ethernet point-to-point direct links or links across Ethernet repeaters. The IEEE 802.3ah standard meets the requirement for OAM capabilities as Ethernet moves from being solely an enterprise technology to being a WAN and access technology, as well as being backward-compatible with existing Ethernet technology. JUNOS software supports IEEE 802.3ah link-fault management.

The features of link-fault management are:

- Discovery
- Link monitoring
- Remote fault detection
- Remote loopback



**NOTE:** Ethernet running on top of a Layer 2 protocol, such as Ethernet over ATM, is not supported in OAM configurations.

---

## Configuring IEEE 802.3ah OAM Link-Fault Management

---

You can configure threshold values for fault events that trigger the sending of link event TLVs when the values exceed the threshold. To set threshold values for fault events on an interface, include the **event-thresholds** statement at the **[edit protocols oam ethernet link-fault-management interface]** hierarchy level.

You can also configure OAM threshold values within an action profile and apply the action profile to multiple interfaces. To create an action profile, include the **action-profile** statement at the **[edit protocols oam ethernet link-fault-management]** hierarchy level.

To view OAM statistics, use the **show oam ethernet link-fault-management operational** mode command. To clear OAM statistics, use the **clear oam ethernet link-fault-management statistics** operational mode command. To clear link-fault management state information and restart the link discovery process on Ethernet interfaces, use the operational **clear oam ethernet link-fault-management state** mode command. For more information about these commands, see the *JUNOS Interfaces Command Reference*.

## Enabling IEEE 802.3ah OAM Support

---

To enable IEEE 802.3ah OAM support, include the **interface** statement at the **[edit protocols oam ethernet link-fault-management]** hierarchy level:

```
[edit protocols oam ethernet link-fault-management interface interface-name]
```

When you enable IEEE 802.3ah OAM on a physical interface, the discovery process is automatically triggered.

## Configuring Link Discovery

---

When the IEEE 802.3ah OAM protocol is enabled on a physical interface, the discovery process is automatically triggered. The discovery process permits Ethernet interfaces to discover and monitor the peer on the link if it also supports the IEEE 802.3ah standard.

You can specify the discovery mode used for IEEE 802.3ah OAM support. The discovery process is triggered automatically when OAM IEEE 802.3ah functionality is enabled on a port. Link monitoring is done when the interface sends periodic OAM PDUs.

To configure the discovery mode, include the `link-discovery` statement at the `[edit protocol oam ethernet link-fault-management interface interface-name]` hierarchy level:

```
[edit protocol oam ethernet link-fault-management interface interface-name]
link-discovery (active | passive);
```

In active mode, the interface discovers and monitors the peer on the link if the peer also supports IEEE 802.3ah OAM functionality. In passive mode, the peer initiates the discovery process. After the discovery process has been initiated, both sides participate in discovery.

## Configuring the OAM PDU Interval

---

Periodic OAM PDUs are sent to perform link monitoring.

You can specify the periodic OAM PDU sending interval for fault detection.

To configure the sending interval, include the `pdu-interval` statement at the `[edit protocol oam ethernet link-fault-management interface interface-name]` hierarchy level:

```
[edit protocol oam ethernet link-fault-management interface interface-name]
pdu-interval interval;
```

The periodic OAM PDU interval range is from 100 through 1000 milliseconds. The default sending interval is 1000 milliseconds.

## Configuring the OAM PDU Threshold

---

You can specify the number of OAM PDUs that an interface can miss before the link between peers is considered down.

To configure the number of PDUs that can be missed from the peer, include the `pdu-threshold` statement at the `[edit protocol oam ethernet link-fault-management interface interface-name]` hierarchy level:

```
[edit protocol oam ethernet link-fault-management interface interface-name]
pdu-threshold threshold-value;
```

The threshold value range is from 3 through 10. The default is three PDUs.

## Configuring Threshold Values for Local Fault Events on an Interface

---

You can configure threshold values on an interface for the local errors that trigger the sending of link event TLVs.

To set the error threshold values for sending event TLVs, include the `frame-error`, `frame-period`, `frame-period-summary`, and `symbol-period` statements at the `[edit protocols`

oam ethernet link-fault-management interface *interface-name* event-thresholds] hierarchy level:

```
[edit protocol oam ethernet link-fault-management interface interface-name]
event-thresholds {
 frame-error count;
 frame-period count;
 frame-period-summary count;
 symbol-period count;
}
```

## Disabling the Sending of Link Event TLVs

---

You can disable the sending of link event TLVs.

To disable the monitoring and sending of PDUs containing link event TLVs in periodic PDUs, include the `no-allow-link-events` statement at the [edit protocols oam ethernet link-fault-management interface *interface-name* negotiation-options] hierarchy level:

```
[edit protocol oam ethernet link-fault-management interface interface-name
 negotiation-options]
no-allow-link-events;
```

## Detecting Remote Faults

---

Fault detection is either based on flags or fault event type length values (TLVs) received in OAM protocol data units (PDUs). Flags that trigger a link fault are:

- Critical Event
- Dying Gasp
- Link Fault

The link event TLVs are sent by the remote DTE by means of event notification PDUs. Link event TLVs are:

- Errored Symbol Period Event
- Errored Frame Event
- Errored Frame Period Event
- Errored Frame Seconds Summary Event

## Configuring an OAM Action Profile

---

You can create an action profile to define event fault flags and thresholds and the action to be taken. You can then apply the action profile to one or more interfaces.

To configure an action profile, include the `action-profile` statement at the [edit protocols oam ethernet link-fault-management] hierarchy level:

```
action-profile profile-name {
```



```

 action {
 syslog;
 link-down;
 send-critical-event;
 }
 event {
 link-adjacency-loss;
 link-event-rate {
 frame-error count;
 frame-period count;
 frame-period-summary count;
 symbol-period count;
 }
 protocol-down;
 }
}

```

## Specifying the Actions to Be Taken for Link-Fault Management Events

---

You can specify the action to be taken by the system when the configured link-fault event occurs. Multiple action profiles can be applied to a single interface. For each action-profile, at least one event and one action must be specified. The actions are taken only when all of the events in the action profile are true. If more than one action is specified, all the actions are executed.

You might want to set a lower threshold for a specific action such as logging the error and set a higher threshold for another action such as sending a critical event TLV.

To specify the action, include the `action` statement at the `[edit protocols oam ethernet link-fault-management action-profile profile-name]` hierarchy level:

```

[edit protocol oam ethernet link-fault-management action-profile profile-name]
event {
 link-adjacency-loss;
 protocol-down;
}
action {
 syslog;
 link-down;
 send-critical-event;
}

```

To create a system log entry when the link-fault event occurs, include the `syslog` statement.

To administratively disable the link when the link-fault event occurs, include the `link-down` statement.

To send IEEE 802.3ah link event TLVs in the OAM PDU when a link-fault event occurs, include the `send-critical-event` statement.




---

**NOTE:** If multiple actions are specified in the action profile, all of the actions are executed in no particular order.

---

## Monitoring the Loss of Link Adjacency

---

You can specify actions be taken when link adjacency is lost. When link adjacency is lost, the system takes the action defined in the **action** statement of the action profile.

To configure the system to take action when link adjacency is lost, include the **link-adjacency-loss** statement at the [edit protocols oam ethernet link-fault-management action-profile *profile-name* event] hierarchy level:

```
[edit protocol oam ethernet link-fault-management action-profile profile-name]
link-adjacency-loss;
```

## Monitoring Protocol Status

---

When a higher level protocol has signaled a down status to the IEEE 802.3ah protocol, the system takes the action defined in the **action** statement of the action profile.

To monitor the IEEE 802.3ah protocol, include the **protocol-down** statement at the [edit protocols oam ethernet link-fault-management action-profile *profile-name* event] hierarchy level:

```
[edit protocol oam ethernet link-fault-management action-profile profile-name]
protocol-down;
```




---

**NOTE:** If multiple events are specified in the action profile, all the events must occur before the specified action is taken.

---

## Configuring Threshold Values for Fault Events in an Action Profile

---

You can configure link event thresholds for received error events that trigger the action specified in the **action** statement. You can then apply the action profile to one or more interfaces.

To configure link event thresholds, include the **link-event-rate** statement at the [edit protocols oam ethernet link-fault-management action-profile *profile-name* event] hierarchy level:

```
link-event-rate {
 frame-error count;
 frame-period count;
 frame-period-summary count;
 symbol-period count;
}
```

## Applying an Action Profile

---

You can apply an action profile to one or more interfaces.

To apply an action profile to an interface, include the `apply-action-profile` statement at the `[edit protocols oam ethernet link-fault-management action-profile interface interface-name]` hierarchy level:

```
[edit protocol oam ethernet link-fault-management interface interface-name]
 apply-action-profile profile-name;
```

## Setting a Remote Interface into Loopback Mode

---

You can configure the software to set the remote DTE into loopback mode on the following interfaces:

- IQ2 Gigabit Ethernet interfaces
- Ethernet interfaces on the MX-series routers

JUNOS software can place a remote DTE into loopback mode (if remote-loopback mode is supported by the remote DTE). When you place a remote DTE into loopback mode, the interface receives the remote-loopback request and puts the interface into remote-loopback mode. When the interface is in remote-loopback mode, all frames except OAM PDUs are looped back without any changes made to the frames. OAM PDUs continue to be sent to the management plane and processed.

To configure remote loopback, include the `remote-loopback` statement at the `[edit protocol oam ethernet link-fault-management interface interface-name]` hierarchy level:

```
[edit protocol oam ethernet link-fault-management interface interface-name]
 remote-loopback;
```

To take the remote DTE out of loopback mode, remove the `remote-loopback` statement from the configuration.

## Enabling Remote Loopback Support on the Local Interface

---

You can allow a remote DTE to set a local interface into remote loopback mode on IQ2 Gigabit Ethernet interfaces and all Ethernet interfaces on the MX-series routers. When a remote-loopback request is sent by a remote DTE, the JUNOS software places the local interface into loopback mode. When an interface is in loopback mode, all frames except OAM PDUs are looped back without any changes to the frames. OAM PDUs continue to be sent to the management plane and processed. By default, the remote loopback feature is not enabled.

To enable remote loopback, include the `allow-remote-loopback` statement at the `[edit protocol oam ethernet link-fault-management interface interface-name negotiation-options]` hierarchy level:

```
[edit protocol oam ethernet link-fault-management interface interface-name
 negotiation-options]
 allow-remote-loopback;
```



**NOTE:** Activation of OAM remote loopback may result in data frame loss.

### Example: Configuring IEEE 802.3ah OAM Support on an Interface

Configure 802.3ah OAM support on an MX-series 10-Gigabit Ethernet interface:

```
[edit]
protocols {
 oam {
 ethernet {
 link-fault-management {
 interface xe-0/0/0 {
 link-discovery active;
 pdu-interval 800;
 pdu-threshold 4;
 remote-loopback;
 negotiation-options {
 allow-remote-loopback;
 }
 event-thresholds {
 frame-error 30;
 frame-period 50;
 frame-period summary 40;
 symbol-period 20;
 }
 }
 }
 }
 }
}
```

## Chapter 43

# Configuring VRRP and VRRP for IPv6

This section contains the following topics:

- Overview of VRRP and VRRP for IPv6 on page 603
- Configuring VRRP and VRRP for IPv6 on page 603

### Overview of VRRP and VRRP for IPv6

---

For Ethernet, Fast Ethernet, Tri-Rate Ethernet copper, Gigabit Ethernet, 10-Gigabit Ethernet, and Ethernet logical interfaces, you can configure the Virtual Router Redundancy Protocol (VRRP) and VRRP for IPv6. VRRP and VRRP for IPv6 allow hosts on a LAN to make use of redundant routing platforms on that LAN without requiring more than the static configuration of a single default route on the hosts. The VRRP routing platforms share the IP address corresponding to the default route configured on the hosts. At any time, one of the VRRP routing platforms is the master (active) and the others are backups. If the master fails, one of the backup routers becomes the new master router, thus always providing a virtual default routing platform and allowing traffic on the LAN to be routed without relying on a single routing platform.

VRRP is defined in RFC 3768, *Virtual Router Redundancy Protocol*.

For VRRP and VRRP for IPv6 overview information, configuration guidelines, and statement summaries, see the *JUNOS High Availability Configuration Guide*.

### Configuring VRRP and VRRP for IPv6

---

To configure VRRP or VRRP for IPv6, include the `vrrp-group` or `vrrp-inet6-group` statement, respectively. These statements are available at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* family inet address *address*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family inet address *address*]

The VRRP and VRRP IPv6 configuration statements are as follows:

```
(vrrp-group | vrrp-inet-group) group-number {
 (accept-data | no-accept-data);
 advertise-interval seconds;
```

```

authentication-key key;
authentication-type authentication;
fast-interval milliseconds;
(preempt | no-preempt) {
 hold-time seconds;
}
priority-number number;
track {
 priority-hold-time;
 interface interface-name {
 priority-cost priority;
 bandwidth-threshold bits-per-second {
 priority-cost;
 }
 }
}
virtual-address [addresses];
}

```

To trace VRRP and VRRP for IPv6 operations, include the `traceoptions` statement at the `[edit protocols vrrp]` hierarchy level:

```

[edit protocols vrrp traceoptions]
file {
 filename filename;
 files number;
 size size;
 (world-readable | no-world-readable);
}
flag flag;

```

To configure the startup period for VRRP and VRRP for IPv6 operations, include the `startup-silent-period` statement at the `[edit protocols vrrp]` hierarchy level:

```

[edit protocols vrrp]
startup-silent-period seconds;

```

## Chapter 44

# Specifying the IP Demux Underlying Interface Family Type

This section contains the following topics:

- Overview of IP Demux Underlying Interface Family Type on page 605
- Specifying the IP Demux Underlying Interface Family Type on page 605

## Overview of IP Demux Underlying Interface Family Type

---

IP demultiplexing (demux) interfaces must use an underlying logical interface to receive packets. You must specify this underlying interface as having either a destination or source interface family type.



**NOTE:** IP demux interfaces currently support only the Internet Protocol version 4 (IPv4) suite (inet).

---

## Specifying the IP Demux Underlying Interface Family Type

---

You can configure an IP demux underlying interface for any Ethernet type (Fast Ethernet, Gigabit Ethernet, or 10-Gigabit Ethernet).



**NOTE:** You cannot configure an aggregated Ethernet interface as an IP demux underlying interface. This configuration is not supported.

---

To configure an IP demux underlying interface, include the **demux-destination** family or **demux-source** family statement at the **[edit interfaces]** hierarchy level:

```
[edit interfaces]
interface-name {
 unit logical-unit-number {
 demux-destination family;
 demux-source family;
 }
}
```





## Chapter 45

# Configuring Gigabit Ethernet Accounting and Policing

This section contains the following topics:

- Overview of Gigabit Ethernet Accounting and Policing on page 607
- Configuring Gigabit Ethernet Policers on page 609
- Configuring Gigabit Ethernet Two-Color and Tricolor Policers on page 614
- Configuring MAC Address Accounting on page 618

## Overview of Gigabit Ethernet Accounting and Policing

---

For Gigabit Ethernet IQ PICs and Gigabit Ethernet PICs with SFPs (except the 10-port Gigabit Ethernet PIC and the built-in Gigabit Ethernet port on the M7i platform), you can configure granular per-VLAN class-of-service (CoS) capabilities and extensive instrumentation and diagnostics on a per-VLAN and per-MAC address basis.

VLAN rewrite, tagging, and deleting enables you to use VLAN address space to support more customers and services.

VPLS allows you to provide a point-to-multipoint LAN between a set of sites in a VPN. Ethernet IQ PICs and Gigabit Ethernet PICs with SFPs (except the 10-port Gigabit Ethernet PIC and the built-in Gigabit Ethernet port on the M7i platform) are combined with VPLS to deliver metro Ethernet service.

The Gigabit Ethernet PICs require an enhanced FPC.

For Gigabit Ethernet IQ2 and 10-Gigabit Ethernet IQ2 interfaces, you can apply Layer 2 policing to logical interfaces in the egress or ingress direction. Policers are configured at the [edit firewall] hierarchy.

Table 52 on page 608 lists the capabilities of Gigabit Ethernet IQ PICs and Gigabit Ethernet PICs with SFPs (except the 10-port Gigabit Ethernet PIC and the built-in Gigabit Ethernet port on the M7i platform).

**Table 52: Capabilities of Gigabit Ethernet IQ and Gigabit Ethernet with SFPs**

| Capability                                                              | Gigabit Ethernet IQ (SFP)  | Gigabit Ethernet (SFP) |
|-------------------------------------------------------------------------|----------------------------|------------------------|
| <b>Layer 2</b>                                                          |                            |                        |
| 802.3ad link aggregation                                                | Yes                        | Yes                    |
| Maximum VLANs per port                                                  | 384                        | 1023                   |
| Maximum transmission unit (MTU) size                                    | 9192                       | 9192                   |
| MAC learning                                                            | Yes                        | Yes                    |
| MAC accounting                                                          | Yes                        | Yes                    |
| MAC filtering                                                           | Yes                        | Yes                    |
| Destinations per port                                                   | 960                        | 960                    |
| Sources per port                                                        | 64                         | 64                     |
| Hierarchical MAC policers                                               | Yes, premium and aggregate | No, aggregate only     |
| Multiple TPID support and IP service for nonstandard TPIDs              | Yes                        | Yes                    |
| Multiple Ethernet encapsulations                                        | Yes                        | Yes                    |
| Dual VLAN tags                                                          | Yes                        | No                     |
| VLAN rewrite                                                            | Yes                        | No                     |
| Layer 2 VPNs                                                            |                            |                        |
| VLAN CCC                                                                | Yes                        | Yes                    |
| Port-based CCC                                                          | Yes                        | Yes                    |
| Extended VLAN CCC Virtual Metropolitan Area Network (VMAN) Tag Protocol | Yes                        | Yes                    |
| CoS                                                                     |                            |                        |
| PIC-based egress queues                                                 | Yes                        | Yes                    |
| Queued VLANs                                                            | Yes                        | No                     |
| VPLS                                                                    | Yes                        | Yes                    |

For more information about configuring VPLS, see the *JUNOS VPNs Configuration Guide* and the *JUNOS Feature Guide*.

You can also configure CoS on logical IQ interfaces. For more information, see the *JUNOS Class of Service Configuration Guide*.

## Configuring Gigabit Ethernet Policers

On Gigabit Ethernet IQ and Gigabit Ethernet PICs with SFPs (except the 10-port Gigabit Ethernet PIC and the built-in Gigabit Ethernet port on the M7i platform), you can define rate limits for premium and aggregate traffic received on the interface. These policers allow you to perform simple traffic policing without configuring a firewall filter. First you configure the Ethernet policer profile, next you classify ingress and egress traffic, then you can apply the policer to a logical interface.

For Gigabit Ethernet PICs with SFPs (except the 10-port Gigabit Ethernet PIC and the built-in Gigabit Ethernet port on the M7i platform), the policer rates you configure can be different than the rates on the Packet Forward Engine. The difference results from Layer 2 overhead. The PIC accounts for this difference.

This section contains the following topics:

- Configuring a Policer on page 609
- Specifying an Input Priority Map on page 610
- Specifying an Output Priority Map on page 610
- Applying a Policer on page 611
- Configuring MAC Address Filtering on page 613
- Example: Configuring Gigabit Ethernet Policers on page 613

### Configuring a Policer

To configure an Ethernet policer profile, include the `ethernet-policer-profile` statement at the [edit interfaces *interface-name* *gigether-options* *ethernet-switch-profile*] hierarchy level:

```
[edit interfaces interface-name gigether-options ethernet-switch-profile]
ethernet-policer-profile {
 policer cos-policer-name {
 aggregate {
 bandwidth-limit bps;
 burst-size-limit bytes;
 }
 premium {
 bandwidth-limit bps;
 burst-size-limit bytes;
 }
 }
}
```

In the Ethernet policer profile, the aggregate-priority policer is mandatory; the premium-priority policer is optional.

For aggregate and premium policers, you specify the bandwidth limit in bits per second. You can specify the value as a complete decimal number or as a decimal number followed by the abbreviation k (1000), m (1,000,000), or g (1,000,000,000). There is no absolute minimum value for bandwidth limit, but any value below 61,040 bps will result in an effective rate of 30,520 bps. The maximum bandwidth limit is 4.29 Gbps.

The maximum burst size controls the amount of traffic bursting allowed. To determine the burst-size limit, you can multiply the bandwidth of the interface on which you are applying the filter by the amount of time you allow a burst of traffic at that bandwidth to occur:

$$\text{burst size} = \text{bandwidth} \times \text{allowable time for burst traffic}$$

If you do not know the interface bandwidth, you can multiply the maximum MTU of the traffic on the interface by 10 to obtain a value. For example, the burst size for an MTU of 4700 would be 47,000 bytes. The burst size should be at least 10 interface MTUs. The maximum value for the burst-size limit is 100 MB.

## Specifying an Input Priority Map

An input priority map identifies ingress traffic with specified IEEE 802.1p priority values, and classifies that traffic as premium.

If you include a premium-priority policer, you can specify an input priority map by including the `ieee802.1p premium` statement at the `[edit interfaces interface-name gigether-options ethernet-policer-profile input-priority-map]` hierarchy level:

```
[edit interfaces interface-name gigether-options ethernet-policer-profile input-priority-map]
ieee802.1p premium [values];
```

The priority values can be from 0 through 7. The remaining traffic is classified as nonpremium (or aggregate). For a configuration example, see “Example: Configuring Gigabit Ethernet Policers” on page 613.



**NOTE:** On IQ2 interfaces and MX-series interfaces, when a VLAN tag is pushed, the inner VLAN IEEE 802.1p bits are copied to the IEEE bits of the VLAN or VLANs being pushed. If the original packet is untagged, the IEEE bits of the VLAN or VLANs being pushed are set to 0.

---

## Specifying an Output Priority Map

An output priority map identifies egress traffic with specified queue classification and packet loss priority (PLP), and classifies that traffic as premium.

If you include a premium-priority policer, you can specify an output priority map by including the `classifier` statement at the `[edit interfaces interface-name gigether-options ethernet-policer-profile output-priority-map]` hierarchy level:

```
[edit interfaces interface-name gigether-options ethernet-policer-profile
 output-priority-map]
classifier {
 premium {
 forwarding-class class-name {
 loss-priority (high | low);
 }
 }
}
```

You can define a forwarding class, or you can use a predefined forwarding class. Table 53 on page 611 shows the predefined forwarding classes and their associated queue assignments.

**Table 53: Default Forwarding Classes**

| Forwarding Class Name | Queue   |
|-----------------------|---------|
| best-effort           | Queue 0 |
| expedited-forwarding  | Queue 1 |
| assured-forwarding    | Queue 2 |
| network-control       | Queue 3 |

For more information about CoS forwarding classes, see the *JUNOS Class of Service Configuration Guide*. For a configuration example, see “Example: Configuring Gigabit Ethernet Policers” on page 613.

## Applying a Policer

On Gigabit Ethernet IQ and Gigabit Ethernet PICs with SFPs (except the 10-port Gigabit Ethernet PIC and the built-in Gigabit Ethernet port on the M7i platform), you can apply input and output policers that define rate limits for premium and aggregate traffic received on the logical interface. Aggregate policers are supported on Gigabit Ethernet PICs with SFPs (except the 10-port Gigabit Ethernet PIC and the built-in Gigabit Ethernet port on the M7i platform).

These policers allow you to perform simple traffic policing without configuring a firewall filter. For information about defining these policers, see “Configuring Gigabit Ethernet Policers” on page 609.

To apply policers to specific source MAC addresses, include the `accept-source-mac` statement:

```
accept-source-mac {
 mac-address mac-address {
 policer {
 input cos-policer-name;
 output cos-policer-name;
 }
 }
}
```

You can include these statements at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* ]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

You can specify the MAC address as *nn:nn:nn:nn:nn:nn* or *nnnn.nnnn.nnnn*, where *n* is a hexadecimal number. You can configure up to 64 source addresses. To specify more than one address, include multiple `mac-address` statements in the logical interface configuration.



**NOTE:** On untagged Gigabit Ethernet interfaces you should not configure the `source-address-filter` statement at the [edit interfaces *ge-fpc/pic/port* *gigether-options*] hierarchy level and the `accept-source-mac` statement at the [edit interfaces *ge-fpc/pic/port* *gigether-options* unit *logical-unit-number*] hierarchy level simultaneously. If these statements are configured for the same interfaces at the same time, an error message is displayed.

On tagged Gigabit Ethernet interfaces you should not configure the `source-address-filter` statement at the [edit interfaces *ge-fpc/pic/port* *gigether-options*] hierarchy level and the `accept-source-mac` statement at the [edit interfaces *ge-fpc/pic/port* *gigether-options* unit *logical-unit-number*] hierarchy level with an identical MAC address specified in both filters. If these statements are configured for the same interfaces with an identical MAC address specified, an error message is displayed.



**NOTE:** If the remote Ethernet card is changed, the interface does not accept traffic from the new card because the new card has a different MAC address.

---

The MAC addresses you include in the configuration are entered into the routing platform's MAC database. To view the routing platform's MAC database, enter the `show interfaces mac-database interface-name` command:

```
user@host> show interfaces mac-database interface-name
```

In the **input** statement, list the name of one policer template to be evaluated when packets are received on the interface.

In the **output** statement, list the name of one policer template to be evaluated when packets are transmitted on the interface.



**NOTE:** On IQ2 PIC interfaces, the default value for maximum retention of entries in the MAC address table has changed, for cases in which the table is not full. The new holding time is 12 hours. The previous retention time of 3 minutes is still in effect when the table is full.

---

You can use the same policer one or more times.

If you apply both policers and firewall filters to an interface, input policers are evaluated before input firewall filters, and output policers are evaluated after output firewall filters.

## Configuring MAC Address Filtering

You cannot explicitly define traffic with specific source MAC addresses to be rejected; however, for Gigabit Ethernet IQ and Gigabit Ethernet PICs with SFPs (except the 10-port Gigabit Ethernet PIC and the built-in Gigabit Ethernet port on the M7i platform), you can block all incoming packets that do not have a source address specified in the `accept-source-mac` statement. For more information about the `accept-source-mac` statement, see “Applying a Policer” on page 611.

To enable this blocking, include the `source-filtering` statement at the `[edit interfaces interface-name gigether-options]` hierarchy level:

```
[edit interfaces interface-name gigether-options]
source-filtering;
```

For more information about the `source-filtering` statement, see “Enabling Ethernet MAC Address Filtering” on page 517.

To accept traffic even though it does not have a source address specified in the `accept-source-mac` statement, include the `no-source-filtering` statement at the `[edit interfaces interface-name gigether-options]` hierarchy level:

```
[edit interfaces interface-name gigether-options]
no-source-filtering;
```

For more information about the `accept-source-mac` statement, see “Applying a Policer” on page 611.

## Example: Configuring Gigabit Ethernet Policers

Configure interface `ge-6/0/0` to treat priority values 2 and 3 as premium. On ingress, this means that IEEE 802.1p priority values 2 and 3 are treated as premium. On egress, it means traffic that is classified into queue 0 or 1 with PLP of low and queue 2 or 3 with PLP of high, is treated as premium.

Define a policer that limits the premium bandwidth to 100 Mbps and burst size to 3 k, and the aggregate bandwidth to 200 Mbps and burst size to 3 k.

Specify that frames received from the MAC address `00:01:02:03:04:05` and the VLAN ID 600 are subject to the policer on input and output. On input, this means frames received with the source MAC address `00:01:02:03:04:05` and the VLAN ID 600 are subject to the policer. On output, this means frames transmitted from the routing platform with the destination MAC address `00:01:02:03:04:05` and the VLAN ID 600 are subject to the policer.

```
[edit interfaces]
ge-6/0/0 {
 gigether-options {
 ether-switch-profile {
 ether-policer-profile {
 input-priority-map {
 ieee-802.1p {
 premium [2 3];
```

```
}
}
output-priority-map {
 classifier {
 premium {
 forwarding-class best-effort {
 loss-priority low;
 }
 forwarding-class expedited-forwarding {
 loss-priority low;
 }
 forwarding-class assured-forwarding {
 loss-priority high;
 }
 forwarding-class network-control {
 loss-priority high;
 }
 }
 }
}

} }
policer policer-1 {
 premium {
 bandwidth-limit 100m;
 burst-size-limit 3k;
 }
 aggregate {
 bandwidth-limit 200m;
 burst-size-limit 3k;
 }
}

} }
}
unit 0 {
 accept-source-mac {
 mac-address 00:01:02:03:04:05 {
 policer {
 input policer-1;
 output policer-1;
 }
 }
 }
}
}
```

## Configuring Gigabit Ethernet Two-Color and Tricolor Policers

For Gigabit Ethernet and 10-Gigabit Ethernet IQ2 interfaces on M-series and T-series routing platforms, you can configure two-color and tricolor marking policers and apply them to logical interfaces to prevent traffic on the interface from consuming bandwidth inappropriately.

Networks police traffic by limiting the input or output transmission rate of a class of traffic on the basis of user-defined criteria. Policing traffic allows you to control the



maximum rate of traffic sent or received on an interface and to partition a network into multiple priority levels or classes of service.

Policers require you to apply a burst size and bandwidth limit to the traffic flow, and set a consequence for packets that exceed these limits—usually a higher loss priority, so that packets exceeding the policer limits are discarded first.

Juniper Networks routing platform architectures support three types of policer:

- Two-color policer—A two-color policer (or “policer” when used without qualification) meters the traffic stream and classifies packets into two categories of packet loss priority (PLP) according to a configured bandwidth and burst-size limit. You can mark packets that exceed the bandwidth and burst-size limit in some way, or simply discard them. A policer is most useful for metering traffic at the port (physical interface) level.
- Single-rate tricolor marking (srTCM)—A single-rate tricolor marking policer is defined in RFC 2697, *A Single Rate Three Color Marker*, as part of an assured forwarding (AF) per-hop-behavior (PHB) classification system for a Differentiated Services (DiffServ) environment. This type of policer meters traffic based on the configured committed information rate (CIR), committed burst size (CBS), and excess burst size (EBS). Traffic is marked as belonging to one of three categories (green, yellow, or red) based on whether the packets arriving are below the CBS (green), exceed the CBS (yellow) but not the EBS, or exceed the EBS (red). Single-rate TCM is most useful when a service is structured according to packet length and not peak arrival rate.
- Two-rate Tricolor Marking (trTCM)—This type of policer is defined in RFC 2698, *A Two Rate Three Color Marker*, as part of an assured forwarding (AF) per-hop-behavior (PHB) classification system for a Differentiated Services (DiffServ) environment. This type of policer meters traffic based on the configured CIR and peak information rate (PIR), along with their associated burst sizes, the CBS and EBS. Traffic is marked as belonging to one of three categories (green, yellow, or red) based on whether the packets arriving are below the CIR (green), exceed the CIR (yellow) but not the PIR, or exceed the PIR (red). Two-rate TCM is most useful when a service is structured according to arrival rates and not necessarily packet length.

Unlike policing (described in “Configuring Gigabit Ethernet Policers” on page 609), configuring two-color policers and tricolor marking policers requires that you configure a firewall filter.

This section contains the following topics:

- Configuring a Policer on page 615
- Applying a Policer on page 616
- Example: Configuring and Applying a Policer on page 617

## Configuring a Policer

Two-color and tricolor marking policers are configured at the [edit firewall] hierarchy level.

A tricolor marking policer polices traffic on the basis of metering rates, including the CIR, the PIR, their associated burst sizes, and any policing actions configured for the traffic.

To configure tricolor policer marking, include the `three-color-policer` statement with options at the `[edit firewall]` hierarchy level:

```
[edit firewall]
three-color-policer name {
 action {
 loss-priority high {
 then discard;
 }
 }
 single-rate {
 (color-aware | color-blind);
 committed-information-rate bps;
 committed-burst-size bytes;
 excess-burst-size bytes;
 }
 two-rate {
 (color-aware | color-blind);
 committed-information-rate bps;
 committed-burst-size bytes;
 peak-information-rate bps;
 peak-burst-size bytes;
 }
}
```

For more information about configuring tricolor policer markings, see the *JUNOS Policy Framework Configuration Guide* and the *JUNOS Class of Service Configuration Guide*.

## Applying a Policer

Apply a two-color policer or tricolor policer to a logical interface to prevent traffic on the interface from consuming bandwidth inappropriately. To apply two-color or tricolor policers, include the `layer2-policer` statement:

```
layer2-policer {
 input-policer policer-name;
 input-three-color policer-name;
 output-policer policer-name;
 policer-name;
}
```

You can include these statements at the following hierarchy levels:

- `[edit interfaces interface-name unit logical-unit-number]`
- `[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number]`

Use the `input-policer` statement to apply a two-color policer to received packets on a logical interface and the `input-three-color` statement to apply a tricolor policer. Use

the `output-policer` statement to apply a two-color policer to transmitted packets on a logical interface and the `output-three-color` statement to apply a tricolor policer. The specified policers must be configured at the `[edit firewall]` hierarchy level. For each interface, you can configure a three-color policer or two-color input policer or output policers—you cannot configure both a three-color policer and a two-color policer.

### **Example: Configuring and Applying a Policer**

Configure tricolor policers and apply them to an interface:

```
[edit firewall]
three-color-policer three-color-policer-color-blind {
 logical-interface-policer;
 two-rate {
 color-blind;
 committed-information-rate 1500000;
 committed-burst-size 150;
 peak-information-rate 3;
 peak-burst-size 300;
 }
}
three-color-policer three-color-policer-color-aware {
 logical-interface-policer;
 two-rate {
 color-aware;
 committed-information-rate 1500000;
 committed-burst-size 150;
 peak-information-rate 3;
 peak-burst-size 300;
 }
}
[edit interfaces ge-1/1/0]
unit 1 {
 layer2-policer {
 input-three-color three-color-policer-color-blind;
 output-three-color three-color-policer-color-aware;
 }
}
```

Configure a two-color policer and apply it to an interface:

```
[edit firewall]
policer two-color-policer {
 logical-interface-policer;
 if-exceeding {
 bandwidth-percent 90;
 burst-size-limit 300;
 }
 then loss-priority-high;
}
[edit interfaces ge-1/1/0]
unit 2 {
 layer2-policer {
 input-policer two-color-policer;
 output-policer two-color-policer;
 }
}
```

```
}
}
```

## Configuring MAC Address Accounting

---

For Gigabit Ethernet IQ and Gigabit Ethernet PICs with SFPs (except the 10-port Gigabit Ethernet PIC and the built-in Gigabit Ethernet port on the M7i platform), you can configure whether source and destination MAC addresses are dynamically learned. To configure MAC address accounting, include the `mac-learn-enable` statement at the [edit interfaces *interface-name* *gigether-options* *ethernet-switch-profile*] hierarchy level:

```
[edit interfaces interface-name gigether-options ethernet-switch-profile]
mac-learn-enable;
```

To prohibit the interface from dynamically learning source and destination MAC addresses, include the `no-mac-learn-enable` statement at the [edit interfaces *interface-name* *gigether-options* *ethernet-switch-profile*] hierarchy level:

```
[edit interfaces interface-name gigether-options ethernet-switch-profile]
no-mac-learn-enable;
```

MAC address learning is based on source addresses. You can start accounting for traffic after it has been sent from the MAC address. Once the MAC address is learned, the frames and bytes transmitted to or received from the MAC address can be tracked.

## Chapter 46

# Configuring Gigabit Ethernet Autonegotiation

This section contains the following topics:

- Overview of Gigabit Ethernet Autonegotiation on page 619
- Configuring Gigabit Ethernet Autonegotiation on page 619

## Overview of Gigabit Ethernet Autonegotiation

---

Autonegotiation is enabled by default on all Gigabit Ethernet and Tri-Rate Ethernet copper interfaces. However, you can explicitly enable autonegotiation to configure remote fault options manually.



**NOTE:** For Gigabit Ethernet interfaces installed in J4350 and J6350 Services Routers, when you manually configure either the link mode or speed settings, the system ignores the configuration and generates a system log message. When autonegotiation is enabled and you specify the link mode and speed, the link autonegotiates with the manually configured settings. When autonegotiation is disabled and you configure both the link mode and speed, the link operates with the manually configured settings. If you disable autonegotiation and do not manually configure the link mode and speed, the link operates at 1000 Mbps full duplex.



**NOTE:** When you configure the Tri-Rate Ethernet copper interface to operate at 1 Gbps, autonegotiation must be enabled.

## Configuring Gigabit Ethernet Autonegotiation

---

To configure explicit autonegotiation and remote fault, include the `auto-negotiation` statement and the `remote-fault` option at the [edit interfaces *ge-fpc/pic/port* *gigether-options*] hierarchy level.

```
[edit interfaces ge-fpc/pic/port gigether-options]
(auto-negotiation | no-auto-negotiation) remote-fault <local-interface-online |
local-interface-offline>
```

To enable flow control, include the **flow-control** statement at the [edit interfaces *ge-fpc/pic>/port gigether-options*] hierarchy level.

To display Gigabit Ethernet interface details, use the operational mode command **show interfaces ge-*fpc/pic/port* extensive**.

Table 54 on page 620 and Table 55 on page 622 provide information about the autonegotiation status on local and remote routers with fiber interfaces. The status of the link and LED can vary depending on the level of autonegotiation set and the transmit and receive fiber status.

**Table 54: Mode and Autonegotiation Status (Local)**

| Transmit | Receive | Mode               | LED   | Link | Autonegotiation Status |
|----------|---------|--------------------|-------|------|------------------------|
| ON       | ON      | Default            | Green | UP   | Complete               |
| ON       | OFF     | Default            | Red   | DOWN |                        |
| OFF      | ON      | Default            | Red   | DOWN |                        |
| OFF      | OFF     | Default            | Red   | DOWN |                        |
| ON       | ON      | Default            | Red   | DOWN |                        |
| ON       | ON      | Default            | Green | UP   | No-autonegotiation     |
| ON       | OFF     | Default            | Red   | DOWN |                        |
| OFF      | OFF     | Default            | Red   | DOWN |                        |
| ON       | ON      | Default            | Green | UP   |                        |
| ON       | ON      | Default            | Red   | DOWN |                        |
| ON       | ON      | No-autonegotiation | Green | UP   | Incomplete             |
| ON       | OFF     | No-autonegotiation | Red   | DOWN |                        |
| OFF      | ON      | No-autonegotiation | Green | UP   |                        |
| OFF      | OFF     | No-autonegotiation | Red   | DOWN |                        |
| ON       | ON      | No-autonegotiation | Red   | DOWN |                        |
| ON       | ON      | Explicit           | Green | UP   | Complete               |
| ON       | OFF     | Explicit           | Red   | DOWN |                        |
| OFF      | ON      | Explicit           | Red   | DOWN |                        |
| OFF      | OFF     | Explicit           | Red   | DOWN |                        |
| ON       | ON      | Explicit           | Red   | DOWN |                        |

**Table 54: Mode and Autonegotiation Status (Local)** *(continued)*

| Transmit | Receive | Mode                   | LED   | Link | Autonegotiation Status |
|----------|---------|------------------------|-------|------|------------------------|
| ON       | OFF     | Explicit + RFI-Offline | Red   | DOWN |                        |
| ON       | ON      | Explicit               | Green | UP   | No-autonegotiation     |
| ON       | OFF     | Explicit               | Red   | DOWN |                        |
| OFF      | ON      | Explicit               | Green | UP   |                        |
| OFF      | OFF     | Explicit               | Red   | DOWN |                        |
| ON       | ON      | Explicit               | Red   | DOWN |                        |
| ON       | ON      | Explicit + RFI-Offline | Green | UP   | Complete               |
| OFF      | ON      | Explicit + RFI-Offline | Red   | DOWN |                        |
| OFF      | OFF     | Explicit + RFI-Offline | Red   | DOWN |                        |
| ON       | ON      | Explicit + RFI-Offline | Red   | DOWN |                        |
| ON       | ON      | Explicit + RFI-Offline | Green | UP   | No-autonegotiation     |
| ON       | OFF     | Explicit + RFI-Offline | Red   | DOWN |                        |
| OFF      | ON      | Explicit + RFI-Offline | Green | UP   |                        |
| OFF      | OFF     | Explicit + RFI-Offline | Red   | DOWN |                        |
| ON       | ON      | Explicit + RFI-Offline | Red   | DOWN |                        |
| ON       | ON      | Explicit + RFI-Offline | Red   | DOWN | Complete               |
| ON       | OFF     | Explicit + RFI-Offline | Red   | DOWN |                        |
| OFF      | ON      | Explicit + RFI-Online  | Red   | DOWN |                        |
| OFF      | OFF     | Explicit + RFI-Online  | Red   | DOWN |                        |
| ON       | ON      | Explicit + RFI-Online  | Red   | DOWN |                        |
| ON       | ON      | Explicit + RFI-Online  | Green | UP   | No-autonegotiation*    |
| ON       | OFF     | Explicit + RFI-Online  | Red   | DOWN |                        |
| OFF      | ON      | Explicit + RFI-Online  | Green | UP   |                        |
| OFF      | OFF     | Explicit + RFI-Online  | Red   | DOWN |                        |
| ON       | ON      | Explicit + RFI-Online  | Green | UP   |                        |
| ON       | ON      | Explicit + RFI-Online  | Red   | DOWN |                        |
| ON       | ON      | Explicit + RFI-Online  | Red   | DOWN | Complete               |

**Table 54: Mode and Autonegotiation Status (Local)** *(continued)*

| Transmit | Receive | Mode                  | LED   | Link | Autonegotiation Status |
|----------|---------|-----------------------|-------|------|------------------------|
| ON       | OFF     | Explicit + RFI-Online | Red   | DOWN |                        |
| OFF      | ON      | Explicit + RFI-Online | Red   | DOWN |                        |
| OFF      | OFF     | Explicit + RFI-Online | Red   | DOWN |                        |
| ON       | ON      | Explicit + RFI-Online | Red   | DOWN |                        |
| ON       | ON      | Explicit + RFI-Online | Green | UP   | Complete               |

**Table 55: Mode and Autonegotiation Status (Remote)**

| Transmit | Receive | Mode               | LED   | Link | Autonegotiation Status |
|----------|---------|--------------------|-------|------|------------------------|
| ON       | ON      | Default            | Green | UP   | Complete               |
| ON       | ON      | Default            | Red   | DOWN |                        |
| ON       | OFF     | Default            | Red   | DOWN |                        |
| OFF      | ON      | Default            | Red   | DOWN |                        |
| OFF      | OFF     | Default            | Red   | DOWN |                        |
| ON       | ON      | No-autonegotiation | Green | UP   | Incomplete             |
| ON       | ON      | No-autonegotiation | Red   | DOWN |                        |
| ON       | OFF     | No-autonegotiation | Red   | DOWN |                        |
| OFF      | ON      | No-autonegotiation | Green | UP   |                        |
| OFF      | OFF     | No-autonegotiation | Red   | DOWN |                        |
| ON       | ON      | No-autonegotiation | Green | UP   | Incomplete             |
| ON       | ON      | No-autonegotiation | Red   | DOWN |                        |
| ON       | ON      | No-autonegotiation | Red   | DOWN |                        |
| ON       | OFF     | No-autonegotiation | Red   | DOWN |                        |
| OFF      | ON      | No-autonegotiation | Green | UP   |                        |
| OFF      | OFF     | No-autonegotiation | Red   | DOWN |                        |
| ON       | ON      | Default            | Green | UP   | Complete               |



**Table 55: Mode and Autonegotiation Status (Remote)** *(continued)*

| Transmit | Receive | Mode               | LED   | Link | Autonegotiation Status |
|----------|---------|--------------------|-------|------|------------------------|
| ON       | ON      | Default            | Red   | DOWN |                        |
| ON       | OFF     | Default            | Red   | DOWN |                        |
| OFF      | ON      | Default            | Red   | DOWN |                        |
| OFF      | OFF     | Default            | Red   | DOWN |                        |
| ON       | ON      | Explicit           | Green | UP   | Complete               |
| ON       | ON      | Explicit           | Red   | DOWN |                        |
| ON       | OFF     | Explicit           | Red   | DOWN |                        |
| OFF      | ON      | Explicit           | Red   | DOWN |                        |
| OFF      | OFF     | Explicit           | Red   | DOWN |                        |
| ON       | ON      | No-autonegotiation | Green | UP   | Incomplete             |
| ON       | ON      | No-autonegotiation | Red   | DOWN |                        |
| ON       | OFF     | No-autonegotiation | Red   | DOWN |                        |
| OFF      | ON      | No-autonegotiation | Green | UP   |                        |
| OFF      | OFF     | No-autonegotiation | Red   | DOWN |                        |
| ON       | ON      | Explicit           | Red   | DOWN | Complete               |
| ON       | OFF     | Explicit           | Red   | DOWN |                        |
| OFF      | ON      | Explicit           | Red   | DOWN |                        |
| OFF      | OFF     | Explicit           | Red   | DOWN |                        |
| ON       | ON      | Default            | Green | UP   | Complete               |
| ON       | ON      | Default            | Red   | DOWN |                        |
| ON       | OFF     | Default            | Red   | DOWN |                        |
| OFF      | ON      | Default            | Red   | DOWN |                        |
| OFF      | OFF     | Default            | Red   | DOWN |                        |
| ON       | ON      | No-autonegotiation | Green | UP   | Incomplete             |
| ON       | ON      | No-autonegotiation | Green | UP   |                        |
| ON       | ON      | No-autonegotiation | Red   | DOWN |                        |
| ON       | ON      | No-autonegotiation | Red   | DOWN |                        |

**Table 55: Mode and Autonegotiation Status (Remote)** *(continued)*

| Transmit | Receive | Mode                   | LED   | Link | Autonegotiation Status |
|----------|---------|------------------------|-------|------|------------------------|
| ON       | OFF     | No-autonegotiation     | Red   | DOWN |                        |
| OFF      | ON      | No-autonegotiation     | Green | UP   |                        |
| OFF      | OFF     | No-autonegotiation     | Red   | DOWN |                        |
| ON       | ON      | Explicit + RFI-Offline | Red   | DOWN | Complete               |
| ON       | ON      | Explicit + RFI-Offline | Red   | DOWN |                        |
| ON       | ON      | Explicit + RFI-Offline | Red   | DOWN |                        |
| ON       | ON      | Explicit + RFI-Offline | Red   | DOWN |                        |
| ON       | OFF     | Explicit + RFI-Offline | Red   | DOWN |                        |
| OFF      | ON      | Explicit + RFI-Offline | Red   | DOWN |                        |
| OFF      | OFF     | Explicit + RFI-Offline | Red   | DOWN |                        |
| ON       | ON      | Explicit               | Green | UP   | Complete               |
| ON       | ON      | Explicit               | Red   | DOWN |                        |
| ON       | ON      | Explicit               | Red   | DOWN |                        |
| ON       | ON      | Explicit               | Red   | DOWN |                        |
| ON       | OFF     | Explicit               | Red   | DOWN |                        |
| OFF      | ON      | Explicit               | Red   | DOWN |                        |
| OFF      | OFF     | Explicit               | Red   | DOWN |                        |
| ON       | ON      | Default                | Green | UP   | Complete               |
| ON       | ON      | Default                | Red   | DOWN |                        |
| ON       | ON      | Default                | Red   | DOWN |                        |
| ON       | ON      | Default                | Red   | DOWN |                        |
| ON       | OFF     | Default                | Red   | DOWN |                        |
| OFF      | ON      | Default                | Red   | DOWN |                        |
| OFF      | OFF     | Default                | Red   | DOWN |                        |
| ON       | ON      | No-autonegotiation     | Green | UP   | Incomplete             |
| ON       | ON      | No-autonegotiation     | Green | UP   |                        |
| ON       | ON      | No-autonegotiation     | Red   | DOWN |                        |

**Table 55: Mode and Autonegotiation Status (Remote)** *(continued)*

| Transmit | Receive | Mode                   | LED   | Link | Autonegotiation Status |
|----------|---------|------------------------|-------|------|------------------------|
| ON       | ON      | No-autonegotiation     | Red   | DOWN |                        |
| ON       | OFF     | No-autonegotiation     | Red   | DOWN |                        |
| OFF      | ON      | No-autonegotiation     | Green | UP   |                        |
| OFF      | OFF     | No-autonegotiation     | Red   | DOWN |                        |
| ON       | ON      | Explicit + RFI-Offline | Green | UP   | Complete               |
| ON       | ON      | Explicit + RFI-Offline | Red   | DOWN |                        |
| ON       | ON      | Explicit + RFI-Offline | Red   | DOWN |                        |
| ON       | ON      | Explicit + RFI-Offline | Red   | DOWN |                        |
| ON       | OFF     | Explicit + RFI-Offline | Red   | DOWN |                        |
| OFF      | ON      | Explicit + RFI-Offline | Red   | DOWN |                        |
| OFF      | OFF     | Explicit + RFI-Offline | Red   | DOWN |                        |
| ON       | ON      | Explicit + RFI-Online  | Green | UP   | Complete               |
| ON       | ON      | Explicit + RFI-Online  | Red   | DOWN |                        |
| ON       | ON      | Explicit + RFI-Online  | Red   | DOWN |                        |
| ON       | ON      | Explicit + RFI-Online  | Red   | DOWN |                        |
| ON       | OFF     | Explicit + RFI-Online  | Red   | DOWN |                        |
| OFF      | ON      | Explicit + RFI-Online  | Red   | DOWN |                        |
| OFF      | OFF     | Explicit + RFI-Online  | Red   | DOWN |                        |



## Chapter 47

# Configuring the Management Ethernet Interface

This section contains the following topics:

- Overview of the Management Ethernet Interface on page 627
- Configuring a Consistent Management IP Address on page 627
- Configuring the MAC Address on the Management Ethernet Interface on page 628

### Overview of the Management Ethernet Interface

---

The routing platform's management Ethernet interface, `fxp0`, is an out-of-band management interface that needs to be configured only if you want to connect to the router through the management port on the front of the router. You can configure an IP address and prefix length for this interface, which you commonly do when you first install the JUNOS software:

```
[edit]
user@host# set interfaces fxp0 unit 0 family inet address/prefix-length
[edit]
user@host# show
interfaces {
 fxp0 {
 unit 0 {
 family inet {
 address/prefix-length;
 }
 }
 }
}
```

### Configuring a Consistent Management IP Address

---

On platforms with multiple Routing Engines, each Routing Engine is configured with a separate IP address for the management interface (`fxp0`). To access the master Routing Engine, you must know which Routing Engine is active and use the appropriate IP address.

Optionally, for consistent access to the master Routing Engine, you can configure an additional IP address and use this address for the management interface regardless of which Routing Engine is active. This additional IP address is active only on the

management interface for the master Routing Engine. During switchover, the address moves to the new master Routing Engine.

On routers with dual Routing Engines, include the **master-only** statement at the **[edit groups]** hierarchy level.

In the following example, IP address **10.17.40.131** is configured for both Routing Engines and includes a **master-only** statement. With this configuration, the **10.17.40.131** address is active only on the master Routing Engine. The address remains consistent regardless of which Routing Engine is active. IP address **10.17.40.132** is assigned to **fxp0** on **re0**, and address **10.17.40.133** is assigned to **fxp0** on **re1**.

```
[edit groups re0 interfaces fxp0]
unit 0 {
 family inet {
 address 10.17.40.131/25 {
 master-only;
 }
 address 10.17.40.132/25;
 }
}
[edit groups re1 interfaces fxp0]
unit 0 {
 family inet {
 address 10.17.40.131/25 {
 master-only;
 }
 address 10.17.40.133/25;
 }
}
```

This feature is available on all platforms that include dual Routing Engines. On the TX Matrix platform, this feature is applicable to the switch-card chassis (SCC) only.

## Configuring the MAC Address on the Management Ethernet Interface

By default, the routing platform's management Ethernet interface (**fxp0**) uses as its MAC address the MAC address that is burned into the Ethernet card. To display this address, enter the **show interface fxp0** operational mode command.

To change the management Ethernet interface's MAC address, include the **mac** statement at the **[edit interfaces fxp0]** hierarchy level:

```
[edit interfaces fxp0]
mac mac-address;
```

Specify the MAC address as six hexadecimal bytes in one of the following formats: **nnnn.nnnn.nnnn** (for example, 0011.2233.4455) or **nn:nn:nn:nn:nn:nn** (for example, 00:11:22:33:44:55).



**NOTE:** When you integrate a standalone T640 routing node into a routing matrix, the PIC MAC addresses for the integrated T640 routing node are derived from a pool of MAC addresses maintained by the TX Matrix platform. For each MAC address you specify in the configuration of a formerly standalone T640 routing node, you must specify the same MAC address in the configuration of the TX Matrix platform.

---





## Chapter 48

# Configuring the 10-Gigabit Ethernet DWDM Interface Wavelength

This section contains the following topics:

- Overview of the 10-Gigabit Ethernet DWDM Interface Wavelength on page 631
- Configuring the 10-Gigabit Ethernet DWDM Interface Wavelength on page 631

## Overview of the 10-Gigabit Ethernet DWDM Interface Wavelength

---

For M320, M120, T320, and T640 routing platforms, the 10-Gigabit Ethernet DWDM PIC enables you to configure 10-Gigabit Ethernet DWDM interfaces with full C-band International Telecommunication Union (ITU)-Grid tunable optics, as defined in the following specifications:

- *Intel TXN13600 Optical Transceiver I2C Interface and Customer EEPROM Preliminary Specification*, July 2004.
- *I2C Reference Document for 300 Pin MSA 10G and 40G Transponder*, Edition 4, August 04, 2003.

By default, the wavelength is 1550.12 nanometers (nm), which corresponds to 193.40 terahertz (THz).

## Configuring the 10-Gigabit Ethernet DWDM Interface Wavelength

---

To configure the wavelength on a 10-Gigabit Ethernet DWDM interface, include the `wavelength` statement at the [edit interfaces `ge-fpc/pic/port` optics-options] hierarchy level:

```
[edit interfaces ge-0/0/0 optics-options]
wavelength nm;
```

For interface diagnostics, you can issue the `show interfaces diagnostics optics ge-fpc/pic/port` operational mode command.

Table 56 on page 632 shows configurable wavelengths and the corresponding frequency for each configurable wavelength.

**Table 56: Wavelength-to-Frequency Conversion Matrix**

| Wavelength (nm) | Frequency (THz) | Wavelength (nm) | Frequency (THz) | Wavelength (nm) | Frequency (THz) |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 1528.77         | 196.10          | 1540.56         | 194.60          | 1552.52         | 193.10          |
| 1529.55         | 196.00          | 1541.35         | 194.50          | 1553.33         | 193.00          |
| 1530.33         | 195.90          | 1542.14         | 194.40          | 1554.13         | 192.90          |
| 1531.12         | 195.80          | 1542.94         | 194.30          | 1554.94         | 192.80          |
| 1531.90         | 195.70          | 1543.73         | 194.20          | 1555.75         | 192.70          |
| 1532.68         | 195.60          | 1544.53         | 194.10          | 1556.56         | 192.60          |
| 1533.47         | 195.50          | 1545.32         | 194.00          | 1557.36         | 192.50          |
| 1534.25         | 195.40          | 1546.12         | 193.90          | 1558.17         | 192.40          |
| 1535.04         | 195.30          | 1546.92         | 193.80          | 1558.98         | 192.30          |
| 1535.82         | 195.20          | 1547.72         | 193.70          | 1559.79         | 192.20          |
| 1536.61         | 195.10          | 1548.52         | 193.60          | 1560.61         | 192.10          |
| 1537.40         | 195.00          | 1549.32         | 193.50          | 1561.42         | 192.00          |
| 1538.19         | 194.90          | 1550.12         | 193.40          | 1562.23         | 191.90          |
| 1538.98         | 194.80          | 1550.92         | 193.30          | 1563.05         | 191.80          |
| 1539.77         | 194.70          | 1551.72         | 193.20          | 1563.86         | 191.70          |

## Chapter 49

# Configuring 10-Gigabit Ethernet Framing

This section contains the following topics:

- Overview of 10-Gigabit Ethernet Framing on page 633
- Configuring 10-Gigabit Ethernet Framing on page 633

### Overview of 10-Gigabit Ethernet Framing

---

The 10-Gigabit Ethernet IQ2 PIC for the M120, M320, and T-series routing platforms operates with Type 3 FPCs. The 10-Gigabit Ethernet IQ2 PIC supports all features of the IQ2 family PICs. Additionally, it provides one external interface running at 10 Gbps that operates in two modes:

- 10GBASE-R, LAN Physical Layer Device (LAN PHY)
- 10GBASE-W, WAN Physical Layer Device (WAN PHY)

When the external interface is running in LAN PHY mode, it bypasses the WIS sublayer to directly stream block-encoded Ethernet frames on a 10-Gigabit Ethernet serial interface. When the external interface is running in WAN PHY mode, it uses the WIS sublayer to transport 10-Gigabit Ethernet frames in an OC192c SONET payload.

Although the external interface provides a lower throughput when running in WAN PHY mode because of the extra SONET overhead, it can interoperate with SONET section or line level repeaters. This creates an advantage when the interface is used for long-distance, point-to-point 10-Gigabit Ethernet links. When the external interface is running in WAN PHY mode, some SONET options are supported. For information about SONET options supported on this interface, see “Configuring SONET Options for 10-Gigabit Ethernet Interfaces” on page 707.

### Configuring 10-Gigabit Ethernet Framing

---

The 10-Gigabit Ethernet IQ2 PIC uses the interface type *xe-fpc/pic/port*. On this single-port PIC, the port number is always zero.

The *xe-fpc/pic/port* interface inherits all the configuration commands that are used for gigabit Ethernet (*ge-fpc/pic/port*) interfaces.

To configure LAN PHY or WAN PHY operating mode, include the *lan-phy* or *wan-phy* statement at the [edit interfaces *xe-fpc /pic/0 framing*] hierarchy level.

```
[edit interfaces]
xe-fpc/pic/port {
 framing {
 (lan-phy | wan-phy);
 }
}
```

To display interface information, use the operational mode command **show interfaces *xe-fpc/pic/port* extensive**.

## Chapter 50

# Configuring 10-Gigabit Ethernet Notification of Link Down Alarm

This section contains the following topics:

- Overview of 10-Gigabit Ethernet Notification of Link Down Alarm on page 635
- Configuring 10-Gigabit Ethernet Notification of Link Down Alarm on page 635

## Overview of 10-Gigabit Ethernet Notification of Link Down Alarm

---

Notification of link down alarm generation and transfer is supported for all 10-Gigabit Ethernet PIC interfaces, M120, M320, and T-series routing platforms.

## Configuring 10-Gigabit Ethernet Notification of Link Down Alarm

---

To configure this option, include the `asynchronous-notification` statement at the [edit interfaces *ge-fpc/pic/port* *gigether-options*] hierarchy level:

```
[edit interfaces]
ge-fpc/pic/port {
 gigether-options {
 asynchronous-notification;
 }
}
```



## Chapter 51

# Configuring Point-to-Point Protocol over Ethernet

This chapter includes the following topics:

- PPPoE Overview on page 637
- Configuring the PPPoE Interfaces MTU on page 640
- Disabling the Sending of PPPoE Keepalive Messages on page 640
- Configuring PPPoE on page 641
- Verifying a PPPoE Configuration on page 649

## PPPoE Overview

---

The Point-to-Point Protocol over Ethernet (PPPoE) connects multiple hosts on an Ethernet LAN to a remote site through a single customer premises equipment (CPE) device. Hosts share a common digital subscriber line (DSL), a cable modem, or a wireless connection to the Internet.

A J-series Services Router can be configured as the CPE device for PPPoE connections. To use PPPoE, you must configure the Services Router as a PPPoE client, encapsulate PPP packets over Ethernet, and initiate a PPPoE session.



**NOTE:** J4300 and J6300 Services Routers with asymmetrical DSL (ADSL) Physical Interface Modules (PIMs) and symmetrical high-speed DSL (SHDSL) PIMs can use PPPoE over Asynchronous Transfer Mode (ATM) to connect through DSL lines only, not for direct ATM connections. For information about configuring ADSL and SHDSL interfaces, see “Configuring ATM-over-ADSL Interfaces” on page 331 and “Configuring ATM-over-SHDSL Interfaces” on page 337.

An M120 Internet router can be configured as a PPPoE access concentrator server. To configure a PPPoE server on an M120 Ethernet logical interface, specify PPPoE encapsulation, include the **pp0** statement for the pseudo PPPoE physical interface, and include the **server** statement in the PPPoE options under the logical interface.



**NOTE:** PPPoE encapsulation is not supported on an M120 router on an ATM2 IQ interface.

On the J-series Services Router, PPPoE establishes a point-to-point connection between the client (the Services Router) and the server, also called an access concentrator. Multiple hosts can be connected to the Services Router, and their data can be authenticated, encrypted, and compressed before the traffic is sent to the PPPoE session on the Services Router's Fast Ethernet or ATM-over-ADSL interface. PPPoE is easy to configure and enables services to be managed on a per-user basis rather than on a per-site basis.

This overview contains the following topics:

- PPPoE Interfaces on page 638
- PPPoE Stages on page 638
- Optional CHAP Authentication on page 640

## PPPoE Interfaces

The PPPoE interface to the access concentrator can be a Fast Ethernet interface on any Services Router, a Gigabit Ethernet interface on J4350 and J6350 Services Routers, an ATM-over-ADSL or ATM-over-SHDSL interface on all J-series Services Routers except the J2300, or an ATM-over-SHDSL interface on a J2300 Services Router. The PPPoE configuration is the same for both interfaces. The only difference is the encapsulation for the underlying interface to the access concentrator:

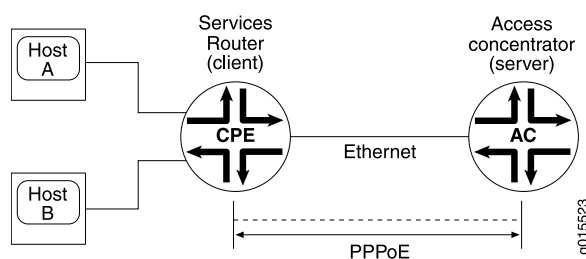
- If the interface is Fast Ethernet, use a PPPoE encapsulation.
- If the interface is ATM over ADSL, use a PPPoE over ATM encapsulation.

The PPPoE interface on the M120 router acting as a access concentrator can be a Gigabit Ethernet or 10-Gigabit Ethernet interface.

## Ethernet Interface

The Services Router encapsulates each PPP frame in an Ethernet frame and transports the frames over an Ethernet loop. Figure 50 on page 638 shows a typical PPPoE session between a Services Router and an access concentrator on the Ethernet loop.

**Figure 50: PPPoE Session on an Ethernet Loop**



## PPPoE Stages

PPPoE has two stages, the discovery stage and the PPPoE session stage. In the discovery stage, the client discovers the access concentrator by identifying the



Ethernet media access control (MAC) address of the access concentrator and establishing a PPPoE session ID. In the PPPoE session stage, the client and the access concentrator build a point-to-point connection over Ethernet, based on the information collected in the discovery stage.

### PPPoE Discovery Stage

A Services Router initiates the PPPoE discovery stage by broadcasting a PPPoE active discovery initiation (PADI) packet. To provide a point-to-point connection over Ethernet, each PPPoE session must learn the Ethernet MAC address of the access concentrator and establish a session with a unique session ID. Because the network might have more than one access concentrator, the discovery stage allows the client to communicate with all of them and select one.



**NOTE:** A Services Router cannot receive PPPoE packets from two different access concentrators on the same physical interface.

---

The PPPoE discovery stage consists of the following steps:

1. PPPoE active discovery initiation (PADI)—The client initiates a session by broadcasting a PADI packet on the LAN to request a service.
2. PPPoE active discovery offer (PADO)—Any access concentrator that can provide the service requested by the client in the PADI packet replies with a PADO packet that contains its own name, the unicast address of the client, and the service requested. An access concentrator can also use the PADO packet to offer other services to the client.
3. PPPoE active discovery request (PADR)—From the PADOs it receives, the client selects one access concentrator based on its name or the services offered and sends it a PADR packet to indicate the service or services needed.
4. PPPoE active discovery session-Confirmation (PADS)—When the selected access concentrator receives the PADR packet, it accepts or rejects the PPPoE session.
  - To accept the session, the access concentrator sends the client a PADS packet with a unique session ID for a PPPoE session and a service name that identifies the service under which it accepts the session.
  - To reject the session, the access concentrator sends the client a PADS packet with a service name error and resets the session ID to zero.

### PPPoE Session Stage

The PPPoE session stage starts after the PPPoE discovery stage is over. The access concentrator can start the PPPoE session after it sends the PADS packet to the client, or the client can start the PPPoE session after it receives a PADS packet from the access concentrator. A Services Router supports multiple PPPoE sessions on each interface, but no more than 256 PPPoE sessions on all interfaces on the Services Router.

Each PPPoE session is uniquely identified by the Ethernet address of the peer and the session ID. After the PPPoE session is established, data is sent as in any other PPP encapsulation. The PPPoE information is encapsulated within an Ethernet frame and is sent to a unicast address. In this stage, both the client and the server must allocate resources for the PPPoE logical interface.

After a session is established, the client or the access concentrator can send a PPPoE active discovery termination (PADT) packet anytime to terminate the session. The PADT packet contains the destination address of the peer and the session ID of the session to be terminated. After this packet is sent, the session is closed to PPPoE traffic.

### Optional CHAP Authentication

For interfaces with PPPoE encapsulation, you can configure interfaces to support the PPP Challenge Handshake Authentication Protocol (CHAP). When you enable CHAP on an interface, the interface can authenticate its peer and be authenticated by its peer.

If you configure an interface to handle incoming CHAP packets only (by including the **passive** statement at the [edit interfaces *interface-name* ppp-options chap] hierarchy level), the interface does not challenge its peer. However, if the interface is challenged, it responds to the challenge. If you do not include the **passive** statement, the interface always challenges its peer.

For more information about CHAP, see “Configuring the PPP Challenge Handshake Authentication Protocol” on page 103.

### Configuring the PPPoE Interfaces MTU

---

You can configure the maximum transmission unit (MTU) of the interface by including the **mtu** statement at the [edit interfaces pp0] hierarchy level:

```
[edit interfaces pp0]
mtu bytes;
```

The default media MTU size used and the range of available sizes on a physical interface depends on the encapsulation used on that interface.

### Disabling the Sending of PPPoE Keepalive Messages

---

When configuring the client, you can disable the sending of keepalive messages on a logical interface by including the **no-keepalives** statement:

```
no-keepalives;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces pp0.0]
- [edit logical-systems *logical-system-name* interfaces pp0 unit *logical-unit-number*]

## Configuring PPPoE

---

To configure PPPoE on a J-series Services Router, perform the following tasks:

1. Configure PPPoE encapsulation for an Ethernet interface or Ethernet over ATM encapsulation for an ATM-over-ADSL interface.
2. If you are configuring ATM over ADSL, configure LLC encapsulation on the logical interface.
3. Specify the logical Ethernet interface or the logical ATM interface as the underlying interface for the PPPoE session.
4. Configure the operational mode as client.
5. Identify the access concentrator by a unique name.
6. Optionally, specify how many seconds to wait before attempting to reconnect.
7. Provide a name for the type of service provided by the access concentrator.
8. Optionally, configure the maximum transmission unit (MTU) of the interface.
9. Configure the PPPoE interface address.
10. Configure the destination PPPoE interface address.
11. Optionally, configure the MTU size for the protocol family.
12. Optionally, disable the sending of keepalive messages on the logical interface.

To configure PPPoE on an M120 Internet Router operating as an access concentrator, perform the following tasks:

1. Configure PPPoE encapsulation for an Ethernet interface.
2. Specify the logical Ethernet interface as the underlying interface for the PPPoE session.
3. Optionally, configure the maximum transmission unit (MTU) of the interface.
4. Configure the operational mode as server.
5. Configure the PPPoE interface address.
6. Configure the destination PPPoE interface address.
7. Optionally, configure the MTU size for the protocol family.

### ***Setting the Appropriate Encapsulation on the PPPoE Interface***

For PPPoE on an Ethernet interface, you must configure encapsulation on the logical interface and use PPP over Ethernet encapsulation.

For PPPoE on an ATM-over-ADSL interface, you must configure encapsulation on both the physical and logical interfaces. To configure encapsulation on an ATM-over-ADSL physical interface, use Ethernet over ATM encapsulation. To configure encapsulation on an ATM-over-ADSL logical interface, use PPPoE over AAL5 LLC encapsulation. LLC encapsulation allows a single ATM virtual connection to transport multiple protocols.



**NOTE:** PPPoE encapsulation is not supported on an M120 router on an ATM2 IQ interface.

When you configure a point-to-point encapsulation such as PPP on a physical interface, the physical interface can have only one logical interface (only one **unit** statement) associated with it.

To configure physical interface properties, include the **encapsulation** statement at the `[edit interfaces interface-name]` hierarchy level:

```
[edit interfaces interface-name]
encapsulation ethernet-over-atm;
```

To configure logical interface encapsulation properties, include the **encapsulation** statement:

```
encapsulation ppp-over-ether;
```

You can include this statement at the following hierarchy levels:

- `[edit interfaces interface-name unit logical-unit-number]`
- `[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number]`

Perform the task appropriate for the interface on which you are using PPPoE:

- Configuring PPPoE Encapsulation on an Ethernet Interface on page 642
- Configuring PPPoE Encapsulation on an ATM-over-ADSL Interface on page 642

### Configuring PPPoE Encapsulation on an Ethernet Interface

Both the client and the server must be configured to support PPPoE. To configure PPPoE encapsulation on an Ethernet interface, include the **encapsulation** statement:

```
encapsulation ppp-over-ether;
```

You can include this statement at the following hierarchy levels:

- `[edit interfaces pp0 unit logical-unit-number]`
- `[edit logical-systems logical-system-name interfaces pp0 unit logical-unit-number]`

### Configuring PPPoE Encapsulation on an ATM-over-ADSL Interface

To configure the PPPoE encapsulation on a ATM-over-ADSL interface, perform the following steps:

1. Include the **encapsulation** statement at the `[edit interfaces interface-name]` hierarchy level, and specify **ethernet-over-atm**:

```
[edit interfaces pp0]
encapsulation ethernet-over-atm;
```

2. Configure LLC encapsulation on the logical interface by including the `encapsulation` statement and specifying `ppp-over-ether-over-atm-llc`:

```
encapsulation ppp-over-ether-over-atm-llc;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces pp0 unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces pp0 unit *logical-unit-number*]

## Configuring a PPPoE Interface

The following sections describe how to configure a PPPoE interface:

- Configuring the PPPoE Underlying Interface on page 643
- Identifying the Access Concentrator on page 644
- Configuring the PPPoE Automatic Reconnect Wait Timer on page 644
- Configuring the PPPoE Service Name on page 645
- Configuring the PPPoE Server Mode on page 645
- Configuring the PPPoE Client Mode on page 646
- Configuring the PPPoE Source and Destination Addresses on page 646
- Deriving the PPPoE Source Address From a Specified Interface on page 646
- Configuring the PPPoE IP Address by Negotiation on page 647
- Configuring the Protocol MTU PPPoE on page 647
- Example: Configuring a PPPoE Client Interface on a J-Series Services Router on page 647
- Example: Configuring a PPPoE Server Interface on an M120 Router on page 648

## Configuring the PPPoE Underlying Interface

To configure the underlying Fast Ethernet, Gigabit Ethernet, 10-Gigabit Ethernet, or ATM interface, include the `underlying-interface` statement at the [edit interfaces pp0 unit *logical-unit-number* pppoe-options] hierarchy level:

```
[edit interfaces pp0]
unit logical-unit-number {
 pppoe-options {
 underlying-interface interface-name;
 }
}
```

You can include this statement at the following hierarchy levels:

- [edit interfaces pp0 unit *logical-unit-number* pppoe-options]
- [edit logical-systems *logical-system-name* interfaces pp0 unit *logical-unit-number* pppoe-options]

Specify the logical Ethernet, Fast Ethernet, Gigabit Ethernet, 10-Gigabit Ethernet, or ATM interface as the underlying interface—for example, *at-0/0/1.0* (ATM VC), *fe-1/0/1.0* (Fast Ethernet interface), or *ge-2/0/0* (Gigabit Ethernet interface).

### Identifying the Access Concentrator

When configuring a PPPoE client, identify the access concentrator by a unique name by including the *access-concentrator* statement at the [edit interfaces *interface-name* unit *logical-unit-number* pppoe-options] hierarchy level:

```
[edit interfaces pp0]
unit logical-unit-number{
 pppoe-options {
 access-concentrator name;
 }
}
```

Specify the access concentrator name.

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* pppoe-options]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* pppoe-options]

### Configuring the PPPoE Automatic Reconnect Wait Timer

By default, after a PPPoE session is terminated, the session attempts to reconnect immediately. When configuring a PPPoE client, you can specify how many seconds to wait before attempting to reconnect, by including the *auto-reconnect* statement at the [edit interfaces *interface-name* unit *logical-unit-number* pppoe-options] hierarchy level:

```
[edit interfaces pp0]
unit logical-unit-number {
 pppoe-options {
 auto-reconnect seconds;
 }
}
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* pppoe-options]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* pppoe-options]

You can configure the reconnection attempt to occur in 0 through 4,294,967,295 seconds after the session terminates.

### Configuring the PPPoE Service Name

When configuring a PPPoE client, identify the type of service provided by the access concentrator—such as the name of the Internet service provider (ISP), class, or quality of service—by including the `service-name` statement at the [edit interfaces *interface-name* unit *logical-unit-number* pppoe-options] hierarchy level:

```
[edit interfaces pp0]
unit logical-unit-number {
 pppoe-options {
 service-name name;
 }
}
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* pppoe-options]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* pppoe-options]

### Configuring the PPPoE Server Mode

When configuring a PPPoE server, identify the mode by including the `server` statement at the [edit interfaces *interface-name* unit *logical-unit-number* pppoe-options] hierarchy level:

```
[edit interfaces pp0]
unit logical-unit-number {
 pppoe-options {
 server;
 }
}
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* pppoe-options]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* pppoe-options]

## Configuring the PPPoE Client Mode

When configuring a PPPoE client, identify the mode by including the `client` statement at the [edit interfaces *interface-name* unit *logical-unit-number* pppoe-options] hierarchy level:

```
[edit interfaces pp0]
unit logical-unit-number {
 pppoe-options {
 client;
 }
}
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number* pppoe-options]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* pppoe-options]

## Configuring the PPPoE Source and Destination Addresses

When configuring a PPPoE client or server, assign source and destination addresses—for example, 192.168.1.1/32 and 192.168.1.2. To assign the source and destination address, include the `address` and `destination` statements:

```
address address {
 destination address;
}
```

You can include these statements at the following hierarchy levels:

- [edit interfaces pp0.0 family inet]
- [edit logical-systems *logical-system-name* interfaces pp0.0 family inet]

## Deriving the PPPoE Source Address From a Specified Interface

For a router supporting PPPoE, you can derive the source address from a specified interface—for example, the loopback interface, lo0.0—and assign a destination address—for example, 192.168.1.2. The specified interface must include a logical unit number and have a configured IP address. To derive the source address and assign the destination address, include the `unnumbered-address` and `destination` statements:

```
unnumbered-address interface-name destination address;
}
```

You can include these statements at the following hierarchy levels:

- [edit interfaces pp0.0 family inet]
- [edit logical-systems *logical-system-name* interfaces pp0.0 family inet]



## Configuring the PPPoE IP Address by Negotiation

You can have the PPPoE client router obtain an IP address by negotiation with the remote end. This method might require the access concentrator to use a RADIUS authentication server. To obtain an IP address from the remote end by negotiation, include the `negotiate-address` statement:

```
negotiate-address;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces pp0.0 family (inet | inet6 | mpls)]
- [edit logical-systems *logical-system-name* interfaces pp0.0 family (inet | inet6 | mpls)]

## Configuring the Protocol MTU PPPoE

You can configure the maximum transmission unit (MTU) size for the protocol family. Specify a range from 0 through 5012 bytes. Ensure that the size of the media MTU is equal to or greater than the sum of the protocol MTU and the encapsulation overhead. To set the MTU, include the `mtu` statement:

```
mtu bytes;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces pp0.0 family (inet | inet6 | mpls)]
- [edit logical-systems *logical-system-name* interfaces pp0.0 family (inet | inet6 | mpls)]

## Example: Configuring a PPPoE Client Interface on a J-Series Services Router

Configure a PPPoE over ATM-over-ADSL interface:

```
[edit interfaces]
at-2/0/0 {
 encapsulation ethernet-over-atm;
 atm-options {
 vpi 0;
 }
 dsl-options {
 operating-mode auto;
 }
 unit 0 {
 encapsulation ppp-over-ether-over-atm-llc;
 vci 0.120;
 }
}
pp0 {
 mtu 1492;
 unit 0 {
 ppp-options {
 chap {
```

```

 access-profile A-ppp-client;
 local-name A-at-2/0/0.0;
 }
}
pppoe-options {
 underlying-interface at-2/0/0;
 client;
 access-concentrator ispl.com;
 service-name "video@ispl.com";
 auto-reconnect 100;
}
no-keepalives;
family inet {
 negotiate-address;
 mtu 100;
}
family inet6 {
 negotiate-address;
 mtu 200;
}
family mpls {
 negotiate-address;
 mtu 300;
}
}
}

```

### Example: Configuring a PPPoE Server Interface on an M120 Router

Configure a PPPoE server over a Gigabit Ethernet interface:

```

[edit interfaces]
ge-1/0/0 {
 vlan-tagging;
 unit 1 {
 encapsulation ppp-over-ether;
 vlan-id 10;
 }
}
pp0 {
 unit 0 {
 pppoe-options {
 underlying-interface ge-1/0/0.0;
 server;
 }
 ppp-options {
 }
 family inet {
 address 22.2.2.1/32 {
 destination 22.2.2.2;
 }
 }
 }
}
}

```

## Verifying a PPPoE Configuration

---

To verify a PPPoE configuration, you can issue the following operational mode commands:

- `show interfaces at-fpc/pic/port extensive`
- `show interfaces pp0`
- `show pppoe interfaces`
- `show pppoe version`
- `show pppoe statistics`

For more information about these operational mode commands, see the *J-series Services Router Basic LAN and WAN Access Configuration Guide* and the *JUNOS Interfaces Command Reference*.



## Chapter 52

# Example Ethernet Configurations

This section contains the following example configurations for Ethernet interfaces:

- Example: Configuring Fast Ethernet Interfaces on page 651
- Example: Configuring Gigabit Ethernet Interfaces on page 651
- Example: Configuring Aggregated Ethernet Interfaces on page 652
- Example: Configuring Aggregated Ethernet Link Protection on page 653

### Example: Configuring Fast Ethernet Interfaces

---

The following configuration is sufficient to get a Fast Ethernet interface up and running. By default, IPv4 Fast Ethernet interfaces use Ethernet Version 2 encapsulation.

```
[edit]
user@host# set interfaces fe-5/2/1 unit 0 family inet address local-address
user@host# show
interfaces {
 fe-5/2/1 {
 unit 0 {
 family inet {
 address local-address;
 }
 }
 }
}
```

### Example: Configuring Gigabit Ethernet Interfaces

---

The following configuration is sufficient to get a Gigabit Ethernet, Tri-Rate Ethernet copper, or 10-Gigabit Ethernet interface up and running. By default, IPv4 Gigabit Ethernet interfaces on MX-series, M-series, and T-series routing platforms use 802.3 encapsulation. J-series Gigabit Ethernet interfaces do not support 802.3 encapsulation.

```
[edit]
user@host# set interfaces ge-2/0/1 unit 0 family inet address local-address
user@host# show
interfaces {
 ge-2/0/1 {
 unit 0 {
 family inet {
```

```

 address local-address;
 }
}
}

```

The M160, M320, M120, T320, and T640 2-port Gigabit Ethernet PIC supports two independent Gigabit Ethernet links.

Each of the two interfaces on the PIC is named:

```
ge-fpc/pic/[0.1]
```

Each of these interfaces has functionality identical to the Gigabit Ethernet interface supported on the single-port PIC.

## Example: Configuring Aggregated Ethernet Interfaces

---

Aggregated Ethernet interfaces can use interfaces from different FPCs, DPCs, or PICs. The following configuration is sufficient to get an aggregated Gigabit Ethernet interface up and running.

```

[edit interfaces]
ge-1/3/0 {
 ggether-options {
 802.3ad ae0;
 }
}
ge-2/0/1 {
 ggether-options {
 802.3ad ae0;
 }
}
ae0 {
 aggregated-ether-options {
 link-speed 1g;
 minimum-links 1;
 }
 vlan-tagging;
 unit 0 {
 vlan-id 1;
 family inet {
 address 14.0.100.50/24;
 }
 }
 unit 1 {
 vlan-id 1024;
 family inet {
 address 14.0.101.50/24;
 }
 }
 unit 2 {
 vlan-id 1025;
 family inet {
 address 14.0.102.50/24;
 }
 }
}

```

```

 }
 }
 unit 3 {
 vlan-id 4094;
 family inet {
 address 14.0.103.50/24;
 }
 }
}

[edit chassis]
aggregated-devices {
 ethernet {
 device-count 15;
 }
}

```

### Example: Configuring Aggregated Ethernet Link Protection

---

The following configuration enables link protection on the `ae0` interface, and specifies the `ge-1/0/0` interface as the primary link and `ge-1/0/1` as the secondary link.

```

[edit interfaces]
ae0 {
 aggregated-ether-options {
 lacp {
 periodic slow;
 }
 link protection;
 }
}

[edit interfaces]
ge-1/0/0 {
 ggether-options {
 802.3ad ae0 primary;
 }
}

[edit interfaces]
ge-1/0/1 {
 ggether-options {
 802.3ad ae0 backup;
 }
}

```





## **Part 10**

# **Configuring ISDN Interfaces**

- Configuring ISDN Interfaces on page 657



## Chapter 53

# Configuring ISDN Interfaces

This section contains the following topics:

- ISDN Interfaces Overview on page 657
- Configuring ISDN Services Physical and Logical Interface Properties on page 658
- Configuring ISDN Physical Interface Properties on page 659
- Configuring ISDN Logical Interface Properties on page 661
- Disabling ISDN Processes on page 675

### ISDN Interfaces Overview

---

ISDN is a set of standards for digital transmission over different media created by the Consultative Committee for International Telegraphy and Telephony (CCITT) and the International Telecommunication Union (ITU). ISDN is a dial-on-demand service that provides fast call setup, low latency, and the ability to carry high-quality voice, data, and video transmissions. ISDN is also a circuit-switched service that can be used on both multipoint and point-to-point connections.

You configure two types of interfaces for ISDN service: a physical interface and a logical interface called the *dialer interface*.

Four types of Physical Interface Modules (PIMs) provide ISDN connectivity on J-series Services Routers:

- 1-port S/T interface supporting ITU-T I.430, ETSI TS 101080, and GR-1089-Core Type III
- 1-port U interface supporting ANSI T.601 and GR-1089-Core
- 4-port S/T interface supporting ITU-T I.430, ETSI TS 101080, and GR-1089-Core Type III as a field-replaceable unit (FRU)
- 4-port U interface supporting ANSI T.601 and GR-1089-Core

For information about installing hardware, see the *J-series Services Router Getting Started Guide*.

For information about installing ISDN service over an ISDN line, contact your telecommunications service provider.

## Configuring ISDN Services Physical and Logical Interface Properties

To configure ISDN services physical interface properties, include the `isdn-options` statement at the `[edit interfaces br-pim/0/port]` hierarchy level:

```
[edit interfaces br-pim/0/port]
isdn-options {
 calling-number number;
 incoming-called-number number <reject>;
 pool pool-name <priority priority>;
 spid1 spid-string;
 spid2 spid-string;
 static-tei-val value;
 switch-type (att5e | etsi | ni1 | ntdms100 | ntt);
 t310 seconds;
 tei-option (first-call | power-up);
}
dialer-options {
 pool pool-name <priority priority>;
}
```

To configure ISDN services logical interface properties, include the following statements:

```
[edit interfaces dln unit logical-unit-number]
dialer-options {
 activation-delay seconds;
 callback;
 callback-wait-period time;
 deactivation-delay seconds;
 dial-string dial-string-numbers;
 idle-timeout seconds;
 incoming-map {
 caller (caller-id | accept-all);
 initial-route-check seconds;
 load-interval seconds;
 load-threshold percent;
 pool pool-name;
 redial-delay time;
 watch-list {
 [routes];
 }
 }
 encapsulation [
 (cisco-hdlc | multilink-ppp | ppp);
]
}
```

To configure a primary interface to use an ISDN logical interface as a backup or “failover” interface when the primary connection experiences interruptions in Internet connectivity, include the `backup-options` statement to specify the ISDN interface at the `[edit interfaces interface-name unit logical-unit-number]` hierarchy level:

```
[edit interfaces interface-name unit logical-unit-number]
backup-options {
```

```
interface dln.0;
}
```

You can include these statements at the following hierarchy levels:

- [edit interfaces]
- [edit logical-systems *logical-system-name* interfaces]

To configure the Services Router to reject incoming ISDN calls (supported when dial-in is configured), include the **reject-incoming** statement at the [edit system processes isdn-signaling] hierarchy level:

```
[edit system processes isdn-signaling]
reject-incoming;
}
```

To disable ISDN, include the **disable** statement at the [edit system processes isdn-signaling] hierarchy level:

```
[edit system processes isdn-signaling]
disable;
}
```

To disable the dial-out on demand process, include the **disable** statement at the [edit system processes dialer-services] hierarchy level:

```
[edit system processes dialer-services]
disable;
}
```

## Configuring ISDN Physical Interface Properties

You specify the physical ISDN interface in the form **br-*pim*/0/*port***. *pim* is the slot in which the PIM is installed. The second number is always 0. *port* is the configured port number.

You specify the B-channel in the form **bc-*pim*/0/*port*:*n***. *n* is the B-channel ID and can be 1 or 2. You specify the D-channel in the form **dc-*pim*/0/*port*:0**.



**NOTE:** The B- and D-channel interfaces do not have any configurable parameters. However, when interface statistics are displayed, B- and D-channel interfaces have statistical values.

To enable ISDN interfaces installed on your Services Router to work properly, you must configure the interface properties. To configure physical interface properties, include the **isdn-options** statement at the [edit interfaces **br-*pim*/0/*port***] hierarchy level:

```
[edit interfaces br-pim/0/port]
isdn-options {
 calling-number number;
}
```

```

incoming-called-number number <reject>;
spid1 spid-string;
spid2 spid-string;
static-tei-val value;
switch-type (att5e | etsi | ni1 | ntdms100 | ntt);
t310 seconds;
tei-option (first-call | power-up);
}
dialer-options {
 pool pool-name <priority priority>;
}

```

You can configure the following ISDN options:

- **calling-number**—The calling number included in outgoing calls.
- **incoming-called-number**—Screening of incoming calls. If the incoming number of the incoming call is configured, the call is accepted. If the reject option is specified with the number, the call is rejected. If no numbers are configured, all calls are accepted. See “Configuring an ISDN Interface to Screen Incoming Calls” on page 661.
- **pool**—The dial pool for logical and physical ISDN interfaces. The dial pool allows logical (dialer) and physical (**br-pim/0/port**) interfaces to be bound together dynamically on a per-call basis. On a dialer interface, pool directs the dialer interface to a dial pool. On a **br-pim/0/port** interface, pool defines the pool to which the interface belongs. Specify a priority value from 0 (lowest) to 255 (highest) for the interface.
- **spid1**—The Service Profile Identifier (SPID). *spid-string* is a numeric value. If your service provider requires SPIDs, you cannot place calls until the interface sends a valid, assigned SPID to the service provider when accessing the ISDN connection. A single SPID must be configured as **spid1**.
- **spid2**—A second SPID, used for DMS-100 and NI1 switch types.
- **static-tei-val**—A static Terminal Endpoint Identifier (TEI) value. The TEI value represents any ISDN-capable device attached to an ISDN network that is the terminal endpoint. TEIs are used to distinguish between different devices using the same ISDN links. Specify a value from 0 through 63. You cannot configure a TEI value with multiple SPIDs—dynamic TEI assignment is required.



**NOTE:** TEI assignment is usually done dynamically instead of statically using the TEI management protocol. When the TEI management protocol is used, values 64-126 are assigned to terminal endpoints. TEI value 127 is used for group assignment.

- **switch-type**—The ISDN switch type. The following switches are compatible:
  - **att5e**—AT&T 5ESS
  - **etsi**—NET3 for United Kingdom and Europe
  - **ni1**—National ISDN-1

- **ntdms100**—Northern Telecom DMS-100
- **ntt**—NTT Group switch for Japan
- **tei-option**—When the Terminal Endpoint Identifier (TEI) negotiates with the ISDN provider. Specify first-call (activation does not occur until the call setup is sent) or power-up (activation occurs when the Services Router is powered on). The default value is power-up.
- **t310**—Q.931-specific timer for T310, in seconds. Specify the number of seconds from 1 through 65536. The default value is 10 seconds.

### Configuring an ISDN Interface to Screen Incoming Calls

By default, an ISDN interface is configured to accept all incoming calls. If multiple devices are connected to the same ISDN line, you can configure an ISDN interface to screen incoming calls based on the incoming called number.

You can specify the incoming called numbers that an ISDN interface accepts. You can use the **reject** option to specify a number that the ISDN interface can ignore. The **reject** option is useful when an incoming called number is specified on one device connected to an ISDN line, and you want the incoming called number rejected on a second ISDN device connected to the same ISDN line. For example, if the first ISDN device has the called number 4085321901, you can configure the called number 4085321901 with the **reject** option on the second ISDN device.

When an incoming ISDN call is received, the Services Router matches the incoming called number against the called numbers configured on its ISDN interfaces. If an exact match is not found, or if the called number is configured with the **reject** option, the incoming call is ignored. Each ISDN interface accepts only the calls whose called number are configured on it.

To specify that an incoming called number be rejected by the interface, include the **incoming-called-number** statement with the **reject** option at the [edit interfaces *br-pim/0/port* isdn-options] hierarchy level:

```
[edit interfaces br-pim/0/port]
 isdn-options {
 incoming-called-number number reject;
 }
```

You can configure up to 30 incoming called numbers.

### Configuring ISDN Logical Interface Properties

You configure ISDN services interface properties at the logical unit level. For information about default settings for ISDN logical interface properties, see the *JUNOS Services Interfaces Configuration Guide*.

The dialer interface, **dl**, is a logical interface for configuring dialing properties for a backup ISDN connection. The interface can be configured in two modes:

- Multilink mode using **multilink-ppp** encapsulation. This mode is used when the router supports B-channel bundling (two B-channels connected to provide a 128-Kbps connection) and runs Multilink Point-to-Point Protocol (MLPPP). When the dialer interface (**dl*n***) is in multilink mode, the value of *n* is from 0 through 149. However, you can only configure one dialer interface with **multilink-ppp** encapsulation. For example, you cannot have both **dl1** and **dl2** as multilink dialers simultaneously. If you need to have multiple multilink dialers, then the values should be **dl*n*.1**, **dl*n*.2**, and so forth.
- Normal mode using **ppp** or **cisco-hdlc** encapsulation. This mode is used when the router is using one B-channel. When the dialer interface (**dl*n***) is in normal mode, the value of *n* is always from 0 through 149.



**NOTE:** Ensure that the same IP subnet address is not configured on different dialer interfaces. Configuring the same IP subnet address on different dialer interfaces can result in inconsistency in the route and packet loss. Packets may be routed through any of the dialer interfaces that have the same IP subnet address, instead of being routed through the dialer interface to which the ISDN call is connected.

You can configure the following ISDN services logical interface properties:

- Configuring an ISDN Dialer Interface as a Backup Interface on page 664
- Applying the Dial-on-Demand Dialer Filter to the Dialer Interfaces on page 666
- Configuring Bandwidth on Demand on page 667
- Configuring Dial-In and Callback on page 670
- Configuring Dialer Watch on page 673

The dialer interface cannot be configured:

- As a backup interface and as a dialer filter simultaneously.
- As a backup interface and as a dialer watch simultaneously.
- As a dialer watch interface and as a dialer filter simultaneously.
- As a backup interface for more than one primary interface.

For specific ISDN configuration information for dial-on-demand routing (DDR) and adding Open Shortest Path First (OSPF) demand circuits to a Services Router, see the *JUNOS Routing Protocols Configuration Guide*.

For general information about logical unit properties, see “Configuring Logical Interface Properties” on page 133. For general information about **family inet** properties, see “Configuring Protocol Family and Interface Address Properties” on page 157.

To configure logical interface properties, include the **encapsulation** statement at the **[edit interfaces dl*n*]** hierarchy level and the **dialer-options** statement at the **[edit interfaces dl*n* unit logical-unit-number]** hierarchy level:

```
[edit interfaces dln]
encapsulation (cisco-hdlc | multilink-ppp | ppp);
```



```
[edit interfaces dln unit logical-unit-number]
dialer-options {
 activation-delay seconds;
 callback;
 callback-wait-period time;
 deactivation-delay seconds;
 dial-string dial-string-numbers;
 idle-timeout seconds;
 incoming-map {
 caller (caller-id | accept-all);
 initial-route-check seconds;
 load-interval seconds;
 load-threshold percent;
 pool pool-name;
 redial-delay time;
 watch-list {
 [routes];
 }
 }
}
```

You can configure the following options:

- **activation-delay**—ISDN activation delay, in seconds. Specify a number from 1 through 4294967295.
- **callback**—Specify the dialer to reject incoming call and call back the caller after a specified wait time.
- **caller**—Specify the dialer to accept a specified caller number or accept all incoming calls.
- **callback-wait-period**—For interfaces configured for ISDN with callback, specify the amount of time the dialer waits before calling back the caller. The default is 5 seconds.
- **deactivation-delay**—ISDN deactivation delay, in seconds. Specify from 1 through 4294967295.
- **encapsulation**—Logical link-layer encapsulation type. For normal mode, specify **cisco-hdlc** for Cisco-compatible High-Level Data Link control (HDLC) or **ppp** for Point-to-Point Protocol. For multilink mode, specify **multilink-ppp**.
- **dial-string**—Phone number to be dialed. Do not include hyphens in number.
- **idle-timeout**—Number of seconds the link is idle before losing connectivity. The default is 120 seconds.
- **incoming-map**—Specify the dialer to accept incoming calls.



**CAUTION:** Changing the caller incoming map when a call is connected can create inconsistencies in the route and prevent traffic on a subnet from being transmitted. This is seen when two dialer interfaces are configured and the association of the caller incoming-map from one interface to the other is changed when a call is

connected on one of the interfaces. The cause of the inconsistency is that dialer interfaces are pseudo interfaces that are always up, even if not actually connected.

- 
- **initial-route-check**—Allows the router to check whether the primary route is up after the initial startup of the router is complete and the timer expires.
  - **load-interval**—Interval used to calculate the average load on the network. By default, the average interface load is calculated every 60 seconds. You can specify an interval from 20 through 180 seconds, configurable in intervals of 10 seconds. For more information about the load interval, see “Configuring Bandwidth on Demand” on page 667.
  - **load-threshold**—Bandwidth threshold percentage used for adding interfaces. Another link is added to the multilink bundle when the bandwidth reaches the threshold value you set. Specify a percentage between 0 and 100. When the value is set to 0, all available channels are dialed. The default value is 100.
  - **pool**—For logical and physical ISDN interfaces, specify the dial pool. The dial pool allows logical (dialer) and physical (**br-pim/0/port**) interfaces to be bound together dynamically on a per-call basis. On a dialer interface, **pool** directs the dialer interface which dial pool to use. On a **br-pim/0/port** interface, **pool** defines the pool to which the interface belongs.
  - **redial-delay**—Specify the delay (in seconds) between two successive calls made by the dialer (for dialout). The default is 3 seconds.
  - **watch-list**—IP prefix of one or more routes. The primary route is considered up if there is at least one valid route for any of the addresses in the watch list to an interface other than the backup interface.

Changing the caller incoming map when a call is connected can create inconsistencies in the route and prevent traffic on a subnet from being transmitted. This is seen when two dialer interfaces are configured and the association of the caller incoming-map from one interface to the other is changed when a call is connected on one of the interfaces.

The cause of the inconsistency is that dialer interfaces are pseudo interfaces that are always up, even if not actually connected.

### **Configuring an ISDN Dialer Interface as a Backup Interface**

Configuring the ISDN interface as a backup interface ensures continuous network connectivity. The Services Router can be configured to fail over to the ISDN interface if the primary connection experiences interruptions in Internet connectivity.

To configure an ISDN interface as the backup interface, include the **backup-options** statement at the **[edit interfaces *interface-name* unit *logical-unit-number*]** hierarchy level:

```
[edit interfaces interface-name unit logical-unit-number]
 backup-options {
 interface dln.0;
 }
```

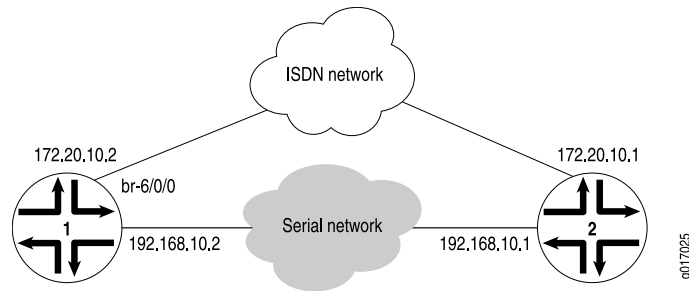
*interface-name* is the primary interface. The backup interface is specified as *dln*.

### Example: Configuring an ISDN Interface as the Backup Interface

The following example illustrates a backup configuration using a primary serial interface, two dialer interfaces, and a physical ISDN interface.

See Figure 51 on page 665 for the topology used for this example.

**Figure 51: ISDN Backup Topology**



Configure dialer interface *d10* as the backup interface on the primary serial interface *t1-4/0/1*:

#### Configuration on the Primary Serial Interface

```
[edit interfaces]
t1-4/0/1 {
 encapsulation ppp;
 backup-options {
 interface d10.0;
 }
 unit 0 {
 family inet {
 address 192.168.10.2;
 }
 }
}
```

#### Configuration on the Dialer Interface

```
[edit interfaces]
d10 {
 encapsulation ppp;
 unit 0 {
 dialer-options {
 pool 10;
 dial-string 5552222;
 activation-delay 10;
 deactivation-delay 10;
 }
 family inet {
 address 172.20.10.2 {
 destination 172.20.10.1;
 }
 }
 }
}
```

**Configuration on the Physical ISDN Interface**

```
[edit interfaces]
br-1/0/0 {
 isdn-options {
 calling-number 5558888;
 spid1 51255511110101 5551111;
 spid2 51255511120101 5551112;
 switch-type ni1;
 t310 70;
 }
 dialer-options {
 pool 10 priority 3;
 pool 2 priority 25;
 }
}
```

**Applying the Dial-on-Demand Dialer Filter to the Dialer Interfaces**

Dial-on-demand routing (DDR) links two sites over a public network and provides bandwidth. An ISDN connection allows an ISDN line to be activated only when there is network traffic configured as an “interesting” packet. An interesting packet is defined using the firewall filter feature of the Services Router.

To configure DDR, you configure the dialer interface as a passive static route with a lower priority than dynamic routes. If the dynamic route is lost, and a packet destined for that IP address is received, the dialer interface initiates an ISDN connection and sends the packet over it. When no new packets are sent to the destination, the dialer interface initiates an inactivity timer. The ISDN connection is terminated when the timer expires.

There are three steps to configuring dial-on-demand connectivity:

- Define the dialer filter.
- Configure the firewall rule.
- Apply the dialer filter to the dialer interface.

To define the filter, include the `dialer-filter interesting-traffic` statement at the `[edit firewall family inet]` hierarchy level.

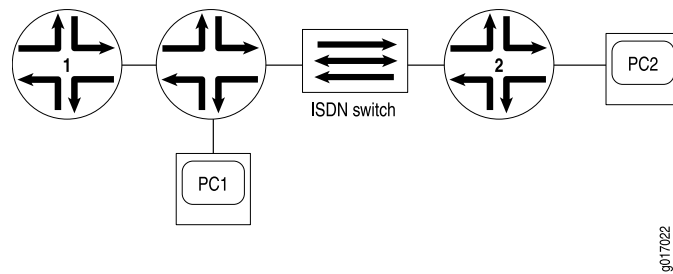
To configure the firewall rule, include the `term` and `from` statements at the `[edit firewall family inet dialer-filter filter-name]` hierarchy level.

To apply the filter to the dialer interface, include the `filter dialer` statement at the `[edit interfaces dln unit logical-unit-number family family]` hierarchy level.

**Example: Applying the Dialer Filter**

The following example illustrates a dialer filter configuration configured at the `[edit firewall family inet]` hierarchy level and applied to a physical interface and a dialer interface.

See Figure 52 on page 667 for the topology used for this example.

**Figure 52: Dialer Filter Topology****Configuration for the Dialer Filter**

```
edit firewall family inet
dialer-filter interesting-traffic {
 term 1 {
 from {
 destination-address {
 100.0.0.50/32;
 }
 }
 then note;
 }
}
```

**Configuration on the Dialer Interface**

```
[edit interfaces]
dlo {
 encapsulation ppp;
 unit 0 {
 dialer-options {
 pool 1;
 dial-string 350100;
 }
 }
 family inet {
 filter {
 dialer interesting-traffic;
 }
 address 50.2.0.1/24;
 }
}
```

**Configuring Bandwidth on Demand**

You can define a bandwidth threshold for network traffic on the Services Router using the dialer interface and ISDN interfaces. Initially, only one ISDN link is active and all packets are sent through this interface. When a predefined bandwidth threshold is reached on this interface, the dialer interface activates another ISDN link and initiates a data connection.

To configure bandwidth on demand, perform the steps in the following sections to configure the dialer interface and the physical ISDN interfaces:

- Configuring the Dialer Interface on page 668
- Configuring the ISDN Interface on page 669
- Example: Configuring Bandwidth on Demand on page 669

## Configuring the Dialer Interface

To configure the dialer interface for bandwidth on demand, include the `encapsulation multilink-ppp` statement at the `[edit interfaces dln]` hierarchy level:

```
[edit interfaces]
dlm {
 encapsulation multilink-ppp;
}
```

To configure dialer options, include the `dialer-options` statement at the `[edit interfaces dlm unit logical-unit-number]` hierarchy level:

```
[edit interfaces dlm unit logical-unit-number]
dialer-options {
 dial-string dial-string-numbers;
 load-interval seconds;
 load-threshold percent;
 pool pool-name;
}
```

To configure unit properties, include the `unit logical-unit-number` statement at the `[edit interfaces dlm]` hierarchy level:

```
[edit interfaces dlm unit logical-unit-number]
family family {
 mtu bytes;
 negotiate-address;
 filter {
 filter-name;
 fragment-threshold bytes;
 mrru bytes;
 ppp-options {
 chap {
 access-profile name;
 }
 }
 }
}
```

You can configure the following unit properties:

- **family**—Protocol family information for the logical interface. For *family*, specify *inet* (for Internet Protocol version 4 [IPv4]) suite.
- **filter**—Dialer filter name. The dialer filter applied here is configured at the [edit firewall family inet] hierarchy level and also applied to the physical ISDN interface.
- **fragment-threshold**—Maximum size, in bytes, for multilink packet fragments. Any nonzero value must be a multiple of 64 bytes. The value can be between 128 and 16320. The default is 0 bytes (no fragmentation).
- **mrru**—Maximum received reconstructed unit (MRRU), in bytes. The value can be between 1500 and 4500. The default is 1500 bytes.
- **negotiate-address**—For interfaces with Point-to-Point Protocol (PPP) encapsulation, enable the interface to be assigned an IP address by the remote end.

### Configuring the ISDN Interface

To configure the ISDN interface for bandwidth on demand, include the **pool** statement at the [edit interfaces *br-pim/0/port* dialer-options] hierarchy level:

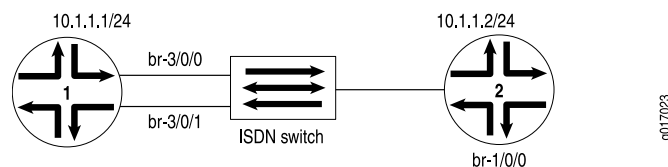
```
[edit interfaces br-pim/0/port]
dialer-options {
 pool pool-name;
}
```

Each ISDN interface must use the same dialer pool name to participate in the bandwidth-on-demand configuration.

### Example: Configuring Bandwidth on Demand

Figure 53 on page 669 illustrates a bandwidth-on-demand configuration using multiple physical ISDN interfaces.

**Figure 53: Bandwidth-on-Demand Topology**



#### Configuration for the Dialer Interface

```
[edit interfaces]
d10 {
 encapsulation multilink-ppp;
 unit 0 {
 dialer-options {
 pool 10;
 dial-string 5552222; #Phone number to be dialed
 load-threshold 95; #Dial more ISDN if load exceeds 95% of
 #current capacity
 }
 }
}
```

```

 fragment-threshold 1024; #Allowed only when dialer is in multilink mode
 mrru 1500; #Allowed only when dialer is in multilink mode
 encapsulation multilink-ppp;
 rtp {
 f-max-period 100;
 queues q3;
 }
 }
 family inet {
 negotiate-address;
 }
}

```

**Configuration for the  
First Physical ISDN  
Interface**

```

[edit interfaces]
br-1/0/0 {
 isdn-options {
 switch-type ni1;
 }
 dialer-options {
 pool 1;
 }
}

```

**Configuration for the  
Second Physical ISDN  
Interface**

```

[edit interfaces]
br-1/0/1 {
 isdn-options {
 switch-type ni1;
 }
 dialer-options {
 pool dialer-pool1;
 }
}

```

## Configuring Dial-In and Callback

You can configure dial-in on the dialer interface to permit incoming calls. Using dial-in, all incoming calls on a BRI interface are mapped to a dialer interface based on a caller ID. The incoming call's caller ID is compared against all caller IDs configured on all dialers to find the valid match. Multiple caller IDs can be configured on a dialer interface. The same caller IDs cannot be configured on different dialers.

Instead of accepting incoming calls, you can configure the dialer interface to call back the caller. When callback is configured, the call is rejected, and after a brief delay the caller is called back using the dial-string configured on the dialer interface. Multiple dial-strings cannot be configured on a dialer when callback is configured.

To configure dial-in or callback, perform the steps in the following sections to configure the dialer interface and the physical ISDN interfaces:

- Configuring Dial-In on page 671
- Disabling Dial-In on page 671



- Configuring Callback on page 672
- Example: Configuring Dial-In and Callback on page 672

## Configuring Dial-In

To configure the dialer interface for dial-in operation, include the `incoming-map` statement with options at the `[edit interfaces dln unit logical-unit-number dialer-options]` hierarchy level:

```
[edit interfaces dln unit logical-unit-number]
dialer-options {
 incoming-map {
 caller (caller-id | accept-all);
 }
}
```

Include the option **accept-all** to accept all incoming calls. You can configure the **accept-all** option for only one of the dialer interfaces associated with an ISDN physical interface. The dialer interface with the **accept-all** option configured will be used only if the incoming call's caller ID does not match against the caller IDs configured on other dialer interfaces.

Include the **caller *caller-id*** statement to configure the dialer interface to accept calls from a specific caller ID. You can configure a maximum of 15 caller IDs per dialer interface.

The same caller ID cannot be configured on different dialer interfaces. However, you can configure a subset of the caller ID configured on another dialer interface. For example, you can configure the caller IDs 14085551515, 4085551515, and 5551515 on different dialer interfaces.

## Disabling Dial-In

When dial-in is configured on the Services Router, incoming ISDN calls are accepted by the Services Router. However, you can configure the Services Router to reject all incoming ISDN calls when dial-in is configured.

To configure the Services Router to reject incoming ISDN calls, include the **reject-incoming** statement at the `[edit system processes isdn-signaling]` hierarchy level:

```
[edit system processes isdn-signaling]
reject-incoming;
```

For more information about disabling dial-in, see the *JUNOS System Basics Configuration Guide* and the *J-series Services Router Basic LAN and WAN Access Configuration Guide*.

## Configuring Callback

To configure the dialer interface to call back a specific caller, include the `caller caller-id` statement and the `callback` statement at the `[edit interfaces dln unit logical-unit-number dialer-options]` hierarchy level:

```
[edit interfaces dln unit logical-unit-number
dialer-options {
 incoming-map {
 caller caller-id;
 callback;
 callback-wait-period time;
 }
}
```

Include the optional `callback-wait-period` statement to change the time at which the dialer interface calls back the caller. The default period is 5 seconds.

Before configuring the callback on a dialer interface, ensure that:

- The dialer interface is not configured as a backup for a primary interface.
- The dialer interface does not have a watch list configured.
- Only one dial string is configured for the dialer interface.
- Dial-in is configured on the dialer interface of the remote router that is dialing in.

## Example: Configuring Dial-In and Callback

The following illustrates configurations for dial-in and callback operations.

### Configuration to Accept All Incoming Calls

```
[edit interfaces]
dlo {
 encapsulationppp;
 unit 0 {
 dialer-options {
 dial-string 7031231282;
 incoming-map;
 accept-all;
 }
 pool 2;
 family inet {
 address 10.1.1.2;
 }
 }
}
```

### Configuration to Accept Calls from a Specific Caller ID

```
[edit interfaces]
dlo {
 encapsulationppp;
 unit 0 {
 dialer-options {
 incoming-map {
 caller 14082711234;
 }
 }
 }
}
```

```

 }
 pool 1;
 family inet {
 address 20.1.1.1;
 }
}
}
}

```

**Configuration to Call  
Back Calls from a  
Specific Caller ID**

```

[edit interfaces]
dIO {
 encapsulation ppp;
 unit 0 {
 dialer-options {
 incoming-map {
 caller 14082711234;
 }
 callback;
 callback-wait-period 2;
 pool 1;
 family inet {
 address 20.1.1.1;
 }
 }
 }
}
}

```

## Configuring Dialer Watch

Dialer watch is a feature that integrates backup dialing with routing capabilities and provides reliable connectivity without relying on “interesting” packets to trigger outgoing ISDN connections. With dialer watch, the Services Router monitors the existence of a specified route and if the route fails, the dialer interface initiates the ISDN connection as a backup connection.

To configure dialer watch, perform the steps in the following sections to configure the dialer interface and the physical ISDN interface:

- Configuring the Dialer Interface on page 673
- Configuring the Physical Interface on page 674
- Example: Configuring Dialer Watch on page 674

### Configuring the Dialer Interface

To configure the dialer interface for dialer watch, include the following statements at the [edit interfaces *dln*] and the [edit interfaces *dln* unit *logical-unit-number*] hierarchy levels:

```

[edit interfaces]
dln {
 encapsulation (cisco-hdlc | multilink-ppp | ppp);
 hold-time (up | down) milliseconds;

```

```

unit logical-unit-number {
 dialer-options {
 activation-delay seconds;
 deactivation-delay seconds;
 dial-string dial-string-numbers;
 hold-time seconds;
 initial-route-check seconds
 pool pool-name;
 watch-list {
 [routes];
 }
 family family {
 ip-address;
 }
 }
}

```

### Configuring the Physical Interface

To configure the physical interface for dialer watch, include the **pool** statement at the [edit interfaces *br-pim/O/port* dialer-options] hierarchy level:

```

[edit interfaces]
br-pim/O/port {
 dialer-options {
 pool name;
 }
}

```

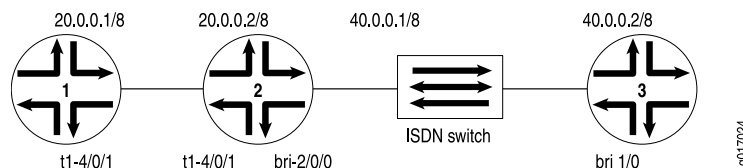
Each physical interface must use the same pool to participate in dialer watch.

### Example: Configuring Dialer Watch

The following example illustrates a dialer watch configuration using one physical interface and one dialer interface.

See Figure 54 on page 674 for the topology used in this example.

**Figure 54: Dialer Watch Topology**



#### Configuration for the Physical Interface

```

[edit interfaces]
br-2/0/0 {
 isdn-options {
 switch-type ntdms100;
 }
 dialer-options {
 pool 1 priority 1;
 }
}

```

```

 }
 }
}

Configuration for the
Dialer Interface

[edit interfaces]
dlo {
 unit 0 {
 dialer-options {
 pool 1;
 dial-string 384030;
 watch-list {
 2.2.2.2/24;
 3.3.3.3/24;
 }
 }
 }
 family inet {
 address 40.0.0.1/8;
 }
}
}

```

## Disabling ISDN Processes

---

You can disable ISDN entirely or disable certain processes at the system process level.

To disable ISDN entirely, include the **disable** statement at the **[edit system processes isdn-signaling]** hierarchy level:

```

[edit system processes isdn-signaling]
disable;

```

To disable the dial-out on demand process, include the **disable** statement at the **[edit system processes dialer-services]** hierarchy level:

```

[edit system processes dialer-services]
disable;

```

To disable dial-in and force the Services Router to reject incoming ISDN calls, include the **reject-incoming** statement at the **[edit system processes isdn-signaling]** hierarchy level:

```

[edit system processes isdn-signaling]
reject-incoming;

```



## **Part 11**

# **Configuring SONET Interfaces**

- Configuring SONET/SDH Interfaces on page 679





## Chapter 54

# Configuring SONET/SDH Interfaces

This chapter discusses configuration of the SONET/SDH interface properties and provides configuration examples in the following sections:

- SONET/SDH Interfaces Overview on page 679
- Configuring SONET/SDH Physical Interface Properties on page 680
- Configuring the Media MTU on page 708
- Enabling Passive Monitoring on SONET/SDH Interfaces on page 709
- Configuring the Clock Source on page 710
- Configuring Receive and Transmit Leaky Bucket Properties on page 711
- Damping Interface Transitions on page 712
- Configuring Interface Encapsulation on page 713
- Example: Configuring SONET/SDH Interfaces on page 716
- Configuring Aggregated SONET/SDH Interfaces on page 716

## SONET/SDH Interfaces Overview

---

Synchronous Digital Hierarchy (SDH) is a CCITT standard for a hierarchy of optical transmission rates. Synchronous Optical Network (SONET) is a USA standard that is largely equivalent to SDH. Both are widely used methods for very high speed transmission of voice and data signals across the numerous world-wide fiber-optic networks.

SDH and SONET use light-emitting diodes or lasers to transmit a binary stream of light-on and light-off sequences at a constant rate. At the far end optical sensors convert the pulses of light back to electrical representations of the binary information.

In wavelength-division multiplexing (WDM), light at several different wavelengths (colors to a human eye) is transmitted on the same fiber segment, greatly increasing the throughput of each fiber cable.

In dense wavelength-division multiplexing (DWDM), many optical data streams at different wavelengths are combined into one fiber.

The basic building block of the SONET/SDH hierarchy in the optical domain is an OC1; in the electrical domain, it is an STS-1. An OC1 operates at 51.840 Mbps. OC3 operates at 155.520 Mbps.

A SONET/SDH stream can consist of discrete lower-rate traffic flows that have been combined using time-division multiplexing (TDM) techniques. This method is useful, but a portion of the total bandwidth is consumed by the TDM overhead. When a SONET/SDH stream consists of only a single, very high speed payload, it is referred to as operating in concatenated mode. A SONET/SDH interface operating in this mode has a “c” added to the rate descriptor. For example, a concatenated OC48 interface is referred to as OC48c.

SONET and SDH traffic streams exhibit very few differences in behavior that are significant to Juniper Networks SONET/SDH interfaces; in general, this chapter uses *SONET/SDH* to indicate behavior that is identical for the two standards. However, there is one important difference that requires you to configure the interface specifically for SONET or SDH mode. That difference is in the setting of two bits (the ss-bits) in the pointer. SONET equipment ignores these bits, but SDH equipment uses them to distinguish a VC-4 payload from other types. When configured in SDH mode, Juniper Networks SONET/SDH PICs set the ss-bits to **s1s0 2** (binary 10). For more information, see the *JUNOS System Basics Configuration Guide*.



**CAUTION:** To extend the life of the laser, when a SONET/SDH PIC is not being actively used with any valid links, take the PIC offline until you are ready to establish a link to another device. To do this, issue the **request chassis pic offline fpc-slot slot-number pic-slot slot-number** operational mode command:

```
user@host> request chassis pic offline fpc-slot slot-number pic-slot slot-number
```

After you have connected the PIC to another device, bring the PIC back online by issuing the **request chassis pic online fpc-slot slot-number pic-slot slot-number** operational mode command.

```
user@host> request chassis pic online fpc-slot slot-number pic-slot slot-number
```

For information about taking a PIC offline or online, see the **request chassis pic offline** command and the **request chassis pic online** command in the *JUNOS System Basics and Services Command Reference*.

---

## Configuring SONET/SDH Physical Interface Properties

---

To configure SONET/SDH physical interface properties, include the **sonet-options** statement at the [edit interfaces *interface-name*] hierarchy level:

```
[edit interfaces so-fpc/pic/port]
framing (sdh | sonet)
sonet-options {
 aggregate asx;
 aps {
 advertise-interval milliseconds;
 authentication-key key;
 force;
```

```

 hold-time milliseconds;
 lockout;
 neighbor address;
 paired-group group-name;
 protect-circuit group-name;
 request;
 revert-time seconds;
 switching-mode (bidirectional | unidirectional);
 working-circuit group-name;
}
bytes {
 e1-quiet value;
 f1 value;
 f2 value;
 s1 value;
 z3 value;
 z4 value;
}
fcs (16 | 32);
loopback (local | remote);
mpls {
 pop-all-labels {
 required-depth number;
 }
}
path-trace trace-string;
(payload-scrambler | no-payload-scrambler);
rfc-2615;
trigger {
 defect ignore;
 defect hold-time up milliseconds down milliseconds;
}
}
vtmapping (itu-t | klm);
(z0-increment | no-z0-increment);
speed (oc3 | oc12 | oc48);

```

Note that when you configure SONET/SDH OC48 interfaces for channelized (multiplexed) mode (by including the **no-concatenate** statement at the [edit chassis fpc slot-number pic pic-number] hierarchy level), the **bytes f1** statement has no effect. Currently, the **bytes e1-quiet** statement is ignored if you include it in the configuration. The **bytes f2**, **bytes z3**, **bytes z4**, and **path-trace** options work correctly on channel 0 and work in the transmit direction only on channels 1, 2, and 3. When using **no-concatenate**, you must specify a channel. For more information, see the *JUNOS System Basics Configuration Guide*.

For DS3 channels on a channelized OC12 interface, the **bytes f1**, **bytes f2**, **bytes z3**, and **bytes z4** options have no effect. The **bytes s1** option is supported only for channel 0; it is ignored if configured on channels 1 through 11. The **bytes s1** value configured on channel 0 applies to all channels on the interface.

You can also include some of the statements in the **sonet-options** statement to set SONET/SDH parameters on ATM interfaces.

You can configure the following SONET/SDH physical interface properties:

- Configuring SONET/SDH Framing on page 682
- Configuring SONET/SDH Interface Speed on page 683
- Configuring SONET/SDH Header Byte Values on page 685
- Configuring an Incrementing STM ID on page 686
- Configuring the SONET/SDH Frame Checksum on page 687
- Configuring Channelized IQ and IQE SONET/SDH Loop Timing on page 687
- Configuring SONET/SDH Loopback Capability on page 688
- Configuring the SONET/SDH Path Trace Identifier on page 689
- Configuring SONET/SDH HDLC Payload Scrambling on page 689
- Configuring SONET/SDH RFC 2615 Support on page 690
- Configuring SONET/SDH Defect Triggers to Be Ignored on page 691
- Configuring SONET/SDH Defect Hold Times on page 692
- Configuring Virtual Tributary Mapping on page 694
- Configuring APS and MSP on page 694
- Configuring SONET Options for 10-Gigabit Ethernet Interfaces on page 707

## Configuring SONET/SDH Framing

The 4-port OC48 PIC with SFP installed, the next-generation SONET/SDH PICs with SFP, and the 4-port OC192 PIC on M-series and T-series routing platforms, support SONET or SDH framing on a per-port basis. This functionality allows you to mix SONET and SDH modes on interfaces on a single PIC. You can use the **framing** statement to configure incoming SDH links from Europe and outgoing SONET links to the US on the same PIC. Traffic flowing through other ports of the same PIC will not be affected.

When you change SONET/SDH mode on a port, only the port's framing type is changed. The PIC does not go offline.

To configure framing on a per-port basis, include the **framing (sdh | sonet)** statement at the **[edit interfaces so-fpc/pic/port]** hierarchy level:

```
[edit interfaces]
so-fpc/pic/port {
 framing (sdh | sonet);
}
```



**NOTE:** Per-port framing configuration is applicable for SONET interfaces in concatenated mode (default mode) only. When you configure a PIC to operate in nonconcatenated mode, the individual channels inherit framing configuration from the **[edit chassis fpc number pic number framing (sonet | sdh)]** hierarchy level.

---



**NOTE:** Automatic Protection Switching (APS) is used by SONET add/drop multiplexers (ADMs) to protect against circuit failures. If APS is configured, and you do not change the SONET/SDH mode on both the working and protection port, APS support will not function properly. Both the working and protection ports must have the same mode configuration.

To view interface information, use the operational mode command `show interfaces so-fpc/pic/port`.

## Configuring SONET/SDH Interface Speed

You can configure the speed of SONET/SDH interfaces on next-generation SONET/SDH Type 1 and Type 2 PICs with SFP. The speed you select is dependent upon whether the PIC is in concatenated or nonconcatenated mode. In concatenated mode, the bandwidth of the interface is in a single channel. In nonconcatenated mode, the PIC operates in channelized (multiplexed) mode.

Table 57 on page 683 shows the mode combinations for the next-generation SONET/SDH Type 1 PICs with SFP.

**Table 57: Type 1 PIC Mode Combinations**

| PIC         | Mode                   | Speed Configuration                 | Default Mode    |
|-------------|------------------------|-------------------------------------|-----------------|
| 2-port OC3  | 2xOC3 concatenated     | <code>fpc/pic/0 speed oc3</code>    | Concatenated    |
| 4-port OC3  | 1xOC12 concatenated    | <code>fpc/pic/0 speed oc12</code>   |                 |
|             | 1xOC12 nonconcatenated | <code>fpc/pic/0:0 speed oc3</code>  | Nonconcatenated |
|             | 4xOC3 concatenated     | <code>fpc/pic/port speed oc3</code> | Concatenated    |
| 1-port OC12 | 1xOC12 concatenated    | <code>fpc/pic/0 speed oc12</code>   | Concatenated    |
|             | 1xOC12 nonconcatenated | <code>fpc/pic/0:0 speed oc3</code>  | Nonconcatenated |
|             | 1xOC3 concatenated     | <code>fpc/pic/0 speed oc3</code>    |                 |

Table 58 on page 684 shows the mode combinations for the next-generation SONET/SDH Type 2 PICs with SFP.

**Table 58: Type 2 PIC Mode Combinations**

| PIC         | Mode                   | Speed Configuration                | Default Mode    |
|-------------|------------------------|------------------------------------|-----------------|
| 1-port OC48 | 1xOC48 concatenated    | <i>fpc/pic/0 speed oc48</i>        | Concatenated    |
|             | 1xOC48 nonconcatenated | <i>fpc/pic/0:0 speed oc12</i>      | Nonconcatenated |
|             | 1xOC12 concatenated    | <i>fpc/pic/0 speed oc12</i>        |                 |
|             | 1xOC12 nonconcatenated | <i>fpc/pic/0 0 speed oc3</i>       |                 |
|             | 1xOC3 concatenated     | <i>fpc/pic/0 speed oc3</i>         |                 |
| 4-port OC12 | 1xOC48 concatenated    | <i>fpc/pic/0 speed oc48</i>        |                 |
|             | 1xOC48 nonconcatenated | <i>fpc/pic/0:0 speed</i>           | Nonconcatenated |
|             | 1xOC12 nonconcatenated | <i>fpc/pic/0 speed oc3</i>         |                 |
|             | 4xOC12 concatenated    | <i>fpc/pic/port speed oc3 oc12</i> | Concatenated    |
| 4-port OC3  | 1xOC12 concatenated    | <i>fpc/pic/0 speed oc12</i>        |                 |
|             | 1xOC12 nonconcatenated | <i>fpc/pic/0:0 speed oc3</i>       | Nonconcatenated |
|             | 4xOC3 concatenated     | <i>fpc/pic/port speed oc3</i>      | Concatenated    |

By default, SONET/SDH PICs operate in concatenated mode. To specify interface speed in concatenated mode, include the **speed** statement with options at the [edit interfaces *so-fpc/pic/port*] hierarchy level:

```
[edit interfaces so-fpc/pic/port
speed (oc3 | oc12 | oc48);
```

For example, each port of 4-port OC12 PIC can be configured to be in OC3 or OC12 speed independently when this PIC is in 4xOC12 concatenated mode.

To specify interface speed in nonconcatenated mode, include the **speed** statement at the [edit interfaces *so-fpc/pic/port.channel*] hierarchy level:

```
[edit interfaces so-fpc/pic/port.channel]
speed (oc3 | oc12);
```

To configure the PIC to operate in channelized (multiplexed) mode, include the **no-concatenate** statement at the [edit chassis *fpc slot-number pic pic-number*] hierarchy level.

For more information about using the **non-concatenate** statement, see the *JUNOS System Basics Configuration Guide*.

## Configuring SONET/SDH Header Byte Values

To configure values in SONET/SDH header bytes, include the **bytes** statement at the [edit interfaces *interface-name* sonet-options] hierarchy level:

```
[edit interfaces so-fpc/pic/port sonet-options]
bytes {
 c2 value;
 e1-quiet value;
 f1 value;
 f2 value;
 s1 value;
 z3 value;
 z4 value;
}
```

You can configure the following SONET/SDH header bytes:

- **c2**—Path signal label SONET/SDH overhead byte. SONET/SDH frames use the C2 byte to indicate the contents of the payload inside the frame. SONET/SDH interfaces use the C2 byte to indicate whether the payload is scrambled. For the c2 byte, *value* can be from 0 through 255. The default value is 0xCF.
- **e1-quiet**—Default idle byte sent on the orderwire SONET/SDH overhead bytes. The routing platform does not support the orderwire channel, and hence sends this byte continuously.
- **f1, f2, z3, z4**—SONET/SDH overhead bytes. For these bytes, *value* can be from 0 through 255. The default value is 0x00.
- **s1**—Synchronization message SONET/SDH overhead byte. This byte is normally controlled as a side effect of the system reference clock configuration and the state of the external clock coming from an interface if the system reference clocks have been configured to use an external reference. For the s1 byte, *value* can be from 0 through 255.

Table 59 on page 685 displays JUNOS software framing bytes for several specific speeds.

**Table 59: SONET/SDH Framing Bytes for Specific Speeds**

| Overhead Bytes    | STM4  | STM16 | STM64 | OC12  | OC48  | OC192  |
|-------------------|-------|-------|-------|-------|-------|--------|
| A1                | F6    | F6    | F6    | F6    | F6    | F6     |
| A2                | 28    | 28    | 28    | 28    | 28    | 28     |
| C1                | —     | —     | —     | 1..12 | 1..48 | 1..192 |
| H1/H2             | 6A0A  | 6A0A  | 6A0A  | 620A  | 620A  | 620A   |
| Z0                | 01/CC | 01/CC | 01/CC | —     | —     | —      |
| Concatenated mode | 93FF  | 93FF  | 93FF  | 93FF  | 93FF  | 93FF   |

When you configure SONET/SDH header bytes, note the following:

- The C2 byte is the path signal label. If the C2 byte value on an interface does not match the C2 byte value on the remote interface, the path label mismatch (PLM-P) or unequipped (UNEQ-P) alarm might occur.
- When you configure SONET/SDH OC48 interfaces for channelized (multiplexed) mode (by including the `no-concatenate` statement at the `[edit chassis fpc slot-number pic pic-number]` hierarchy level), the `bytes f1` statement has no effect.
- Currently, the `bytes e1-quiet` statement is ignored if you include it in the configuration.
- The `bytes f2`, `bytes z3`, `bytes z4`, and `path-trace` options work correctly on channel 0 and work in the transmit direction only on channels 1, 2, and 3.
- For DS3 channels on a channelized OC12 interface, the `bytes f1`, `bytes f2`, `bytes z3`, and `bytes z4` options have no effect.
- The `bytes s1` option is supported only for channel 0; it is ignored if configured on channels 1 through 11. The `bytes s1` value configured on channel 0 applies to all channels on the interface.
- Embedded operations channel (EOC) D1, D2, and D3 bytes are not supported.

## Configuring an Incrementing STM ID

When configured in SDH framing mode, SONET/SDH interfaces on a Juniper Networks routing platform might not interoperate with some older versions of ADMs or regenerators that require an incrementing STM ID.

Current SDH standards specify a set of  $3 * n$  overhead bytes in an STM $n$  that includes the J0 section trace byte. The rest are essentially unused (spare Z0) and contain hexadecimal values (0x01, 0xCC, 0xCC ... 0xCC). The older version of the standard specified that the same set of bytes should contain an incrementing sequence: 1, 2, 3, ...,  $3 * n$ . Their use was still unspecified although they might have been used to assist in frame alignment. You can configure an incrementing STM ID to enable your Juniper Networks routing platform to interoperate with older equipment that relies on these bytes for frame alignment.

The STM identifier has a precise definition in the SDH specifications. In ITU-T Recommendation G.707, *Network node interface for the synchronous digital hierarchy (SDH)* (03/96), Section 9.2.2.2.

You can explicitly configure an incrementing STM ID rather than a static one in the SDH overhead by including the `z0-increment` statement at the `[edit interfaces interface-name sonet-options]` hierarchy level. You should include this statement only for SDH mode; do not use it for SONET mode.

```
[edit interfaces so-fpc/pic/port sonet-options]
z0-increment;
```

To explicitly disable incrementing of the STM ID, include the following statement:

```
[edit interfaces so-fpc/pic/port sonet-options]
no-z0-increment;
```



## Configuring the SONET/SDH Frame Checksum

By default, SONET/SDH interfaces use a 16-bit frame checksum. You can configure a 32-bit checksum, which provides more reliable packet verification. However, some older equipment might not support 32-bit checksums.

To configure a 32-bit checksum, include the **fcs** statement at the [edit interfaces *interface-name* sonet-options] hierarchy level:

```
[edit interfaces so-fpc/pic/port sonet-options]
fcs 32;
```

To return to the default 16-bit frame checksum, delete the **fcs 32** statement from the configuration:

```
[edit]
user@host# delete interfaces so-fpc/pic/port sonet-options fcs 32
```

To explicitly configure a 16-bit checksum, include the **fcs** statement at the [edit interfaces *interface-name* sonet-options] hierarchy level:

```
[edit interfaces so-fpc/pic/port sonet-options]
fcs 16;
```

On a channelized OC12 interface, the **sonet-options fcs** statement is not supported. To configure the frame checksum sequence (FCS) on each DS3 channel, you must include the **t3-options fcs** statement in the configuration for each channel.

## Configuring Channelized IQ and IQE SONET/SDH Loop Timing

By default, internal clocking (line timing) is used on channelized IQ and IQE interfaces. To configure SONET/SDH or DS3-level clocking, include the **loop-timing** statement:

```
loop-timing;
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *ct3-fpc/pic/port* t3-options]
- [edit interfaces *stm1-fpc/pic/port* sonet-options]

To explicitly configure the default line timing, include the **no-loop-timing** statement in the configuration:

```
no-loop-timing;
```

The **loop-timing** and **no-loop-timing** statements apply only to E1 and T1 interfaces you configure on channelized IQ and IQE PICs. If you attempt to include these statements on any other interface type, they are ignored.

For all channelized IQ and IQE PICs, the **clocking** statement is supported on all channels. To configure clocking on individual interfaces, include the **clocking** statement at the [edit interfaces *type-fpc/pic/port:channel*] hierarchy level. If you do not include the **clocking** statement, the individual interfaces use internal clocking by default.

For more information, see “Configuring the Clock Source” on page 119 and “Clock Sources on Channelized Interfaces” on page 364.

## Configuring SONET/SDH Loopback Capability

To configure loopback capability on a SONET/SDH interface, include the **loopback** statement at the [edit interfaces *interface-name* sonet-options] hierarchy level:

```
[edit interfaces so-fpc/pic/port sonet-options]
loopback (local | remote);
```

To exchange BERT patterns between a local routing platform and a remote routing platform, include the **loopback remote** statement in the interface configuration at the remote end of the link. From the local routing platform, issue the **test interface** command.

For more information about configuring BERT, see “Interface Diagnostics” on page 125. For more information about using operational mode commands to test interfaces, see the *JUNOS System Basics and Services Command Reference*.

To turn off the loopback capability, remove the **loopback** statement from the configuration:

```
[edit]
user@host# delete interfaces so-fpc/pic/port sonet-options loopback
```

For channel 0 on channelized interfaces only, you can include the **loopback** statement at the [edit interfaces *interface-name* *interface-type-options*] hierarchy level. The loopback setting configured for channel 0 applies to all channels on the channelized interface. The **loopback** statement is ignored if you include it at this hierarchy level in the configuration of other channels. To configure loopbacks on individual channels, you must include the *channel-type-options* **loopback** statement in the configuration for each channel. This allows each channel to be put in loopback mode independently.

For example, for DS3 channels on a channelized OC12 interface, the **sonet-options loopback** statement is supported only for channel 0; it is ignored if included in the configuration for channels 1 through 11. The SONET/SDH loopback configured for channel 0 applies to all 12 channels equally. To configure loopbacks on the individual DS3 channels, you must include the **t3-options loopback** statement in the configuration for each channel. This allows each DS3 channel can be put in loopback mode independently.

You can determine whether there is an internal problem or an external problem by checking the error counters in the output of the **show interface *interface-name* extensive** command:

```
user@host> show interfaces so-fpc/pic/port extensive
```

### Example: Configuring SONET/SDH Loopback Capability

To determine whether a problem is internal or external, loop packets on both the local and the remote routing platform. To do this, include the **no-keepalives** and **encapsulation cisco-hdlc** statements at the [edit interfaces *interface-name*] hierarchy

level, and the `loopback local` statement at the `[edit interfaces interface-name sonet-options]` hierarchy level. With this configuration, the link stays up, so you can loop ping packets to a remote routing platform. The `loopback local` statement causes the interface to loop within the PIC just before the data reaches the transceiver.

```
[edit interfaces]
so-1/0/0 {
 no-keepalives;
 encapsulation cisco-hdlc;
 sonet-options {
 loopback local;
 }
 unit 0 {
 family inet {
 address 10.100.100.1/24;
 }
 }
}
```

### Configuring the SONET/SDH Path Trace Identifier

The SONET/SDH *path trace identifier* is a text string that identifies the circuit. If the string contains spaces, enclose it in quotation marks.

By default, the JUNOS software uses the router and interface names for the path trace identifier. Depending on the router and interface names, the default path trace identifier might be longer than 16 bytes. The SDH standards define a maximum 16-byte path trace. For this reason, the default path trace identifier might be truncated in SDH mode. You can prevent the path trace identifier from being truncated in SDH mode by configuring a path trace identifier that is under 16-bytes long. In SONET mode, a path trace identifier can be up to 64-bytes long.

For DS3 channels on a channelized OC12 interface, you can configure a unique path trace for each of the 12 channels. Each path trace can be up to 16 bytes. For channels on a channelized OC12 intelligent queuing (IQ and IQE) interface, each path trace can be up to 64 bytes.

To configure a path trace identifier, include the `path-trace` statement at the `[edit interfaces interface-name sonet-options]` hierarchy level:

```
[edit interfaces interface-name sonet-options]
path-trace trace-string;
```

A common convention is to use the circuit identifier as the path trace identifier.

To display the local router's path trace identifier, issue the `show interfaces` command on the remote router.

### Configuring SONET/SDH HDLC Payload Scrambling

SONET/SDH HDLC payload scrambling, which is enabled by default, provides better link stability. Both sides of a connection must either use or not use scrambling.



**NOTE:** HDLC payload scrambling conflicts with traffic shaping configured using leaky bucket properties. If you configure leaky bucket properties, you must disable payload scrambling, because the JUNOS software rejects configurations that have both features enabled. For more information, see “Configuring Receive and Transmit Leaky Bucket Properties” on page 711.

On a channelized OC12 interface, the `sonet-options payload-scrambler` statement is ignored. To configure scrambling on the DS3 channels on the interface, include the `t3-options payload-scrambler` statement in the configuration for each DS3 channel.

To disable HDLC payload scrambling, include the `no-payload-scrambler` statement at the `[edit interfaces interface-name sonet-options]` hierarchy level:

```
[edit interfaces so-fpc/pic/port sonet-options]
no-payload-scrambler;
```

To return to the default, that is, to re-enable payload scrambling, delete the `no-payload-scrambler` statement from the configuration:

```
[edit]
user@host# delete interfaces so-fpc/pic/port sonet-options no-payload-scrambler
```

To explicitly enable payload scrambling, include the `payload-scrambler` statement at the `[edit interfaces interface-name sonet-options]` hierarchy level:

```
[edit interfaces so-fpc/pic/port sonet-options]
payload-scrambler;
```

## Configuring SONET/SDH RFC 2615 Support

RFC 2615, *PPP over SONET/SDH*, requires certain C2 header byte and FCS settings that vary from the default values configured in accordance with RFC 1619 (the previous version of RFC 2615). The newer values are optimized for stronger error detection, especially when combined with payload scrambling at higher bit rate links.

Table 60 on page 690 shows the older (RFC 1619) and newer (RFC 2615) values, together with the Juniper Networks default values.

**Table 60: SONET/SDH Default Settings**

| Value                    | RFC 1619 | Default | RFC 2615 |
|--------------------------|----------|---------|----------|
| SONET/SDH C2 header byte | 0XCF     | 0XCF    | 0X16     |
| Frame checksum (bit)     | 16       | 16      | 32       |
| Payload scrambling       | n/a      | Enabled | Enabled  |

To enable support for the RFC 2615 features, include the `rfc-2615` statement at the `[edit interfaces interface-name sonet-options]` hierarchy level:

```
[edit interfaces so-fpc/pic/port sonet-options]
rfc-2615;
```

## Configuring SONET/SDH Defect Triggers to Be Ignored

A trigger is a defect alarm that causes a physical interface to be marked down. By default, all defects are honored with no hold time. For SONET/SDH and ATM over SONET/SDH interfaces only, you can configure individual triggers to ignore a defect, honor a defect, and apply up and down hold timers to the defect.

Table 61 on page 691 lists the defects you can configure.

**Table 61: SONET/SDH and ATM Active Alarms and Defects**

| Alarm           | Description                          |
|-----------------|--------------------------------------|
| <b>Physical</b> |                                      |
| pll             | Phase-locked loop out of lock        |
| lol             | Loss of light                        |
| <b>Section</b>  |                                      |
| lof             | Loss of frame                        |
| los             | Loss of signal                       |
| <b>Line</b>     |                                      |
| ais-l           | Alarm indication signal—line         |
| rfl-l           | Remote failure indication—line       |
| ber-sd          | Bit error rate defect-signal degrade |
| ber-sf          | Bit error rate fault-signal fail     |
| <b>Path</b>     |                                      |
| ais-p           | Alarm indication signal—path         |
| locd (ATM only) | Loss of cell delineation             |
| lop-p           | Loss of pointer—path                 |
| plm-p           | Payload label mismatch               |
| rfl-p           | Remote failure indication—path       |
| uneq-p          | Path unequipped                      |

To configure defects to be ignored, include the **trigger** statement at the `[edit interfaces interface-name sonet-options]` hierarchy level:

```
[edit interfaces interface-name sonet-options]
```

```
trigger {
 defect ignore;
}
```

If you configure a defect to be ignored, that defect does not contribute to the interface being marked down or up.

After you configure a defect to be ignored, the JUNOS software reevaluates the state of the defect on the interface. If the defect is outstanding and has caused the interface to be marked down, the interface is marked up.

When you configure a trigger on a low-level defect—for example, an LOS—only the low-level defect is affected. Higher-level defects that might result from the lower-level defect are not affected by the low-level trigger configuration. Therefore, you must configure higher-level defects as well.

## Configuring SONET/SDH Defect Hold Times

By default, an interface is marked down as soon as a defect is detected, and is marked up as soon as the defect is absent. You might want to apply hold times to defects for the following reasons:

- To prevent route flaps from happening before a defect has been outstanding for a longer period than would be expected for an Automatic Protection Switching (APS) cutover
- To reduce the number of interface transitions

When you apply a “down” hold time to a defect, the defect must be present for at least the hold-time period before the interface is marked down. When you apply an “up” hold time to a defect, the defect must remain absent for at least the hold-time period before the interface is marked up, assuming no other defect is outstanding.

When you configure hold timers and the interface goes from up to down, the interface transition is not advertised to the rest of the system until the interface has remained down for the hold-time period. Similarly, when an interface goes from down to up, the interface transition is not advertised until the interface has remained up for the hold-time period.

To configure hold timers, include the **hold-time** statement at the [edit interfaces *interface-name* sonet-options trigger defect] hierarchy level:

```
[edit interfaces interface-name sonet-options trigger defect]
hold-time up milliseconds down milliseconds;
```

The time can be a value from 1 through 65,534 milliseconds.

When you configure defect hold times, you should note the following:

- You can configure an up hold time, a down hold time, or both.
- Each interface on a SONET/SDH PIC controls certain aspects of the SONET/SDH overhead. For example, when you configure an OC48 PIC to be nonconcatenated, four interfaces are created. Each interface has its own path overhead. However,

all four path interfaces share the same physical, section, and line overhead. This means the following:

- Each interface's path trigger configuration is honored.
- The physical, section, and line trigger configuration for the primary interface (*so-fpc/pic/slot:0*) is applied to all four interfaces.

Therefore, if you configure the *so-fpc/pic/slot:0* interface to have a hold time for the LOS trigger, when an LOS event occurs, all four interfaces remain up until the trigger expires, and then all four interfaces are marked down.

- The hold timers on the SONET/SDH defects are applied in addition to any other hold timers you configure on the interface. For example, if an interface is up and you configure a SONET/SDH trigger down hold time of 100 milliseconds and an interface down hold time of 250 milliseconds, when the SONET/SDH defect occurs, the SONET/SDH trigger timer starts. After 100 milliseconds, assuming the defect is still present, the SONET/SDH defect starts the 250 millisecond down timer. After this has expired and again assuming the defect is still outstanding, the interface will be marked down. For more information about interface hold timers, see "Damping Interface Transitions" on page 128.
- Some defects are reported through a periodic poll (once every second). For these defects, there could be up to one second lost before the defect is detected and the hold timer is started. The hold timer expires in precisely the amount of time configured. At that point, the existence of the defect is checked again and the interface is marked up or down accordingly. These defects are as follows:
  - lol
  - pll
  - ber-sf
  - ber-sd
- We recommend the following settings:
  - Configure SONET/SDH defect timers on no more than 64 interfaces per FPC.
  - Configure a combined up hold time and down hold time for a SONET/SDH defect to be at least 100 milliseconds.

### Example: Configuring SONET/SDH Defects to Be Ignored

Prevent an LOS from bringing down an interface. An LOS can lead to the following defects:

- AIS-L
- LOF
- PLL
- RFI-L
- RFI-P

```
[edit interfaces sonet-options trigger]
ais-l ignore;
lof ignore;
los ignore;
pll ignore;
rfi-l ignore;
rfi-p ignore;
```

## Configuring Virtual Tributary Mapping

You can configure virtual tributary mapping to use KLM mode or ITU-T mode. By default, virtual tributary mapping uses KLM mode.

For the Channelized STM1 IQ and IQE PICs, you can configure virtual tributary mapping by including the `vtmapping` statement at the `[edit interfaces cau4-fpc/pic/port sonet-options]` hierarchy level:

```
[edit interfaces cau4-fpc/pic/port sonet-options]
vtmapping (klm | itu-t);
```

For the STM1 PIC, you can configure virtual tributary mapping by including the `vtmapping` statement at the `[edit chassis fpc slot-number pic pic-number]` hierarchy level:

```
[edit chassis fpc slot-number pic pic-number]
vtmapping (klm | itu-t);
```

Table 41 on page 431 lists the KLM mappings used by the Channelized STM1-to-E1 PIC interfaces.

## Configuring APS and MSP

Automatic Protection Switching (APS) is used by SONET add/drop multiplexers (ADMs) to protect against circuit failures. The JUNOS implementation of APS allows you to protect against circuit failures between an ADM and one or more routing platforms, and between multiple interfaces in the same routing platform. When a circuit or routing platform fails, a backup immediately takes over.



**NOTE:** For SDH interfaces, the JUNOS software supports multiplex section protection (MSP). You configure MSP with the same CLI statements you use to configure APS.

---

The JUNOS software supports APS 1 + 1 switching, either revertive or nonrevertive mode, and bidirectional mode only (although you can configure interoperation with line-terminating equipment [LTE] provisioned for unidirectional mode). The JUNOS software does not transmit identical data on the working and protect circuits, as the APS specification requires for 1 + 1 switching, but this causes no operational impact.

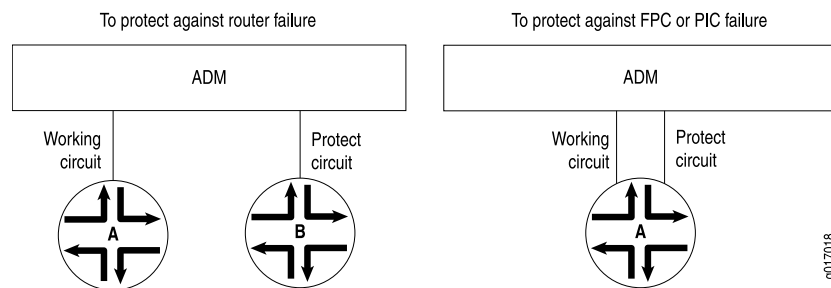
For DS3 channels on a channelized OC12 interface, you can configure APS on channel 0 only. If you configure APS on channels 1 through 11, it is ignored.



With APS and MSP, you configure two circuits, a *working circuit* and a *protect circuit*. Normally, traffic is carried on the working circuit (that is, the working circuit is the active circuit), and the protect circuit is disabled. If the working circuit fails or degrades, or if the working router fails, the ADM and the protect router switch the traffic to the protect circuit, and the protect circuit becomes the active circuit.

To configure APS or MSP, you configure a working and a protect circuit, as shown in Figure 55 on page 695. To protect against a routing platform failure, you connect two routing platforms to the ADM, configuring one of them as the working router and the second as the protect router. To protect against a PIC or FPC failure, you connect one routing platform to the ADM through both the working and protect circuits, configuring one of the PICs or FPCs as the working circuit and the second as the protect circuit.

**Figure 55: APS/MSP Configuration Topologies**



To configure APS or MSP, include the `aps` statement at the [edit interfaces *interface-name* sonet-options] hierarchy level:

```
[edit interfaces interface-name sonet-options]
aps {
 advertise-interval milliseconds;
 authentication-key key;
 force;
 hold-time milliseconds;
 lockout;
 neighbor address;
 paired-group group-name;
 protect-circuit group-name;
 request;
 revert-time seconds;
 switching-mode (bidirectional | unidirectional);
 working-circuit group-name;
}
```

This section includes the following topics:

- Configuring Basic APS Support on page 696
- Configuring Container Interfaces on page 697
- Configuring Switching Between the Working and Protect Circuits on page 700
- Configuring Revertive Mode on page 702
- Configuring Unidirectional Switching Mode Support on page 702

- Configuring APS Timers on page 703
- Configuring Link PIC Redundancy on page 704
- Example: Configuring Link PIC Redundancy on page 704
- Configuring APS Load Sharing Between Circuit Pairs on page 705
- Example: Configuring APS Load Sharing Between Circuit Pairs on page 707



**NOTE:** This implementation of APS is not supported on Layer 2 circuits. For Layer 2 circuits, configure APS by including the **protect-interface** statement. You can include this statement at the following hierarchy levels:

- [edit logical-systems *logical-system-name* protocols l2circuit neighbor *neighbor-id* interface *interface-name*]
- [edit protocols l2circuit neighbor *neighbor-id* interface *interface-name*]

For more information and a configuration example, see the *JUNOS VPNs Configuration Guide*.

---

## Configuring Basic APS Support

To set up a basic APS configuration, configure one interface to be the working circuit and a second to be the protect circuit. If you are using APS to protect against routing platform failure, configure one interface on each routing platform. If you are using APS to protect against FPC failure, configure two interfaces on the routing platform, one on each FPC.

For each working–protect circuit pair, configure the following:

- Group name—Creates the association between the two circuits. Configure the same group name for both the working and protect routers.
- Authentication key—You configure this on both interfaces. Configure the same key for both the working and protect routers.
- Address of the other interface on the other routing platform—If you are configuring one routing platform to be the working router and a second to be the protect router, you must configure the address of the remote interface. You configure this on one or both of the interfaces.

The address you specify for the neighbor must never be routed through the interface on which APS is configured, or instability will result. APS neighbor only applies to inter-routing platform configurations. We strongly recommend that you directly connect the working and protect routers and that you configure the interface address of this shared network as the neighbor address.

The working and protect configurations on the routing platforms must match the circuit configurations on the ADM; that is, the working router must be connected to the ADM's working circuit and the protect router must be connected to the protect circuit.

To set up a basic APS configuration, include the following statements at the [edit interfaces *interface-name* sonet-options] hierarchy level:

|                               |                                                                                                                                                                                                                |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>On the Working Circuit</b> | <pre>[edit interfaces so-fpc/pic/port sonet-options] aps {   working-circuit group-name;   authentication-key key;   neighbor address; # Include if protect circuit is on a different routing platform }</pre> |
| <b>On the Protect Circuit</b> | <pre>aps {   protect-circuit group-name;   authentication-key key;   neighbor address; # Include if working circuit is on a different routing platform }</pre>                                                 |

### Example: Configuring Basic APS Support

Configure Router A to be the working router and Router B to be the protect router.

|                                                                                                                |                                                                                                                                                                                                                                |
|----------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>On Router A (the Working Router)</b>                                                                        | <pre>[edit interfaces so-6/1/1 sonet-options] aps {   working-circuit San-Jose;   authentication-key " \$9\$B2612345" ; }</pre>                                                                                                |
| <b>On Router B (the Protect Circuit)</b>                                                                       | <pre>[edit interfaces so-0/0/0 sonet-options] aps {   protect-circuit San-Jose;   authentication-key " \$9\$B2612345" ;   neighbor 192.168.1.2;# Address of Router A on the link between A and B }</pre>                       |
| <b>On a Single Platform, One Interface as the Working Circuit and Another Interface as the Protect Circuit</b> | <pre>[edit interfaces so-2/1/1 sonet-options] aps {   working-circuit Hayward;   authentication-key blarney; } [edit interfaces so-3/0/2 sonet-options] aps {   protect-circuit Hayward;   authentication-key blarney; }</pre> |

### Configuring Container Interfaces

JUNOS supports container interfaces for APS on SONET links. Physical interfaces and logical interfaces remain up on switchover, and their APS parameters are auto-copied from the container interface to the member links. See “Container Interfaces” on page 32 for more information.

Container interfaces support the following features:

- Cisco HDLC or PPP encapsulation methods.
- Unpaired groups.
- Bidirectional APS.
- Non-container and container-based APS on the same system.
- Use of any combination of (nonchannelized) SONET interfaces installed on the same router.

To configure a container interface, you must first create the number of container devices that you require. You can create up to a maximum of 128 container interfaces per router using the **device-count** statement at the **[edit chassis container-devices]** hierarchy level. You can create more container interfaces later if required, up to 128 (total). The resulting container interfaces are designated sequentially from **ci0** up to a maximum of **ci127**, depending on the **device-count number** specified. SONET interfaces can be assigned to any container interface **cin**.

To configure each container interface, you must assign two SONET interfaces (**so-fpc/pic/port**) using the **container-list cin** statement, and specify the **member-interface-speed speed** and **container-options** for each SONET interface.

Within each of the two SONET interfaces' container options, you must set one **container-type** as **primary** (corresponding to an APS working circuit) and the other as **standby** (corresponding to an APS protect circuit). For each SONET interface, you can also use the **allow-configuration-override** statement to allow the physical configuration of a member link to override the container configuration.

The following configuration steps are required:

1. Specify the total number of container interfaces (up to 128) to create using the **device-count number** statement at the **[edit chassis container-devices]** hierarchy level:

```
[edit chassis container-devices]
user@host# set device-count number
```

2. Configure the container interface parameters for a specified container **cin** as follows:

- a. Specify the container interface using the numbered identifier **cin**:

```
[edit interfaces]
user@host# edit cin
```

- b. Specify the container interface encapsulation as **cisco-hdlc** or **ppp**:

```
[edit interfaces cin]
user@host# set encapsulation (cisco-hdlc | ppp)
```

- c. Specify the container options **container-type** as **aps**; a SONET interface is required for APS selection:

```
[edit interfaces cin]
```

```
user@host# set container-options container-type aps
```

- d. Specify the container interface member-interface type as `sonet`:

```
[edit interfaces cin]
user@host# set interfaces cin container-options member-interface-type sonet
```

- e. Specify the container member-interface-speed *speed* to match the specified installed SONET interface links; the available values are *OC3*, *OC12*, *OC48*, *OC192*, *OC768*, or *mixed*. The member-interface-speed *speed* statement setting applies to all SONET member interfaces of the specified container *cin*.

```
[edit interfaces cin]
user@host# set interfaces cin container-options member-interface-type sonet member-interface-speed speed
```

- f. Specify the container interface's unit number, family, IP address, and mask:

```
[edit interfaces cin]
user@host# set interfaces cin unit number family inet address ip-address/mask
```

3. Configure each of the required two SONET interfaces as follows:

- a. Specify the SONET interfaces and their container options; including the container-list, identified by its *cin*.
- b. Specify the container-type as *primary* (corresponding to an APS working-circuit) or *standby* (corresponding to an APS protect-circuit).

For example, setting `so-0/0/0` as the primary and `so-0/0/1` as the standby SONET interfaces for container interface `ci0`:

```
[edit]
user@host#edit interfaces so-0/0/0 # Enter config mode for interface so-0/0/0
[edit interfaces so-0/0/0]
user@host#set container-options container-list ci0 primary # Set so-0/0/0 as APS primary interface
[edit interfaces so-0/0/0]
user@host#top
[edit]
user@host#edit interfaces so-0/0/1 # Enter config mode for interface so-0/0/1
[edit interfaces so-0/0/1]
user@host#set container-options container-list ci0 standby # Set so-0/0/1 as APS standby interface
```

Optionally, you can set the `allow-configuration-override` statement to allow the physical configuration of a member link to override the container configuration:

```
[edit interfaces so-0/0/1]
user@host#set container-options container-list ci0 standby allow-configuration-override
```

**Example Container Interface Configuration**

The following snippet is an example container interface configuration:

```
[edit chassis]
container-devices {
 device-count 1;
}
[edit interfaces]
so-1/0/2 {
 container-options {
 container-list ci0;
 primary;
 }
}
so-1/0/3 {
 container-options {
 container-list ci0;
 standby;
 }
}
ci0 {
 encapsulation cisco-hdlc;
 container-options {
 container-type aps {
 member-interface-type sonet {
 member-interface-speed mixed;
 }
 }
 }
 unit 0 {
 family inet {
 address 192.168.11.1/24;
 }
 }
}
```

You can run the **show aps** command to display the APS container interface configuration, as follows:

```
user@host> show aps
```

| Interface | Group         | Circuit   | Intf state   |
|-----------|---------------|-----------|--------------|
| ci0       | CONTAINER_ci0 | Container | enabled, up  |
| so-1/2/2  | MEMBER_OF_ci0 | Working   | enabled, up  |
| so-1/2/3  | MEMBER_OF_ci0 | Protect   | disabled, up |

**Configuring Switching Between the Working and Protect Circuits**

When there are multiple reasons to switch between the working and protect circuits, a priority scheme is used to decide which circuit to use. The routing platforms and the ADM might automatically switch traffic between the working and protect circuits because of circuit and routing platform failures. You can also choose to switch traffic manually between the working and protect circuits.

When an ATM2 PIC is configured for APS, and the protect circuit comes online for the first time, there are no open VCs and the PIC discards the input traffic received

on the protect circuit. The **show interface extensive** or **show monitor interface traffic** commands display the statistics as zero since the PIC drops the packets at the VC.

When the APS switches from the working circuit to the protect circuit, VCs are created on the protect circuit to accept traffic. However, the VCs on the working circuit remain open to support any future APS switches even though the interface is down or disabled. The input traffic received on the working circuit (current backup) is accepted by the PIC but discarded in the PFE. The **show interface extensive** or **show monitor interface traffic** commands displays live statistics for the traffic since it is accepted by the PIC.

When APS switches from the protect circuit to the working circuit again, the VCs on the protect circuit remain open to support a future APS switch even though the interface is down or disabled. The input traffic received on the current backup protect circuit is accepted by the PIC but discarded in the PFE. The **show interface extensive** or the **show monitor interface traffic** command displays live statistics for this traffic since it is accepted by the PIC.

There are three priority levels of manual configuration, listed here in order from lowest to highest priority:

- Request (also known as manual switch)—Overridden by signal failures, signal degradations, or any higher-priority reasons.
- Force (also known as forced switch)—Overrides manual switches, signal failures, and signal degradation.
- Lockout (also known as lockout of protection)—Do not switch between the working and protect circuits.

A routing platform failure is considered to be equivalent to a signal failure on a circuit.

To perform a manual switch, include the **request** statement at the [edit interfaces *interface-name* sonet-options aps] hierarchy level. This statement is honored only if there are no higher-priority reasons to switch.

```
[edit interfaces so-fpc/pic/port sonet-options aps]
request (protect | working);
```

When the working circuit is operating in nonrevertive mode, use the **request working** statement to switch the circuit manually to being the working circuit or to override the revert timer.

To perform a forced switch, include the **force** statement at the [edit interfaces *interface-name* sonet-options aps] hierarchy level. This statement is honored only if there are no higher-priority reasons to switch. This configuration can be overridden by a signal failure on the protect circuit, thus causing a switch to the working circuit.

```
[edit interfaces so-fpc/pic/port sonet-options aps]
force (protect | working);
```

To configure a lockout of protection, forcing the use of the working circuit and locking out the protect circuit regardless of anything else, include the **lockout** statement at the [edit interfaces *interface-name* sonet-options aps] hierarchy level:

```
[edit interfaces so-fpc/pic/port sonet-options aps]
lockout;
```

### Configuring Revertive Mode

By default, APS is nonrevertive, which means that if the protect circuit becomes active, traffic is not switched back to the working circuit unless the protect circuit fails or you manually configure a switch to the working circuit. In revertive mode, traffic is automatically switched back to the working circuit.

You should configure the ADM and routing platforms consistently with regard to revertive or nonrevertive mode.

To configure revertive mode, include the **revert-time** statement, specifying the amount of time to wait after the working circuit has again become functional before making the working circuit active again:

```
[edit interfaces so-fpc/pic/port sonet-options aps]
revert-time seconds;
```

If you are using nonrevertive APS, you can use the **request working** statement to switch the circuit manually to being the working circuit or to override the revert timer (configured with the **revert-time** statement).

### Configuring Unidirectional Switching Mode Support

You can configure interoperability with SONET/SDH Line Terminating Equipment (LTE) that is provisioned for unidirectional linear APS in 1 + 1 architecture on the following interfaces:

- Unchannelized OC3, OC12, and OC48 SONET/SDH interfaces on T-series platforms
- SONET/SDH interfaces on the M40e routing platform
- ATM over SONET interfaces

By default, APS supports only SONET/SDH LTE that is provisioned for bidirectional mode.

In bidirectional switching mode, the working interface switches to the protect interface for both receipt and transmission of data, regardless of whether the signal failure is in the transmit or receive direction.

In true unidirectional mode, the working interface switches to the protect interface only for the direction in which signal failure occurs; for example, if there is a signal failure in the transmit direction, the working interface switches over to the protect interface for transmission but not receipt of data. When the protect interface operates in unidirectional mode, the working and protect interfaces must cooperate to operate the transmit and receive interfaces in a bidirectional fashion.

The JUNOS software does not support true unidirectional mode. Instead the software supports interoperability with SONET/SDH LTE provisioned for unidirectional switching. This means that the SONET/SDH LTE on the router receives and transmits on one



interface, even when you configure unidirectional support. The JUNOS implementation of unidirectional mode support allows the router to do the following:

- Accept a unidirectional mode as valid
- Trigger the peer (ADM) selector to switch receive from working interface to protect interface or the reverse
- Not send reverse requests to the far end (ADM)

To configure unidirectional mode support, include the `switching-mode unidirectional` statement, at the `[edit interfaces interface-name sonet-options aps]` hierarchy level:

```
[edit interfaces interface-name sonet-options aps]
switching-mode unidirectional;
```



**NOTE:** On interfaces with unidirectional APS support configured, revertive mode and load sharing between circuits are not supported.

---

To restore the default behavior, include the `switching-mode bidirectional` statement, at the `[edit interfaces interface-name sonet-options aps]` hierarchy level:

```
[edit interfaces interface-name sonet-options aps]
switching-mode bidirectional;
```

## Configuring APS Timers

The protect and working routers periodically send packets to their neighbors to advertise that they are operational. By default, these advertisement packets are sent every 1 000 milliseconds. A routing platform considers its neighbor to be operational for a period, called the hold time, that is, by default, three times the advertisement interval. If the protect router does not receive an advertisement packet from the working router within the hold time configured on the protect router, the protect router assumes that the working router has failed and becomes active.

APS is symmetric; either side of a circuit can time out the other side (for example, when detecting a crash of the other). Under normal circumstances, the failure of the protect router does not cause any changes because the traffic is already moving on the working router. However, if you had configured `request protect` and the protect router failed, the working router would enable its interface.

To modify the advertisement interval, include the `advertise-interval` at the `[edit interfaces interface-name sonet-options aps]` hierarchy level:

```
[edit interfaces so-fpc/pic/port sonet-options aps]
advertise-interval milliseconds;
```

To modify the hold time, include the `hold-time` at the `[edit interfaces interface-name sonet-options aps]` hierarchy level:

```
[edit interfaces so-fpc/pic/port sonet-options aps]
hold-time milliseconds;
```

The advertisement intervals and hold times on the protect and working routers can be different.

### Configuring Link PIC Redundancy

Link state replication, also called interface preservation, is an addition to the SONET Automatic Protection Switching (APS) functionality that helps promote redundancy of link PICs used in LSQ configurations, providing MLPPP link redundancy at the port level.

Link state replication provides the ability to add two sets of links, one from the active SONET PIC and the other from the standby SONET PIC, to the same bundle. If the active SONET PIC fails, links from the standby PIC are used without link renegotiation. All the negotiated state is replicated from the active links to the standby links to prevent link renegotiation. For more information about LSQ configurations, see the *JUNOS Services Interfaces Configuration Guide*.

To configure link state replication, include the `preserve-interface` statement at the `[edit interfaces interface-name sonet-options aps]` hierarchy level on the interfaces on both PICs:

```
preserve-interface;
```

APS functionality must be available on the SONET PICs and the interface configurations must be identical on both ends of the link. Any configuration mismatch causes the commit operation to fail.

This feature is supported with SONET APS and the following link PICs:

- Channelized OC3 IQ and IQE PICs
- Channelized OC12 IQ and IQE PICs
- Channelized STM1 IQ and IQE PICs

Link state replication supports MLPPP and PPP over Frame Relay (`frame-relay-ppp`) encapsulation, and fully supports GRES.

### Example: Configuring Link PIC Redundancy

Configure link state replication configuration between the ports `coc3-1/0/0` and `coc3-2/0/0`.

```
interfaces {
 coc3-1/0/0 {
 sonet-options {
 aps {
 preserve-interface;
 working-circuit aps-group-1;
 }
 }
 }
 coc3-2/0/0 {
 sonet-options {
```

```

aps {
 preserve-interface;
 working-circuit aps-group-1;
}
}
}

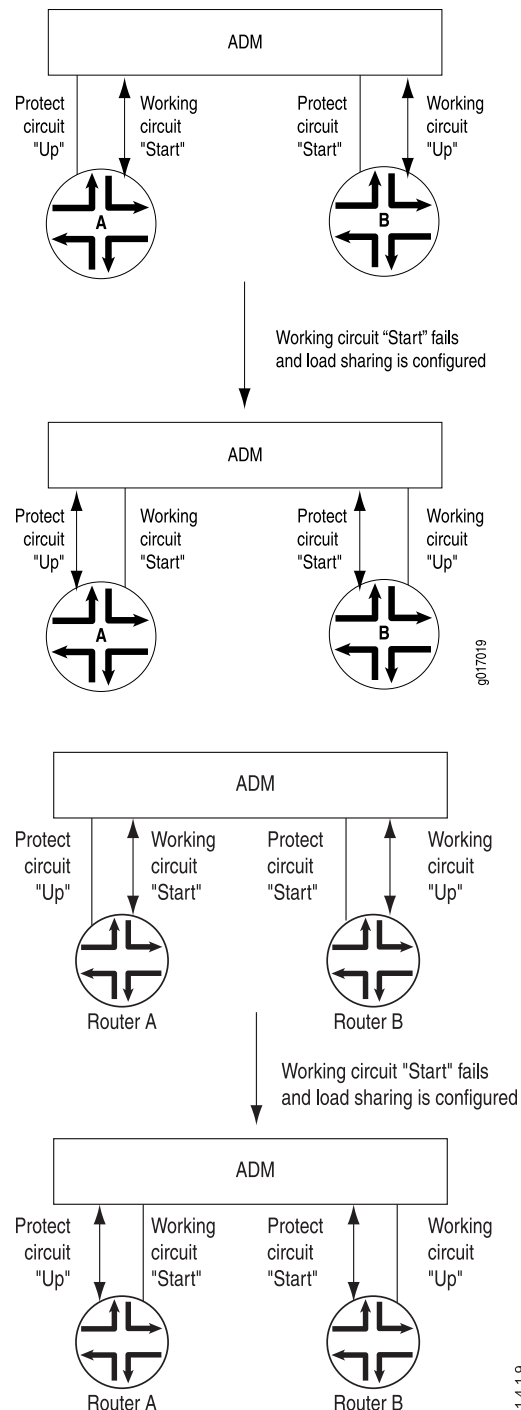
```

### Configuring APS Load Sharing Between Circuit Pairs

When two routing platforms are connected to a single ADM, you can have them back up each other on two different pairs of circuits. This arrangement provides load balancing between the routing platforms if one of the working circuits fails.

Figure 56 on page 706 illustrates load sharing between circuits on two routing platforms. Router A has a working circuit “Start” and a protect circuit “Up,” and Router B has a working circuit “Up” and a protect circuit “Start.” Under normal circumstances, Router A carries the “Start” circuit traffic and Router B carries the “Up” circuit traffic. If the working circuit “Start” were to fail, Router B would end up carrying all the traffic for both the “Start” and “Up” circuits.

To balance the load between the circuits, you pair the two circuits. In this case, you pair the “Start” and “Up” circuits. Then, if the working circuit “Start” fails, the two routing platforms automatically switch the “Up” traffic from the working to the protect circuit so that each routing platform is still carrying only one circuit’s worth of traffic. That is, the working circuit on Router A would be “Up” and the working circuit on Router B would be “Start.”

**Figure 56: APS Load Sharing Between Circuit Pairs**

To configure load sharing between two working-protect circuit pairs, include the **paired-group** statement when configuring one of the circuits on one of the routing platforms. In this statement, the **group-name** is the name of the group you assigned to one of the circuits with the **working-circuit** and **protect-circuit** statements. The JUNOS

software automatically configures the remainder of the load-sharing setup based on the group name.

```
[edit interfaces so-fpc/pic/port sonet-options aps]
paired-group group-name;
```

### Example: Configuring APS Load Sharing Between Circuit Pairs

Configure APS load sharing to match the configuration shown in Figure 56 on page 706:

```
On Router A [edit interfaces so-7/0/0 sonet-options aps]
user@host# set working-circuit start
[edit interfaces so-7/0/0 sonet-options aps]
user@host# set authentication-key linsey
[edit interfaces so-7/0/0 sonet-options aps]
user@host# set paired-group "Router A-Router B"
...
[edit interfaces so-0/0/0 sonet-options aps]
user@host# set protect-circuit up
[edit interfaces so-0/0/0 sonet-options aps]
user@host# set authentication-key woolsey
[edit interfaces so-0/0/0 sonet-options aps]
user@host# set paired-group "Router A-Router B"

On Router B [edit interfaces so-1/0/0 sonet-options aps]
user@host# set working-circuit up
[edit interfaces so-1/0/0 sonet-options aps]
user@host# set authentication-key woolsey
[edit interfaces so-1/0/0 sonet-options aps]
user@host# set paired-group "Router A-Router B"
...
[edit interfaces so-6/0/0 sonet-options aps]
user@host# set protect-circuit start
[edit interfaces so-6/0/0 sonet-options aps]
user@host# set authentication-key linsey
[edit interfaces so-6/0/0 sonet-options aps]
user@host# set paired-group "Router A-Router B"
```

### Configuring SONET Options for 10-Gigabit Ethernet Interfaces

The 10-Gigabit Ethernet IQ2 PIC is supported on the M120, M320, and T-series routing platforms. The PIC provides one external interface running at 10 Gbps. The interface operates in either LAN PHY or WAN PHY mode. When the external interface is running in WAN PHY mode, it uses the WIS sublayer to transport 10-Gigabit Ethernet frames in an OC192c SONET payload, and can interoperate with SONET section or line level repeaters. This creates an advantage when the interface is used for long-distance, point-to-point 10-Gigabit Ethernet links.

When the external interface is running in WAN PHY mode, you can configure specific physical SONET options. To configure SONET options, include the `loopback`, `mpls`, `path-trace`, and `trigger` statements at the `[edit interfaces interface-name sonet-options]` hierarchy level:

```

[edit interfaces]
xe-0/0/0 {
 sonet-options {
 loopback (local | remote);
 mpls {
 pop-all-labels {
 required-depth number;
 }
 }
 path-trace trace-string;
 trigger {
 defect ignore {
 defect hold-time up milliseconds down milliseconds;
 }
 }
 }
}

```

For information about using the **loopback** statement, see “Configuring SONET/SDH Loopback Capability” on page 688. For information about using the **mpls** statement, see “Removing MPLS Labels from Incoming Packets” on page 709. For information about using the **path-trace** statement, see “Configuring the SONET/SDH Path Trace Identifier” on page 689. For information about using the **trigger** statement, see “Configuring SONET/SDH Defect Triggers to Be Ignored” on page 691.

## Configuring the Media MTU

---

The default media MTU size used on a physical interface depends on the encapsulation being used on that interface. For a listing of MTU sizes for each encapsulation type, see “Configuring the Media MTU” on page 89. For information about configuring the encapsulation on an interface, see “Configuring Interface Encapsulation” on page 713.

To modify the default media MTU size for a physical interface, include the **mtu** statement at the **[edit interfaces *interface-name*]** hierarchy level:

```

[edit interfaces interface-name]
mtu bytes;

```

If you change the size of the media MTU, you must ensure that the size is equal to or greater than the sum of the protocol MTU and the encapsulation overhead. You configure the protocol MTU by including the **mtu** statement at the following hierarchy levels:

- **[edit interfaces *interface-name* unit *logical-unit-number* family *family*]**
- **[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family *family*]**

For more information, see “Setting the Protocol MTU” on page 177.

## Enabling Passive Monitoring on SONET/SDH Interfaces

The Monitoring Services I and Monitoring Services II PICs are designed to enable IP services. If you have a Monitoring Services PIC and a SONET/SDH PIC installed in an M160, M40e, or T-series routing platform, you can monitor IPv4 traffic from another routing platform.

On SONET/SDH interfaces, you enable packet flow monitoring by including the `passive-monitor-mode` statement:

```
passive-monitor-mode;
```

You can include this statement at the following hierarchy levels:

- `[edit interfaces so-fpc/pic/port unit logical-unit-number]`
- `[edit logical-systems logical-system-name interfaces so-fpc/pic/port unit logical-unit-number]`

If you include the `passive-monitor-mode` statement in the configuration, the SONET/SDH interface does not send keepalives or alarms, and does not participate actively on the network.

On monitoring services interfaces, you enable packet flow monitoring by including the `family` statement at the `[edit interfaces mo-fpc/pic/port unit logical-unit-number]` hierarchy level, specifying the `inet` option:

```
[edit interfaces mo-fpc/pic/port unit logical-unit-number]
family inet;
```

For conformity with cflowd record structure, you must include the `receive-options-packets` and `receive-ttl-exceeded` statements at the `[edit interfaces mo-fpc/pic/port unit logical-unit-number family inet]` hierarchy level:

```
[edit interfaces mo-fpc/pic/port unit logical-unit-number family inet]
receive-options-packets;
receive-ttl-exceeded;
```

For the monitoring services interface, you can configure multiservice physical interface properties. For more information, see “Configuring Multiservice Physical Interface Properties” on page 129 and the *JUNOS Services Interfaces Configuration Guide*.

## Removing MPLS Labels from Incoming Packets

The JUNOS software can forward only IPv4 packets to a Monitoring Services PIC. IPv4 packets with MPLS labels cannot be forwarded to a Monitoring Services PIC. By default, if packets with MPLS labels are forwarded to the Monitoring Services PIC, they are discarded. To monitor packets with MPLS labels, you must remove the MPLS labels as the packets arrive on the interface.

You can remove up to two MPLS labels from an incoming packet by including the `pop-all-labels` statement at the `[edit interfaces interface-name sonet-options mpls]` hierarchy level:

```
[edit interfaces interface-name sonet-options mpls]
pop-all-labels {
 required-depth number;
}
```

By default, the **pop-all-labels** statement takes effect for incoming packets with one or two labels. You can specify the number of MPLS labels an incoming packet must have for the **pop-all-labels** statement to take effect by including the **required-depth** statement at the [edit interfaces *interface-name* atm-options mpls pop-all-labels] hierarchy level:

```
[edit interfaces interface-name atm-options mpls pop-all-labels]
required-depth number;
```

The required depth can be 1, 2, or [ 1 2 ]. If you include the **required-depth 1** statement, the **pop-all-labels** statement takes effect for incoming packets with one label only. If you include the **required-depth 2** statement, the **pop-all-labels** statement takes effect for incoming packets with two labels only. If you include the **required-depth [ 1 2 ]** statement, the **pop-all-labels** statement takes effect for incoming packets with one or two labels. A required depth of [ 1 2 ] is equivalent to the default behavior of the **pop-all-labels** statement.

When you remove MPLS labels from incoming packets, note the following:

- The **pop-all-labels** statement has no effect on IP packets with three or more MPLS labels.
- When you enable MPLS label removal, you must configure all ports on a PIC with the same label popping mode and required depth.
- You use the **pop-all-labels** statement to enable passive monitoring applications, not active monitoring.
- You cannot apply MPLS filters or accounting to the MPLS labels because the labels are removed as soon as the packet arrives on the interface.

## Configuring the Clock Source

For interfaces such as SONET/SDH that can use different clock sources, you can configure the source of the transmit clock on each interface. The source can be internal or external. The default source is internal, which means that each interface uses the routing platform's internal Stratum 3 clock.

For DS3 channels on a channelized OC12 interface, the **clocking** statement is supported only for channel 0; it is ignored if included in the configuration of channels 1 through 11. The clock source configured for channel 0 applies to all channels on the channelized OC12 interface. The individual DS3 channels use a gapped 45-MHz clock as the transmit clock. For more information, see "Clock Sources on Channelized Interfaces" on page 364.





**NOTE:** On channelized STM1 interfaces, you should configure the clock source at one side of the connection to be internal (the default JUNOS configuration) and configure the other side of the connection to be external.

To configure loop timing on an interface, include the **clocking external** statement at the [edit interfaces *interface-name*] hierarchy level:

```
[edit interfaces interface-name]
clocking external;
```

To explicitly configure line timing on an interface, include the **clocking internal** statement at the [edit interfaces *interface-name*] hierarchy level:

```
[edit interfaces interface-name]
clocking internal;
```

## Configuring Receive and Transmit Leaky Bucket Properties

Congestion control is particularly difficult in high-speed networks with high volumes of traffic. When congestion occurs in such a network, it is usually too late to react. You can avoid congestion by regulating the flow of packets into your network. Smoother flows prevent bursts of packets from arriving at (or being transmitted from) the same interface and causing congestion.

For all interface types except ATM, Fast Ethernet, Gigabit Ethernet, and channelized IQ and IQE, you can configure leaky bucket properties, which allow you to limit the amount of traffic received on and transmitted by a particular interface. You effectively specify what percentage of the interface's total capacity can be used to receive or transmit packets. You might want to set leaky bucket properties to limit the traffic flow from a link that is known to transmit high volumes of traffic.



**NOTE:** Instead of configuring leaky bucket properties, you can limit traffic flow by configuring policers. Policers work on all interfaces. For more information, see the *JUNOS Policy Framework Configuration Guide*.

The leaky bucket is used at the host-network interface to allow packets into the network at a constant rate. Packets might be generated in a bursty manner, but after they pass through the leaky bucket, they enter the network evenly spaced. In some cases, you might want to allow short bursts of packets to enter the network without smoothing them out. By controlling the number of packets that can accumulate in the bucket, the **threshold** property controls burstiness. The maximum number of packets entering the network in *t* time units is **threshold + rate \* t**.

By default, leaky buckets are disabled and the interface can receive and transmit packets at the maximum line rate.

For each DS3 channel on a channelized OC12 interface, you can configure unique receive and transmit buckets.



**NOTE:** HDLC payload scrambling conflicts with traffic shaping configured using leaky bucket properties. If you configure leaky bucket properties, you must disable payload scrambling, because the JUNOS software rejects configurations that have both features enabled. For more information, see “Configuring SONET/SDH HDLC Payload Scrambling” on page 689.

To configure leaky bucket properties, include one or both of the **receive-bucket** and **transmit-bucket** statements at the [edit interfaces *interface-name*] hierarchy level:

```
[edit interfaces interface-name]
receive-bucket {
 overflow (discard | tag);
 rate percentage;
 threshold bytes;
}
transmit-bucket {
 overflow discard;
 rate percentage;
 threshold bytes;
}
```

In the **rate** statement, specify the percentage of the interface line rate that is available to receive or transmit packets. The percentage can be a value from 0 (none of the interface line rate is available) to 100 (the maximum interface line rate is available). For example, when you set the line rate to 33, the interface receives or transmits at one third of the maximum line rate.

In the **threshold** statement, specify the bucket threshold, which controls the burstiness of the leaky bucket mechanism. The larger the value, the more bursty the traffic, which means that over a very short amount of time the interface can receive or transmit close to line rate, but the average over a longer time is at the configured bucket rate. The threshold can be a value from 0 through 65,535 bytes. For ease of entry, you can enter *number* either as a complete decimal number or as a decimal number followed by the abbreviation k (1,000). For example, the entry **threshold 2k** corresponds to a threshold of 2,000 bytes.

In the **overflow** option, specify how to handle packets that exceed the threshold:

- **tag**—(receive-bucket only) Tag, count, and process received packets that exceed the threshold.
- **discard**—Discard received packets that exceed the threshold. No counting is done.

## Damping Interface Transitions

By default, when an interface changes from being up to being down, or from down to up, this transition is advertised immediately to the hardware and the JUNOS software. In some situations—for example, when an interface is connected to an add-drop multiplexer (ADM) or wavelength-division multiplexer (WDM), or to protect against SONET/SDH framer holes—you might want to damp interface transitions.

This means not advertising the interface's transition until a certain period of time has transpired.

When you have damped interface transitions and the interface goes from up to down, the interface is not advertised to the rest of the system as being down until it has remained down for the hold-time period. Similarly when an interface goes from down to up, it is not advertised as being up until it has remained up for the hold-time period.

To damp interface transitions, include the **hold-time** statement at the [edit interfaces *interface-name*] hierarchy level:

```
hold-time up milliseconds down milliseconds;
```

The time can be a value from 0 through 65,534 milliseconds. The default value is 0, which means that interface transitions are not damped. The JUNOS software advertises the transition within 100 milliseconds of the time value you specify.

## Configuring Interface Encapsulation

---

Point-to-Point Protocol (PPP) encapsulation is the default encapsulation type for physical interfaces. You need not configure encapsulation for any physical interfaces that support PPP encapsulation. If you do not configure encapsulation, PPP is used by default. For physical interfaces that do not support PPP encapsulation, you must configure an encapsulation to use for packets transmitted on the interface. You can optionally configure an encapsulation on a logical interface, which is the encapsulation used within certain packet types.

### Configuring the Encapsulation on a Physical Interface

For SONET/SDH interfaces, the physical interface encapsulation can be one of the following:

- Point-to-Point Protocol (PPP)—PPP encapsulation is defined in RFC 1661, *The Point-to-Point Protocol (PPP) for the Transmission of Multiprotocol Datagrams over Point-to-Point Links*. PPP is the default encapsulation type for physical interfaces. Two related versions are supported:
  - Circuit cross-connect (CCC) version (**ppp-ccc**)—The logical interfaces do not require an encapsulation statement. When you use this encapsulation type, you can configure the **ccc** family only.
  - Translational cross-connect (TCC) version (**ppp-tcc**)—Similar to CCC and has the same configuration restrictions, but used for circuits with different media on either side of the connection.
- Cisco HDLC—E1, E3, SONET/SDH, T1, and T3 interfaces can use Cisco HDLC encapsulation. Two related versions are supported:
  - CCC version (**cisco-hdlc-ccc**)—The logical interfaces do not require an encapsulation statement. When you use this encapsulation type, you can configure the **ccc** family only.

- TCC version (**cisco-hdlc-tcc**)—Similar to CCC and has the same configuration restrictions, but used for circuits with different media on either side of the connection.
- Frame Relay—Defined in RFC 1490, *Multiprotocol Interconnect over Frame Relay*. E1, E3, SONET/SDH, T1, and T3 interfaces can use Frame Relay encapsulation. Two related versions are supported:
  - CCC version (**frame-relay-ccc**)—The same as standard Frame Relay for DLCIs 0 through 511. DLCIs 512 through 1022 are dedicated to CCC. This numbering restriction does not apply to IQ and IQE interfaces. The logical interface must also have **frame-relay-ccc** encapsulation.
  - TCC version (**frame-relay-tcc**)—Similar to Frame Relay CCC and has the same configuration restrictions, but used for circuits with different media on either side of the connection.
- Frame Relay Ether Type (**frame-relay-ether-type**)—Physical interfaces can use Frame Relay ether type encapsulation for compatibility with Cisco Frame Relay. IETF Frame Relay encapsulation identifies the payload format using NLPID and SNAP formats. Cisco-compatible Frame Relay encapsulation uses the Ethernet type to identify the type of payload. Two related versions are supported:
  - TCC version (**frame-relay-ether-type-tcc**)—Cisco-compatible Frame Relay for DLCIs 0 through 511. DLCIs 512 through 1022 are dedicated to TCC. This numbering restriction does not apply to IQ and IQE interfaces. This encapsulation is used for circuits with different media on either side of the connection.
  - Extended TCC version (**extended-frame-relay-ether-type-tcc**)—This encapsulation allows you to dedicate Cisco-compatible Frame Relay TCC for DLCIs 1 through 1022. This encapsulation is used for circuits with different media on either side of the connection. All ether type TCC encapsulation is supported on the same PICs as non-ether type Frame Relay TCC encapsulation.



**NOTE:** When the encapsulation type is set to Cisco-compatible Frame Relay encapsulation, ensure that the LMI type is set to ANSI or Q933-A.

---

To configure the encapsulation on a physical interface, include the **encapsulation** statement at the **[edit interfaces *interface-name*]** hierarchy level:

```
[edit interfaces interface-name]
encapsulation (cisco-hdlc | cisco-hdlc-ccc | cisco-hdlc-tcc | frame-relay | frame-relay-ccc |
frame-relay-tcc | frame-relay-tcc | ppp | ppp-ccc | ppp-tcc);
```

When you configure a point-to-point encapsulation (such as PPP or Cisco HDLC) on a physical interface, the physical interface can have only one logical interface (that is, only one **unit** statement) associated with it. When you configure a multipoint encapsulation (such as Frame Relay), the physical interface can have multiple logical units, and the units can be either point to point or multipoint. Use PPP if you are running Cisco IOS Release 12.0 or later. If you need to run Cisco HDLC, the JUNOS software automatically configures an ISO family MTU of 4469 in the routing platform. This is due to an extra byte of padding used by Cisco.

For more information about physical interface encapsulation, see “Configuring the Encapsulation on a Physical Interface” on page 98.

### Example: Configuring the Encapsulation on a Physical Interface

Configure PPP encapsulation on a SONET/SDH interface. The second two family statements allow IS-IS and MPLS to run on the interface.

```
[edit interfaces]
so-7/0/0 {
 encapsulation ppp;
 unit 0 {
 point-to-point;
 family inet {
 address 192.168.1.113/32 {
 destination 192.168.1.114;
 }
 }
 family iso;
 family mpls;
 }
}
```

### Configuring the Encapsulation on a Logical Interface

Generally, you configure an interface’s encapsulation at the [edit interfaces *interface-name*] hierarchy level. However, for Frame Relay encapsulation, you can also configure the encapsulation type that is used inside the Frame Relay packet itself. To do this, include the `encapsulation` statement, specifying the `frame-relay-ccc`, `frame-relay-tcc`, `frame-relay-ether-type`, or `frame-relay-ether-type-tcc` option:

```
encapsulation (frame-relay-ccc | frame-relay-tcc | frame-relay-ether-type |
 frame-relay-ether-type-tcc);
```

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* unit *logical-unit-number*]
- [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

The ATM encapsulations are defined in RFC 2684, *Multiprotocol Encapsulation over ATM Adaptation Layer 5*.

With the `atm-nlpid`, `atm-cisco-nlpid`, and `atm-vc-mux` encapsulations, you can configure the `inet` family only. With the circuit cross-connect (CCC) encapsulations, you cannot configure a family on the logical interface. A logical interface cannot have `frame-relay-ccc` encapsulation unless the physical device also has `frame-relay-ccc` encapsulation. A logical interface cannot have `frame-relay-tcc` encapsulation unless the physical device also has `frame-relay-tcc` encapsulation. In addition, you must assign this logical interface a DLCI from 512 through 1022. This numbering restriction does not apply to IQ and IQE interfaces. You must configure the logical interface as point-to-point.

For more information about logical interface encapsulation, see “Configuring the Encapsulation on a Logical Interface” on page 150.

### Example: Configuring SONET/SDH Interfaces

---

SONET/SDH interfaces can use either PPP or Cisco HDLC encapsulation. Use PPP if you are running Cisco IOS Release 12.0 or later. If you need to run Cisco HDLC, the JUNOS software automatically configures an ISO family MTU of 4469 in the routing platform. This is due to an extra byte of padding used by Cisco. The following configuration, which uses PPP encapsulation, is sufficient to get a SONET/SDH OC3 or OC12 interface up and running:

```
[edit interfaces]
so-fpc/pic/port {
 encapsulation ppp;
 unit 0 {
 family inet {
 address local-address {
 destination remote-address;
 }
 }
 }
}
```

### Configuring Aggregated SONET/SDH Interfaces

---

The JUNOS software enables link aggregation of SONET/SDH interfaces; this is similar to Ethernet link aggregation, but is not defined in a public standard. The JUNOS software balances traffic across the member links within an aggregated SONET/SDH bundle based on the Layer 3 information carried in the packet. This implementation uses the same load balancing algorithm used for per-packet load balancing. For information about per-packet load balancing, see the *JUNOS Routing Protocols Configuration Guide*.

You configure an aggregated SONET/SDH virtual link by specifying the link number as a physical device and then associating a set of physical interfaces that have the same speed. Channelized OC IQ and IQE PICs do not support SONET aggregation.

By default, no aggregated SONET/SDH interfaces are created. You must define the number of aggregated SONET/SDH interfaces by including the **device-count** statement at the [edit chassis aggregated-devices sonet] hierarchy level:

```
[edit chassis aggregated-devices sonet]
device-count number;
```

The maximum number of aggregated interfaces is 16. The aggregated SONET/SDH interfaces are numbered from **as0** through **as15**. For more information, see the *JUNOS Services Interfaces Configuration Guide*.



**NOTE:** SONET/SDH aggregation is proprietary to the JUNOS software and might not work with other software.

---

To configure aggregated SONET/SDH interfaces, assign a number for the aggregated SONET/SDH interface **asx** at the **[edit interfaces]** hierarchy level:

```
[edit interfaces]
asx {
 ...
}
```

The following example shows an aggregated SONET/SDH configuration:

```
[edit interfaces]
as0 {
 aggregated-sonet-options {
 minimum-links 1;
 link-speed oc3;
 }
 unit 0 {
 family inet {
 address 10.2.11.1/32 {
 destination 10.2.11.3;
 }
 }
 }
}
```

You also need to specify the constituent physical interfaces by including the **aggregate** statement at the **[edit interfaces *interface-name* sonet-options]** hierarchy level; for more information, see “Configuring SONET/SDH Link Aggregation” on page 718. You can optionally specify other physical properties that apply specifically to the aggregated SONET/SDH interfaces; for details, see “Configuring SONET/SDH Physical Interface Properties” on page 680. For a sample configuration, see “Example: Configuring Aggregated SONET/SDH Interfaces” on page 720.

To remove the configuration statements related to **asx** and set the aggregated SONET/SDH interface to down state, delete the interface from the configuration:

```
[edit]
user@host# delete interfaces asx
```

However, the aggregated SONET/SDH interface is not deleted until you delete the **chassis aggregated-devices sonet device-count** configuration statement.

You can configure the following aggregated SONET/SDH properties:

- Configuring SONET/SDH Link Aggregation on page 718
- Configuring Aggregated SONET/SDH Link Speed on page 718
- Configuring Aggregated SONET/SDH Minimum Links on page 718
- Configuring Filters or Sampling on Aggregated SONET/SDH Links on page 719
- Example: Configuring Aggregated SONET/SDH Interfaces on page 720

## Configuring SONET/SDH Link Aggregation

On SONET/SDH interfaces, you can associate a physical interface with an aggregated SONET/SDH interface. To associate the interface with an aggregated SONET/SDH link, include the **aggregate** statement at the **[edit interfaces *interface-name* sonet-options]** hierarchy level:

```
[edit interfaces interface-name sonet-options]
aggregate asx;
```

*x* is the interface instance number and can be from 0 through 15, for a total of 16 aggregated interfaces. You should not mix SONET and SDH mode on the same aggregated interface. You must also include a statement configuring **asx** at the **[edit interfaces]** hierarchy level. For a sample configuration, see “Example: Configuring Aggregated SONET/SDH Interfaces” on page 720.

## Configuring Aggregated SONET/SDH Link Speed

On aggregated SONET/SDH interfaces, you can set the required link speed for all interfaces included in the bundle, or specify that the bundle contains interfaces with mixed interface speeds.



**NOTE:** For nonconcatenated interfaces on aggregated SONET/SDH interfaces, you can configure the link speed of the aggregate to match the speed of the nonconcatenated interface. For example, an OC12 PIC can have nonconcatenated interfaces with a link speed of OC3.

---

To set the required link speed or specify mixed interface speeds, include the **link-speed** statement at the **[edit interfaces *interface-name* aggregated-sonet-options]** hierarchy level:

```
[edit interfaces interface-name aggregated-sonet-options]
link-speed (speed | mixed);
```

The link speed can be one of the following values:

- **oc3**—Links are OC3c or STM1c.
- **oc12**—Links are OC12c or STM4c.
- **oc48**—Links are OC48c or STM16c.
- **oc192**—Links are OC192c or STM64c.
- **oc768**—Links are OC768c or STM256c.

## Configuring Aggregated SONET/SDH Minimum Links

On aggregated SONET/SDH interfaces, you can set the minimum number of links that must be up for the bundle as a whole to be labeled up. By default, only one link must be up for the bundle to be labeled up.



To set the minimum number, include the `minimum-links` statement at the `[edit interfaces interface-name aggregated-sonet-options]` hierarchy level:

```
[edit interfaces interface-name aggregated-sonet-options]
minimum-links number;
```

The number can be from 1 through 8. The maximum number of links supported in an aggregate is eight or for Ethernet or SONET interfaces on a T-series platform or TX matrix routing platform, from 1 through 16. When 8 is specified, all configured links of a bundle must be up.

## Configuring Filters or Sampling on Aggregated SONET/SDH Links

To set up firewall filters or sampling on aggregated SONET/SDH interfaces, you must configure the `asx` interface with these properties. The filters function in the same manner as on other interfaces.

To configure a filter, include the `filter` statement:

```
filter {
 input input-filter-name;
 output output-filter-name;
}
```

You can include this statement at the following hierarchy levels:

- `[edit interfaces as x unit logical-unit-number]`
- `[edit logical-systems logical-system-name interfaces asx unit logical-unit-number]`

You must also configure separate statements that define the properties of the filter. For more information, see the *JUNOS Policy Framework Configuration Guide* and “Examples: Configuring Filters or Sampling on Aggregated SONET/SDH Links” on page 719.

## Examples: Configuring Filters or Sampling on Aggregated SONET/SDH Links

Configure filtering on aggregated SONET/SDH interfaces:

```
[edit interfaces]
asx {
 unit 0 {
 family inet {
 address 10.2.11.1/32 {
 destination 10.2.11.3;
 }
 filter {
 input input-filter-name;
 output output-filter-name;
 }
 }
 }
}
```

**Defining the Filter**

```
[edit firewall]
filter input-filter-name {
 term match-any-input {
 then {
 accept;
 }
 }
}
filter output-filter-name {
 term match-any-output {
 then {
 accept;
 }
 }
}
```

**Configuring Sampling on an Aggregated SONET/SDH Interface**

```
[edit interfaces]
asx {
 unit 0 {
 family inet {
 address 10.2.11.1/32 {
 destination 10.2.11.3;
 }
 filter {
 input input-sampler-name;
 }
 }
 }
}
```

**Defining the Sampling Filter and the Forwarding Action**

```
[edit firewall]
filter input-sampler-name {
 term match-any-input {
 then {
 sample;
 accept;
 }
 }
}
[edit forwarding-options]
sampling {
 input {
 family inet {
 rate 10000;
 run-length 1;
 }
 }
}
```

**Example: Configuring Aggregated SONET/SDH Interfaces**

The following configuration is sufficient to get an aggregated SONET/SDH interface up and running:

```

[edit interfaces]
as0 {
 aggregated-sonet-options {
 minimum-links 1;
 link-speed oc3;
 }
 unit 0 {
 family inet {
 address 10.2.11.1/32 {
 destination 10.2.11.3;
 }
 }
 }
}
[edit chassis]
aggregated-devices {
 sonet {
 device-count 15;
 }
}
[edit interfaces]
so-1/3/0 {
 sonet-options {
 aggregate as0;
 }
}

```



## **Part 12**

# **Interface Configuration Statements**

- Summary of Interface Configuration Statements on page 725



## Chapter 55

# Summary of Interface Configuration Statements

The following descriptions explain each of the interface configuration statements. The statements are organized alphabetically.

### 802.3ad

---

**Syntax** 802.3ad {  
    aex (primary | backup);  
    lACP {  
        port-priority;  
    }  
}

**Hierarchy Level** [edit interfaces *interface-name* fastether-options],  
[edit interfaces *interface-name* gige-eth-options]

**Release Information** Statement introduced before JUNOS Release 7.4.  
primary and backup options added in JUNOS Release 8.3.

**Description** Specify aggregated Ethernet logical interface number.

**Options** aex—Aggregated Ethernet logical interface number.  
**Range:** 0 through 15

primary—For link protection configurations, specify the primary link for egress traffic.

backup—For link protection configurations, specify the backup link for egress traffic.

**Usage Guidelines** See “Configuring Ethernet Link Aggregation” on page 537, “Configuring Aggregated Ethernet Interfaces” on page 535, and “Configuring Aggregated Ethernet Link Protection” on page 537.

**Required Privilege Level** interface—To view this statement in the configuration.  
interface-control—To add this statement to the configuration.

**Related Topics** link-protection

## accept-source-mac

---

**Syntax**

```
accept-source-mac {
 mac-address mac-address {
 policer {
 input cos-policer-name;
 output cos-policer-name;
 }
 }
}
```

**Hierarchy Level** [edit interfaces *interface-name* unit *logical-unit-number*],  
[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

**Release Information** Statement introduced before JUNOS Release 7.4.

**Description** For Gigabit Ethernet intelligent queuing (IQ) interfaces only, accept traffic from and to the specified remote media access control (MAC) address.

The **accept-source-mac** statement is equivalent to the **source-address-filter** statement, which is valid for aggregated Ethernet, Fast Ethernet, and Gigabit Ethernet interfaces only.

On untagged Gigabit Ethernet interfaces you should not configure the **source-address-filter** statement and the **accept-source-mac** statement simultaneously. On tagged Gigabit Ethernet interfaces you should not configure the **source-address-filter** statement and the **accept-source-mac** statement with an identical MAC address specified in both filters.

The statements are explained separately.

**Usage Guidelines** See “Configuring MAC Address Filtering” on page 613.

**Required Privilege Level** interface—To view this statement in the configuration.  
interface-control—To add this statement to the configuration.

**Related Topics** source-filtering



## access-concentrator

---

|                                 |                                                                                                                                                                                                                            |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>access-concentrator <i>name</i>;</code>                                                                                                                                                                              |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> pppoe-options],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> pppoe-options] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                             |
| <b>Description</b>              | For J-series Services Routers with Point-to-Point Protocol over Ethernet (PPPoE) interfaces, configure the name of the access concentrator (AC).                                                                           |
| <b>Options</b>                  | <i>name</i> —Name of the AC.                                                                                                                                                                                               |
| <b>Usage Guidelines</b>         | See “Identifying the Access Concentrator” on page 644.                                                                                                                                                                     |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                    |
| <b>Related Topics</b>           | <i>J-series Services Router Basic LAN and WAN Access Configuration Guide</i>                                                                                                                                               |

## access-profile

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>access-profile <i>name</i>;</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Hierarchy Level</b>          | <p>[edit interfaces <i>interface-name</i> ppp-options chap],<br/>         [edit interfaces <i>interface-name</i> ppp-options pap],<br/>         [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ppp-options chap],<br/>         [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ppp-options pap],<br/>         [edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ppp-options chap],<br/>         [edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ppp-options pap]</p>                               |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.<br>Support for PAP added in JUNOS Release 8.3.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Description</b>              | <p>For CHAP authentication, the mapping between peer names (or “clients” ) and the secrets associated with their respective links. For PAP authentication, the peer's username and password.</p> <p>For Asynchronous Transfer Mode 2 (ATM2) IQ interfaces only, you can configure a Challenge Handshake Authentication Protocol (CHAP) access profile on the logical interface unit if the logical interface is configured with one of the following PPP over ATM encapsulation types:</p> <ul style="list-style-type: none"> <li>■ atm-ppp-llc—PPP over AAL5 logical link control (LLC) encapsulation.</li> <li>■ atm-ppp-vc-mux—PPP over AAL5 multiplex encapsulation.</li> </ul> |
| <b>Options</b>                  | <i>name</i> —Name of the access profile.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Usage Guidelines</b>         | See “Configuring the PPP Challenge Handshake Authentication Protocol” on page 103 and “Configuring the PPP Password Authentication Protocol” on page 106.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Related Topics</b>           | default-chap-secret, <i>JUNOS System Basics Configuration Guide</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

## accounting

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|                                 |                                                                                                                                                                                                                        |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <pre> accounting {     destination-class-usage;     source-class-usage {         direction;     } } </pre>                                                                                                             |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                         |
| <b>Description</b>              | <p>Enable IP packet counters on an interface.</p> <p>The statements are explained separately.</p>                                                                                                                      |
| <b>Usage Guidelines</b>         | See “Enabling Source Class and Destination Class Usage” on page 194.                                                                                                                                                   |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                     |

## accounting-profile

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|                                 |                                                                                                                                                       |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | accounting-profile <i>name</i> ;                                                                                                                      |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> ],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],                                |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                        |
| <b>Description</b>              | Enable collection of accounting data for the specified physical or logical interface.                                                                 |
| <b>Options</b>                  | <i>name</i> —Name of the accounting profile.                                                                                                          |
| <b>Usage Guidelines</b>         | See “Applying an Accounting Profile to the Physical Interface” on page 122 and “Applying an Accounting Profile to the Logical Interface” on page 148. |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                    |

**acfc**

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | acfc;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> ppp-options compression],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ppp-options compression],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ppp-options compression]                                                                                                                                                                                                                                                                                                                     |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b>              | For interfaces with PPP encapsulation, configure compression of the Data Link Layer address and control fields. The <b>acfc</b> option is not supported with <b>frame-relay-ppp</b> encapsulation.<br><br>On M320, M120, and T-series routing platforms, address and control field compression (ACFC) is not supported for any ISO family protocols. Do not include the <b>acfc</b> statement at the [edit interfaces <i>interface-name</i> ppp-options compression] hierarchy level when you include the <b>family iso</b> statement at the [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ] hierarchy level. |
| <b>Usage Guidelines</b>         | See “Configuring PPP Address and Control Field Compression” on page 111.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

**ack-delay-time**

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|                                 |                                                                                                                                                                                                                        |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | ack-delay-time <i>time</i> ;                                                                                                                                                                                           |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family llc2],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family llc2] |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 7.4.                                                                                                                                                                             |
| <b>Description</b>              | For J-series Services Routers only. On Ethernet interfaces configured for DLSw, configure the maximum time allowed for incoming Information-frames (I-frames) to remain unacknowledged.                                |
| <b>Options</b>                  | <i>time</i> —Number of milliseconds.<br><b>Range:</b> 1 through 60,000 milliseconds<br><b>Default:</b> 100 milliseconds                                                                                                |
| <b>Usage Guidelines</b>         | See “Configuring LLC2 Options” on page 167.                                                                                                                                                                            |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                |
| <b>Related Topics</b>           | <i>J-series Services Router Advanced WAN Access Configuration Guide</i>                                                                                                                                                |

## ack-max

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|                                 |                                                                                                                                                                                                                        |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>ack-max count;</code>                                                                                                                                                                                            |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family llc2],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family llc2] |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 7.4.                                                                                                                                                                             |
| <b>Description</b>              | For J-series Services Routers only. On Ethernet interfaces configured for DLSw, configure the maximum number of Information-frames (I-frames) received before acknowledgment is sent.                                  |
| <b>Options</b>                  | <i>count</i> —Number of I-frames.<br><b>Range:</b> 1 through 127 I-frames<br><b>Default:</b> 3 I-frames                                                                                                                |
| <b>Usage Guidelines</b>         | See “Configuring LLC2 Options” on page 167.                                                                                                                                                                            |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                |
| <b>Related Topics</b>           | <i>J-series Services Router Advanced WAN Access Configuration Guide</i>                                                                                                                                                |

## acknowledge-retries

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|                                 |                                                                                                                                                                                                                      |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>acknowledge-retries number;</code>                                                                                                                                                                             |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> mlfr-uni-nni-bundle-options]                                                                                                                                                  |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                       |
| <b>Description</b>              | For link services and voice services interfaces only, configure the number of retransmission attempts to be made for consecutive hello or remove link messages following the expiration of the acknowledgment timer. |
| <b>Options</b>                  | <i>number</i> —Number of retransmission attempts to be made following the expiration of the acknowledgment timer.<br><b>Range:</b> 1 through 5<br><b>Default:</b> 2                                                  |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                                       |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                              |
| <b>Related Topics</b>           | action-red-differential-delay, hello-timer                                                                                                                                                                           |

## acknowledge-timer

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|                                 |                                                                                                                                                                                                                                      |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | acknowledge-timer <i>milliseconds</i> ;                                                                                                                                                                                              |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> mlfr-uni-nni-bundle-options]                                                                                                                                                                  |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                       |
| <b>Description</b>              | For link services and voice services interfaces only, configure the maximum time, in milliseconds, to wait for an add link acknowledgment, hello acknowledgment, or remove link acknowledgment message.                              |
| <b>Options</b>                  | <p>milliseconds—Time, in milliseconds, to wait for an add link acknowledgment, hello acknowledgment, or remove link acknowledgment message.</p> <p><b>Range:</b> 1 through 10 milliseconds</p> <p><b>Default:</b> 4 milliseconds</p> |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                                                       |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                              |
| <b>Related Topics</b>           | address, hello-timer                                                                                                                                                                                                                 |

## action

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See the following sections:

- [action \(OAM\) on page 733](#)
- [action \(Policer\) on page 733](#)

### **action (OAM)**

**Syntax**

```
action {
 syslog (OAM Action);
 link-down;
 send-critical-event;
}
```

**Hierarchy Level** [edit protocols oam ethernet link-fault-management action-profile]

**Release Information** Statement introduced in JUNOS Release 8.5.

**Description** Define the action or actions to be taken when the OAM fault event occurs.

**Usage Guidelines** See “Specifying the Actions to Be Taken for Link-Fault Management Events” on page 599.

**Required Privilege Level** interface—To view this statement in the configuration.  
interface-control—To add this statement to the configuration.

### **action (Policer)**

**Syntax**

```
action {
 loss-priority high then discard;
}
```

**Hierarchy Level** [edit firewall three-color-policer *policer-name*]

**Release Information** Statement introduced in JUNOS Release 8.2.

**Description** This statement discards high loss priority traffic as part of a configuration using tricolor marking on a logical interface.

**Usage Guidelines** See the *JUNOS Class of Service Configuration Guide*.

**Required Privilege Level** interface—To view this statement in the configuration.  
interface-control—To add this statement to the configuration.

**Related Topics** logical-interface-policer

## action-profile

---

See the following sections:

- action-profile (Applying to CFM) on page 734
- action-profile (Defining for CFM) on page 734
- action-profile (Defining for LFM) on page 735

### action-profile (Applying to CFM)

|                                 |                                                                                                                                                                                                  |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>action-profile <i>profile-name</i>;</code>                                                                                                                                                 |
| <b>Hierarchy Level</b>          | <code>[edit protocols oam ethernet connectivity-fault-management maintenance-domain <i>domain-name</i> maintenance-association <i>ma-name</i> mep <i>mep-id</i> remote-mep <i>mep-id</i>]</code> |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.4.                                                                                                                                                       |
| <b>Description</b>              | Identify the action profile to use.                                                                                                                                                              |
| <b>Options</b>                  | <i>profile-name</i> —Name of the action profile to use.                                                                                                                                          |
| <b>Usage Guidelines</b>         | See “Configuring the Remote Maintenance End Point Action Profile” on page 589.                                                                                                                   |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                          |

### action-profile (Defining for CFM)

|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>action-profile <i>profile-name</i> {<br/>    default-action {<br/>        interface-down;<br/>    }<br/>}</code>  |
| <b>Hierarchy Level</b>          | <code>[edit protocols oam ethernet connectivity-fault-management]</code>                                                |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.4.                                                                              |
| <b>Description</b>              | Configure a name and default action for an action profile.                                                              |
| <b>Options</b>                  | <i>profile-name</i> —Name of the action profile.<br><br>The remaining statements are explained separately.              |
| <b>Usage Guidelines</b>         | See “Creating a Connectivity-Fault Management Action Profile” on page 589.                                              |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |



***action-profile (Defining for LFM)***

**Syntax**    `action-profile profile-name {`  
                   `action {`  
                   `syslog;`  
                   `link-down;`  
                   `send-critical-event;`  
                   `}`  
                   `event {`  
                   `link-adjacency-loss;`  
                   `link-event-rate {`  
                   `frame-error count;`  
                   `frame-period count;`  
                   `frame-period-summary count;`  
                   `symbol-period count;`  
                   `}`  
                   `protocol-down;`  
                   `}`  
                   `}`

**Hierarchy Level**    [edit protocols oam ethernet link-fault-management]

**Release Information**    Statement introduced in JUNOS Release 8.5.

**Description**    Configure a name, one or more actions, and the events that trigger the action for an action profile.

**Options**    *profile-name*—Name of the action profile.

The remaining statements are explained separately.

**Usage Guidelines**    See “Configuring an OAM Action Profile” on page 598.

**Required Privilege Level**    interface—To view this statement in the configuration.  
                   interface-control—To add this statement to the configuration.

## action-red-differential-delay

---

|                                 |                                                                                                                                           |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | action-red-differential-delay (disable-tx   remove-link);                                                                                 |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> mlfr-uni-nni-bundle-options]                                                                       |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                            |
| <b>Description</b>              | For link services and voice services interfaces only, configure the action to be taken when the differential delay exceeds the red limit. |
| <b>Options</b>                  | disable-tx—Disable transmission on the bundle link.<br>remove-link—Remove bundle link from service.<br><b>Default:</b> disable-tx         |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                            |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                   |
| <b>Related Topics</b>           | remote, yellow-differential-delay                                                                                                         |

## activation-delay

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|                                 |                                                                                                                                                               |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | activation-delay <i>seconds</i> ;                                                                                                                             |
| <b>Hierarchy Level</b>          | [edit interface <i>dlIn</i> unit <i>logical-unit-number</i> dialer-options]                                                                                   |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                |
| <b>Description</b>              | (J-series Services Routers) For ISDN interfaces, configure the ISDN dialer activation delay. Used only for dialer backup and dialer watch cases.              |
| <b>Options</b>                  | <i>seconds</i> —Interval before the backup interface is activated after the primary interface has gone down.<br><b>Range:</b> 1 through 4,294,967,295 seconds |
| <b>Usage Guidelines</b>         | See “Configuring the Dialer Interface” on page 673.                                                                                                           |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                       |
| <b>Related Topics</b>           | <i>J-series Services Router Basic LAN and WAN Access Configuration Guide</i>                                                                                  |

## activation-priority

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>activation-priority <i>priority</i>;</code>                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> dynamic-call-admission-control]<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> dynamic-call-admission-control]                                                                                                                                                                         |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.2.                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b>              | (J4350 and J6350 Services Routers supporting voice over IP with the TGM550 media gateway module) For Fast Ethernet and Gigabit Ethernet interfaces, ISDN BRI interfaces, and serial interfaces with PPP or Frame Relay encapsulation, configure the dynamic call admission control (dynamic CAC) activation priority value.                                                                                                         |
| <b>Options</b>                  | <i>priority</i> —The activation priority in which the interface is used for providing call bandwidth. The interface with the highest activation priority value is used as the primary link for providing call bandwidth. If the primary link becomes unavailable, the TGM550 switches over to the next active interface with the highest activation priority value, and so on.<br><b>Range:</b> 0 through 255<br><b>Default:</b> 50 |
| <b>Usage Guidelines</b>         | See “Configuring Dynamic Call Admission Control” on page 155.                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                             |
| <b>Related Topics</b>           | <i>JUNOS Services Interfaces Configuration Guide, J-series Services Router Basic LAN and WAN Access Configuration Guide</i>                                                                                                                                                                                                                                                                                                         |

## address

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**Syntax** `address address {`  
     `arp ip-address (mac | multicast-mac) mac-address <publish>;`  
     `broadcast address;`  
     `destination address;`  
     `destination-profile name;`  
     `eui-64;`  
     `master-only;`  
     `multipoint-destination address dlcid dlcid-identifier;`  
     `multipoint-destination address {`  
         `epd-threshold cells;`  
         `inverse-arp;`  
         `oam-liveness {`  
             `up-count cells;`  
             `down-count cells;`  
         `}`  
         `oam-period (disable | seconds);`  
         `shaping {`  
             `(cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained`  
                 `rate burst length);`  
             `queue-length number;`  
         `}`  
         `vci vpi-identifier.vci-identifier;`  
     `}`  
     `primary;`  
     `preferred;`  
     `(vrrp-group | vrrp-inet6-group) group-number {`  
         `(accept-data | no-accept-data);`  
         `advertise-interval seconds;`  
         `authentication-type authentication;`  
         `authentication-key key;`  
         `fast-interval milliseconds;`  
         `(preempt | no-preempt) {`  
             `hold-time seconds;`  
         `}`  
         `priority-number number;`  
         `track {`  
             `priority-cost seconds;`  
             `priority-hold-time interface-name {`  
                 `interface priority;`  
                 `bandwidth-threshold bits-per-second {`  
                     `priority;`  
                 `}`  
             `}`  
             `route ip-address/mask routing-instance instance-name priority-cost cost;`  
         `}`  
     `virtual-address [ addresses ];`  
     `}`  
`}`

**Hierarchy Level** [edit interfaces *interface-name* unit *logical-unit-number* family *family*],

[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*  
family *family*]

**Release Information** Statement introduced before JUNOS Release 7.4.

**Description** Configure the interface address.

**Options** *address*—Address of the interface.

The remaining statements are explained separately.

**Usage Guidelines** See “Configuring the Protocol Family” on page 160.

**Required Privilege Level** interface—To view this statement in the configuration.  
interface-control—To add this statement to the configuration.

**Related Topics** negotiate-address, unnumbered-address, *JUNOS System Basics Configuration Guide*

## advertise-interval

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See the following sections:

- advertise-interval (APS) on page 740
- advertise-interval (DLSw) on page 741



**NOTE:** For information about the `advertise-interval` statement at the [edit interfaces *interface-name* unit *unit-number* family inet address *address* (vrrp-group | vrrp-inet6-group) *group-number*] or [edit logical-systems *logical-system-name* interfaces *interface-name* unit *unit-number* family (inet | inet6) address *address* (vrrp-group | vrrp-inet6-group) *group-number*] hierarchy level, see the *JUNOS High Availability Configuration Guide*.

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### advertise-interval (APS)

|                                 |                                                                                                                                                                                                                                                                                                                              |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>advertise-interval milliseconds;</code>                                                                                                                                                                                                                                                                                |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> sonet-options aps]                                                                                                                                                                                                                                                                    |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                               |
| <b>Description</b>              | Modify the Automatic Protection Switching (APS) interval at which the protect and working routers send packets to their neighbors to advertise that they are operational. A router considers its neighbor to be operational for a period, called the hold time, that is, by default, three times the advertisement interval. |
| <b>Options</b>                  | <i>milliseconds</i> —Interval between advertisement packets.<br><b>Range:</b> 1 through 65,534 milliseconds<br><b>Default:</b> 1000 milliseconds                                                                                                                                                                             |
| <b>Usage Guidelines</b>         | See “Configuring APS Timers” on page 703.                                                                                                                                                                                                                                                                                    |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                      |
| <b>Related Topics</b>           | hold-time                                                                                                                                                                                                                                                                                                                    |

**advertise-interval (DLSw)**

|                                 |                                                                                                                                                                                                                                                                                                    |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | advertise-interval <i>seconds</i> ;                                                                                                                                                                                                                                                                |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family llc2 redundancy-group <i>group-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family llc2 redundancy-group <i>group-number</i> ] |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 7.5.                                                                                                                                                                                                                                                         |
| <b>Description</b>              | For J-series Services Routers only. On Ethernet interfaces configured for DLSw Ethernet redundancy, configure the advertisement interval of DLSw neighbors on the network.<br><br>All routers in the redundancy group must use the same advertisement interval.                                    |
| <b>Options</b>                  | <i>seconds</i> —Interval between advertisement packets.<br><b>Range:</b> 1 through 255 seconds<br><b>Default:</b> 1 second                                                                                                                                                                         |
| <b>Usage Guidelines</b>         | See “Configuring DLSw Ethernet Redundancy Using LLC2 Properties” on page 168.                                                                                                                                                                                                                      |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                            |
| <b>Related Topics</b>           | <i>JUNOS Services Interfaces Configuration Guide</i>                                                                                                                                                                                                                                               |

**age**


---

|                                 |                                                                                                                                                         |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | age (30m   10m   1m   30s   10s);                                                                                                                       |
| <b>Hierarchy Level</b>          | [edit protocols oam ethernet connectivity-fault-management linktrace]                                                                                   |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.5.                                                                                                              |
| <b>Description</b>              | Time to wait (in minutes or seconds) for a response. If no response is received, the request and response entry is deleted from the linktrace database. |
| <b>Default</b>                  | 10 minutes                                                                                                                                              |
| <b>Usage Guidelines</b>         | See “Configuring the Linktrace Path Age Timer” on page 590.                                                                                             |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                 |

## aggregate

---

See the following sections:

- aggregate (Gigabit Ethernet CoS Policer) on page 742
- aggregate (SONET/SDH) on page 742

### aggregate (Gigabit Ethernet CoS Policer)

**Syntax**    aggregate {  
                  bandwidth-limit *bps*;  
                  burst-size-limit *bytes*;  
                  }

**Hierarchy Level**    [edit interfaces *interface-name* gigether-options ethernet-switch-profile  
                          ethernet-policer-profile policer *cos-policer-name*]

**Release Information**    Statement introduced before JUNOS Release 7.4.

**Description**    Define a policer to apply to nonpremium traffic.

The statements are explained separately.

**Usage Guidelines**    See “Configuring Gigabit Ethernet Policers” on page 609.

**Required Privilege Level**    interface—To view this statement in the configuration.  
                                  interface-control—To add this statement to the configuration.

**Related Topics**    premium, ieee802.1p

### aggregate (SONET/SDH)

**Syntax**    aggregate asx;

**Hierarchy Level**    [edit interfaces *interface-name* sonet-options]

**Release Information**    Statement introduced before JUNOS Release 7.4.

**Description**    Specify aggregated SONET/SDH logical interface number.

**Options**    asx—Aggregated SONET/SDH logical interface number.

**Range:** 0 through 15

**Usage Guidelines**    See “Configuring Aggregated SONET/SDH Interfaces” on page 716.

**Required Privilege Level**    interface—To view this statement in the configuration.  
                                  interface-control—To add this statement to the configuration.



## aggregate-ports

---

|                                 |                                                                                                                                                                    |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | aggregate-ports;                                                                                                                                                   |
| <b>Hierarchy Level</b>          | [edit chassis fpc <i>slot-number</i> pic <i>pic-number</i> ]                                                                                                       |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.1.                                                                                                                         |
| <b>Description</b>              | For T-series routers only, specify OC768-over-OC192 mode on the 4-port OC192C PIC. Four OC192 links are aggregated into one OC768 link with one logical interface. |
| <b>Usage Guidelines</b>         | See “Specifying OC768-over-OC192 Mode” on page 87.                                                                                                                 |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                            |

## aggregated-ether-options

---

```

Syntax aggregated-ether-options {
 ethernet-switch-profile {
 ethernet-policer-profile {
 input-priority-map {
 ieee802.1p premium [values];
 }
 output-priority-map {
 classifier {
 premium {
 forwarding-class class-name {
 loss-priority (high | low);
 }
 }
 }
 }
 }
 policer cos-policer-name {
 aggregate {
 bandwidth-limit bps;
 burst-size-limit bytes;
 }
 premium {
 bandwidth-limit bps;
 burst-size-limit bytes;
 }
 }
 }
 (mac-learn-enable | no-mac-learn-enable);
 }
 (flow-control | no-flow-control);
 lacp {
 (active | passive);
 link-protection{
 disable;
 }
 (revertive | non-revertive);
 periodic interval;
 system-priority priority;
 }
 link-protection;
 link-speed speed;
 (loopback | no-loopback);
 minimum-links number;
 source-address-filter {
 mac-address;
 (source-filtering | no-source-filtering);
 }
 }

```

**Hierarchy Level** [edit interfaces aex]

**Release Information** Statement introduced before JUNOS Release 7.4.

|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Description</b>              | Configure aggregated Ethernet-specific interface properties.<br><br>The statements are explained separately.            |
| <b>Usage Guidelines</b>         | See “Configuring Ethernet Interfaces” on page 511.                                                                      |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |

## aggregated-sonet-options

---

|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | aggregated-sonet-options {<br>link-speed <i>speed</i> ;<br>minimum-links <i>number</i> ;<br>}                           |
| <b>Hierarchy Level</b>          | [edit interfaces <i>asx</i> ]                                                                                           |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                          |
| <b>Description</b>              | Configure aggregated SONET/SDH-specific interface properties.<br><br>The statements are explained separately.           |
| <b>Usage Guidelines</b>         | See “Configuring Aggregated SONET/SDH Interfaces” on page 716.                                                          |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |

## allow-any-vci

---

|                                 |                                                                                                                                              |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | allow-any-vci;                                                                                                                               |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit 0],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit 0] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                               |
| <b>Description</b>              | Dedicate entire ATM device to ATM cell relay circuit.                                                                                        |
| <b>Usage Guidelines</b>         | See “Configuring an ATM1 Cell-Relay Circuit” on page 308.                                                                                    |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                      |

## allow-fragmentation

---

|                                 |                                                                                                                                                                                                                |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | allow-fragmentation;                                                                                                                                                                                           |
| <b>Hierarchy Level</b>          | [edit interfaces <i>gr-fpc/pic/port</i> unit <i>logical-unit-number</i> tunnel],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>gr-fpc/pic/port</i> unit <i>logical-unit-number</i> tunnel] |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 9.2.                                                                                                                                                                     |
| <b>Description</b>              | Enable fragmentation of generic routing encapsulation (GRE) encapsulated packets regardless of maximum transmission unit (MTU) value.                                                                          |
| <b>Default</b>                  | By default, the GRE encapsulated packets are dropped if the packet size exceeds the MTU setting of the egress interface.                                                                                       |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                                 |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                        |
| <b>Related Topics</b>           | reassemble-packets                                                                                                                                                                                             |

## allow-remote-loopback

---

|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | allow-remote-loopback;                                                                                                  |
| <b>Hierarchy Level</b>          | [edit protocols oam link-fault-management interface <i>interface-name</i> negotiation-options]                          |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.4.                                                                              |
| <b>Description</b>              | Enable the remote loopback on IQ2 Gigabit Ethernet interfaces, and all Ethernet interfaces on the MX-series routers.    |
| <b>Usage Guidelines</b>         | See “Enabling Remote Loopback Support on the Local Interface” on page 601.                                              |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |

## annex

---

|                                 |                                                                                                                                                            |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | annex (annex-a   annex-b);                                                                                                                                 |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> shdsl-options];<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> shdsl-options] |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 7.4.                                                                                                                 |
| <b>Description</b>              | For J-series Services Routers only, configure the type of SHDSL annex.                                                                                     |
| <b>Default</b>                  | annex-b                                                                                                                                                    |
| <b>Options</b>                  | annex-a—Use for North American SHDSL network implementations.<br><br>annex-b—Use for European SHDSL network implementations.                               |
| <b>Usage Guidelines</b>         | See “Configuring ATM-over-SHDSL Interfaces” on page 337.                                                                                                   |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                    |

## apply-action-profile

---

|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | apply-action-profile <i>profile-name</i> ;                                                                              |
| <b>Hierarchy Level</b>          | [edit protocols oam ethernet link-fault-management interface]                                                           |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.5.                                                                              |
| <b>Description</b>              | Apply the specified action profile to the interface for link-fault management.                                          |
| <b>Usage Guidelines</b>         | See “Applying an Action Profile” on page 601.                                                                           |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |

**aps**

---

**Syntax**   aps {  
               advertise-interval *milliseconds*;  
               authentication-key *key*;  
               force;  
               hold-time *milliseconds*;  
               lockout;  
               neighbor *address*;  
               paired-group *group-name*;  
               preserve-interface;  
               protect-circuit *group-name*;  
               request;  
               revert-time *seconds*;  
               switching-mode (bidirectional | unidirectional);  
               working-circuit *group-name*;  
               }

**Hierarchy Level**   [edit interfaces *interface-name* sonet-options]

**Release Information**   Statement introduced before JUNOS Release 7.4.

**Description**   Configure Automatic Protection Switching (APS) on the router.

For DS3 channels on a channelized OC12 interface, configure APS on channel 0 only. If you configure APS on channels 1 through 11, it is ignored.

The statements are explained separately.

**Usage Guidelines**   See “Configuring APS and MSP” on page 694.

**Required Privilege Level**   interface—To view this statement in the configuration.  
                                   interface-control—To add this statement to the configuration.

**arp**

---

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>arp ip-address (mac   multicast-mac) mac-address &lt;publish&gt;;</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet address <i>address</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i><br>family inet address <i>address</i> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b>              | For Ethernet, Fast Ethernet, and Gigabit Ethernet interfaces only, configure Address Resolution Protocol (ARP) table entries, mapping IP addresses to MAC addresses.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Options</b>                  | <p><i>ip-address</i>—IP address to map to the MAC address. The IP address specified must be part of the subnet defined in the enclosing <b>address</b> statement.</p> <p><i>mac mac-address</i>—MAC address to map to the IP address. Specify the MAC address as six hexadecimal bytes in one of the following formats: <i>nnnn.nnnn.nnnn</i> or <i>nn:nn:nn:nn:nn:nn</i>. For example, 0011.2233.4455 or 00:11:22:33:44:55.</p> <p><i>multicast-mac</i>—Multicast MAC address to map to the IP address. Specify the multicast MAC address as six hexadecimal bytes in one of the following formats: <i>nnnn.nnnn.nnnn</i> or <i>nn:nn:nn:nn:nn:nn</i>. For example, 0011.2233.4455 or 00:11:22:33:44:55.</p> <p><i>publish</i>—(Optional) Have the routing platform reply to ARP requests for the specified IP address. If you omit this option, the routing platform uses the entry to reach the destination but does not reply to ARP requests.</p> |
| <b>Usage Guidelines</b>         | See “Configuring Static ARP Table Entries” on page 573.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

## asynchronous-notification

---

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | (asynchronous-notification   no-asynchronous-notification);                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Hierarchy Level</b>          | [edit interfaces <i>ge-fpc/pic/port</i> <i>gigether-options</i> ]                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.3.                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b>              | For all 10-Gigabit Ethernet interfaces, M120, M320, and T-series routing platforms, configure support for notification of link down alarm generation and transfer. <ul style="list-style-type: none"> <li>■ <b>asynchronous-notification</b>—Support notification of link down alarm generation and transfer.</li> <li>■ <b>no-asynchronous-notification</b>—Prohibit notification of link down alarm generation and transfer.</li> </ul> |
| <b>Default</b>                  | Support for notification of link down alarm generation and transfer is not enabled.                                                                                                                                                                                                                                                                                                                                                       |
| <b>Usage Guidelines</b>         | See “Configuring 10-Gigabit Ethernet Notification of Link Down Alarm” on page 635.                                                                                                                                                                                                                                                                                                                                                        |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                   |

## atm-encapsulation

---

|                                 |                                                                                                                                                    |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | atm-encapsulation (direct   plcp);                                                                                                                 |
| <b>Hierarchy Level</b>          | [edit interfaces <i>at-fpc/pic/port</i> <i>e3-options</i> ],<br>[edit interfaces <i>at-fpc/pic/port</i> <i>t3-options</i> ]                        |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                     |
| <b>Description</b>              | Configure encapsulation for E3 and T3 traffic over ATM interfaces.                                                                                 |
| <b>Default</b>                  | Physical Layer Convergence Protocol (PLCP) encapsulation is the default for T3 traffic and for E3 traffic using G.751 framing.                     |
| <b>Options</b>                  | <b>direct</b> —Use direct encapsulation. G.832 framing on E3 interfaces requires direct encapsulation.<br><br><b>plcp</b> —Use PLCP encapsulation. |
| <b>Usage Guidelines</b>         | See “Configuring E3 and T3 Parameters on ATM Interfaces” on page 313.                                                                              |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                            |
| <b>Related Topics</b>           | encapsulation                                                                                                                                      |



## atm-options

---

**Syntax**

```

atm-options {
 cell-bundle-size cells;
 ilmi;
 linear-red-profiles profile-name {
 high-plp-max-threshold percent;
 low-plp-max-threshold percent;
 queue-depth cells high-plp-threshold percent low-plp-threshold percent;
 }
 mpls {
 pop-all-labels {
 required-depth number;
 }
 }
 pic-type (atm1 | atm2);
 plp-to-clp;
 promiscuous-mode {
 vpi vpi-identifier;
 }
 scheduler-maps map-name {
 forwarding-class class-name {
 epd-threshold cells plp1 cells;
 linear-red-profile profile-name;
 priority (high | low);
 transmit-weight (cells number | percent number);
 }
 vc-cos-mode (alternate | strict);
 }
 vpi vpi-identifier {
 maximum-vcs maximum-vcs;
 oam-liveness {
 up-count cells;
 down-count cells;
 }
 oam-period (disable | seconds);
 shaping {
 (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained
 rate burst length);
 queue-length number;
 }
 }
}

```

**Hierarchy Level** [edit interfaces *interface-name*]

**Release Information** Statement introduced before JUNOS Release 7.4.

**Description** Configure ATM-specific physical interface properties.

The statements are explained separately.

**Usage Guidelines** See “Configuring ATM Interfaces” on page 257.

**Required Privilege Level** interface—To view this statement in the configuration.  
interface-control—To add this statement to the configuration.

**Related Topics** multipoint-destination, shaping, vci

## atm-scheduler-map

---

**Syntax** atm-scheduler-map (*map-name* | default);

**Hierarchy Level** [edit interfaces *interface-name* unit *logical-unit-number*],  
[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

**Release Information** Statement introduced before JUNOS Release 7.4.

**Description** Associate a scheduler map with a virtual circuit on a logical interface.

**Options** *map-name*—Name of scheduler map that you define at the [edit interfaces *interface-name* atm-options scheduler-maps] hierarchy level.

default—The default scheduler mapping.

**Usage Guidelines** See “Configuring ATM2 IQ VC Tunnel CoS Components” on page 315.

**Required Privilege Level** interface—To view this statement in the configuration.  
interface-control—To add this statement to the configuration.

**Related Topics** scheduler-maps

## authentication-key

---

**Syntax** authentication-key *key*;

**Hierarchy Level** [edit interfaces *interface-name* sonet-options aps]

**Release Information** Statement introduced before JUNOS Release 7.4.

**Description** Configure the Automatic Protection Switching (APS) authentication key (password).

**Options** *key*—Authentication password. It can be 1 through 8 characters long. Configure the same key for both the working and protect routers.

**Usage Guidelines** See “Configuring Basic APS Support” on page 696.

**Required Privilege Level** interface—To view this statement in the configuration.  
interface-control—To add this statement to the configuration.

**Related Topics** For information about the authentication-key statement at the [edit interfaces *interface-name* unit *unit-number* family inet address *address* (vrrp-group | vrrp-inet6-group) *group-number*] or [edit logical-systems *logical-system-name* interfaces *interface-name* unit *unit-number* family (inet | inet6) address *address* (vrrp-group | vrrp-inet6-group) *group-number*] hierarchy level, see the *JUNOS High Availability Configuration Guide*.

## authentication-profile-name

---

|                                 |                                                                                                                                                                          |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | authentication-profile-name <i>access-profile-name</i> ;                                                                                                                 |
| <b>Hierarchy Level</b>          | [edit protocols dot1x authenticator]                                                                                                                                     |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 9.3.                                                                                                                               |
| <b>Description</b>              | Specify the RADIUS authentication profile to use for user authentication when establishing an IEEE 802.1x Port-Based Network Access Control ( <b>dot1x</b> ) connection. |
| <b>Usage Guidelines</b>         | See “Configuring IEEE 802.1x Port-Based Network Access Control” on page 591.                                                                                             |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface control—To add this statement to the configuration.                                                  |
| <b>Related Topics</b>           | dot1x, authenticator                                                                                                                                                     |

## authenticator

---

**Syntax**     authenticator {  
                  authentication-profile-name *access-profile-name*;  
                  interface *interface-ids* {  
                      maximum-requests *integer*;  
                      retries *integer*;  
                      quiet-period *seconds*;  
                      transmit-period *seconds*;  
                      reauthentication (disable | interval *seconds*);  
                      server-timeout *seconds*;  
                      supplicant (*single*);  
                      supplicant-timeout *seconds*;  
                  }  
                }

**Hierarchy Level**     [edit protocols dot1x]

**Release Information**     The authenticator statement was introduced in JUNOS Release 9.3.

**Description**     Specify an authentication profile for user or client authentication and configure the Ethernet interface for 802.1x protocol operation.

**Options**     authentication-profile-name *access-profile-name*—Specifies the RADIUS authentication profile for user or client authentication.

                 interface *interface-ids*—Configures the Ethernet interface for 802.1x protocol operation. See interface (IEEE 802.1x (dot1x)—Port-Based Network Access Control) for descriptions of interface statement subordinate options.

**Usage Guidelines**     See “Configuring IEEE 802.1x Port-Based Network Access Control” on page 591.

**Required Privilege Level**     protocols—To view this statement in the configuration.  
                  protocols-control—To add this statement to the configuration.

**Related Topics**     authentication-profile-name, dot1x, interface (IEEE 802.1x (dot1x)—Port-Based Network Access Control)

## auto-discovery

---

|                                 |                                                                                                                                                             |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | auto-discovery;                                                                                                                                             |
| <b>Hierarchy Level</b>          | [edit protocols oam ethernet connectivity-fault-management maintenance-domain <i>domain-name</i> maintenance-association <i>ma-name</i> mep <i>mep-id</i> ] |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.4.                                                                                                                  |
| <b>Description</b>              | Enable the MEP to accept continuity check messages from all remote MEPs.                                                                                    |
| <b>Usage Guidelines</b>         | See “Enabling Maintenance End Point Automatic Discovery” on page 588.                                                                                       |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                     |

## auto-negotiation

---

See the following sections:

- auto-negotiation (Gigabit Ethernet) on page 756
- auto-negotiation (J-series uPIM) on page 757

### ***auto-negotiation (Gigabit Ethernet)***

|                                 |                                                                                                                                                                                                                                                                                                                                                        |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | (auto-negotiation   no-auto-negotiation) remote-fault <local-interface-online   local-interface-offline>;                                                                                                                                                                                                                                              |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> together-options]                                                                                                                                                                                                                                                                                               |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 7.6.                                                                                                                                                                                                                                                                                                             |
| <b>Description</b>              | For Gigabit Ethernet interfaces only, explicitly enable autonegotiation and remote fault. In this mode, you can manually configure remote fault options. Include the <b>no-auto-negotiation</b> statement to disable autonegotiation. When you configure the Tri-Rate Ethernet copper interface to operate at 1 Gbps, autonegotiation must be enabled. |
| <b>Default</b>                  | Autonegotiation is automatically enabled. No explicit action is taken after the autonegotiation is complete or if the negotiation fails.                                                                                                                                                                                                               |
| <b>Options</b>                  | <p><b>no-auto-negotiation</b>—Disables explicit autonegotiation.</p> <p><b>remote-fault local-interface-online   local-interface-offline</b>—(Optional) Manually configure remote fault on an interface. Specify remote fault as <b>online</b> or <b>offline</b>.<br/> <b>Default:</b> online</p>                                                      |
| <b>Usage Guidelines</b>         | See “Configuring Gigabit Ethernet Autonegotiation” on page 619.                                                                                                                                                                                                                                                                                        |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                     |

**auto-negotiation (J-series uPIM)**

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | (auto-negotiation   no-auto-negotiation);                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Hierarchy Level</b>          | [edit interfaces <i>ge-pim</i> /0/0 switch-options switch-port <i>port-number</i> ]                                                                                                                                                                                                                                                                                                                                                     |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.4.                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b>              | <p>For universal Physical Interface Modules (uPIMs) on J-series Services Routers only, explicitly enable autonegotiation. If the link speed and duplex are also configured, the interfaces use the values configured as the desired values in the negotiation. Include the <b>no-auto-negotiation</b> statement to disable autonegotiation.</p> <p>If autonegotiation is disabled, the link speed and link mode must be configured.</p> |
| <b>Default</b>                  | Autonegotiation is enabled by default.                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Options</b>                  | <p><b>auto-negotiation</b>—Enables autonegotiation.</p> <p><b>no-auto-negotiation</b>—Disables autonegotiation.</p>                                                                                                                                                                                                                                                                                                                     |
| <b>Usage Guidelines</b>         | See “Configuring J-series Services Router Switching Interfaces” on page 515.                                                                                                                                                                                                                                                                                                                                                            |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                                                                                                      |

**auto-reconnect**


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|                                 |                                                                                                                                                                                                                                       |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | auto-reconnect <i>seconds</i> ;                                                                                                                                                                                                       |
| <b>Hierarchy Level</b>          | <p>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> pppoe-options],</p> <p>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> pppoe-options]</p> |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                        |
| <b>Description</b>              | For J-series Services Routers with PPP over Ethernet interfaces, configure the amount of time to wait before reconnecting after a session has terminated.                                                                             |
| <b>Options</b>                  | <p><i>seconds</i>—Time to wait before reconnecting after a session has terminated.</p> <p><b>Range:</b> 0 through 4,294,967,295 seconds</p> <p><b>Default:</b> 0 (immediately)</p>                                                    |
| <b>Usage Guidelines</b>         | See “Configuring the PPPoE Automatic Reconnect Wait Timer” on page 644.                                                                                                                                                               |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                    |
| <b>Related Topics</b>           | <i>J-series Services Router Basic LAN and WAN Access Configuration Guide</i>                                                                                                                                                          |

## backup-destination

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|                                 |                                                                                                                                                                                                              |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | backup-destination <i>address</i> ;                                                                                                                                                                          |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> tunnel],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> tunnel] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                               |
| <b>Description</b>              | For tunnel interfaces, specify the remote address of the backup tunnel.                                                                                                                                      |
| <b>Options</b>                  | <i>address</i> —Address of the remote side of the connection.                                                                                                                                                |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                               |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                      |
| <b>Related Topics</b>           | destination                                                                                                                                                                                                  |

## backup-interface

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|                                 |                                                                                                                                                                                                                                      |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | backup-interface <i>es-fpc/pic/port</i> ;                                                                                                                                                                                            |
| <b>Hierarchy Level</b>          | [edit interfaces <i>es-fpc/pic/port</i> es-options]                                                                                                                                                                                  |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                       |
| <b>Description</b>              | Configure a backup ES Physical Interface Card (PIC). If the primary ES PIC fails, the backup becomes active, inherits all the tunnels and security associations (SAs), and acts as the new next hop for IP Security (IPSec) traffic. |
| <b>Options</b>                  | <i>es-fpc/pic/port</i> —Name of ES interface to serve as the backup.                                                                                                                                                                 |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                                                       |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                              |



## backup-options

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|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | backup-options {<br>interface <i>interface-name</i> ;<br>}                                                                                                                                              |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ]        |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                          |
| <b>Description</b>              | Configure an interface to be used as a backup interface if the primary interface goes down. This is used to support ISDN dial backup operation.<br><br>The remaining statement is explained separately. |
| <b>Usage Guidelines</b>         | See “Configuring an ISDN Dialer Interface as a Backup Interface” on page 664.                                                                                                                           |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                 |
| <b>Related Topics</b>           | <i>J-series Services Router Basic LAN and WAN Access Configuration Guide</i>                                                                                                                            |

## bandwidth

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | bandwidth <i>rate</i> ;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ]                                                                                                                                                                                                                                                                                                                            |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b>              | Configure an informational-only bandwidth value for an interface. This statement is valid for all logical interface types, except multilink and aggregated interfaces.                                                                                                                                                                                                                                                                                                                                                      |
| <b>Options</b>                  | <i>rate</i> —Peak rate, in bits per second (bps) or cells per second (cps). You can specify a value in bits per second either as a complete decimal number or as a decimal number followed by the abbreviation k (1000), m (1,000,000), or g (1,000,000,000). You can also specify a value in cells per second by entering a decimal number followed by the abbreviation c; values expressed in cells per second are converted to bits per second by means of the formula<br>1 cps = 384 bps.<br><b>Range:</b> Not limited. |
| <b>Usage Guidelines</b>         | See “Configuring the Interface Bandwidth” on page 148.                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                     |

## bandwidth-limit

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|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | bandwidth-limit <i>bps</i> ;                                                                                                                                                                                                                                                                                                                                            |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> gigether-options ethernet-switch-profile ethernet-policer-profile policer <i>cos-policer-name</i> aggregate],<br>[edit interfaces <i>interface-name</i> gigether-options ethernet-switch-profile ethernet-policer-profile policer <i>cos-policer-name</i> premium]                                                               |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b>              | Define a policer to apply to nonpremium traffic.                                                                                                                                                                                                                                                                                                                        |
| <b>Options</b>                  | <i>bps</i> —Bandwidth limit, in bits per second. Specify either as a complete decimal number or as a decimal number followed by the abbreviation k (1000), m (1,000,000), or g (1,000,000,000).<br><b>Range:</b> 32 Kbps through 32 gigabits per second (Gbps). For IQ2 interfaces 65,536 bps through 1 Gbps. For 10-Gigabit IQ2 interfaces 65,536 bps through 10 Gbps. |
| <b>Usage Guidelines</b>         | See “Configuring Gigabit Ethernet Policers” on page 609.                                                                                                                                                                                                                                                                                                                |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                 |
| <b>Related Topics</b>           | burst-size-limit                                                                                                                                                                                                                                                                                                                                                        |

## bchannel-allocation

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|                                 |                                                                                                                                                                                                                           |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | bchannel-allocation (ascending   descending);                                                                                                                                                                             |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> isdn-options]                                                                                                                                                                      |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.3.                                                                                                                                                                                |
| <b>Description</b>              | (J-series Services Routers equipped with a Dual-Port Channelized T1/E1 PIM) For Integrated Services Digital Network Primary Rate Interfaces (ISDN PRI), allocate PRI dialout B-channels in ascending or descending order. |
| <b>Options</b>                  | (ascending   descending)—Allocate the B-channels in ascending (from low to high) or descending (from high to low) order.<br><b>Default:</b> Descending order                                                              |
| <b>Usage Guidelines</b>         | See “Allocating B-Channels for Dialout” on page 389.                                                                                                                                                                      |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                   |
| <b>Related Topics</b>           | <i>J-series Services Router Basic LAN and WAN Access Configuration Guide</i>                                                                                                                                              |

## bearer-bandwidth-limit

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>bearer-bandwidth-limit <i>kilobits-per-second</i>;</code>                                                                                                                                                                                                                                                                                                                                |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> dynamic-call-admission-control],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i><br>dynamic-call-admission-control]                                                                                                                                |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.2.                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b>              | (J4350 and J6350 Services Routers supporting voice over IP with the TGM550 media gateway module) For Fast Ethernet and Gigabit Ethernet interfaces, ISDN BRI interfaces, and serial interfaces with PPP or Frame Relay encapsulation, configure the bearer bandwidth limit (BBL). BBL is used for dynamic call admission control (dynamic CAC) to provide enhanced control over WAN bandwidth. |
| <b>Options</b>                  | <i>kilobits-per-second</i> —The bearer bandwidth limit to be reported to a TGM550 media gateway module, in kilobits per second (kbps).<br><b>Range:</b> 0 through 9999 kbps<br><b>Default:</b> 1 (dynamic CAC is not enabled on the interface)                                                                                                                                                 |
| <b>Usage Guidelines</b>         | See “Configuring Dynamic Call Admission Control” on page 155.                                                                                                                                                                                                                                                                                                                                  |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                        |
| <b>Related Topics</b>           | <i>JUNOS Services Interfaces Configuration Guide, J-series Services Router Basic LAN and WAN Access Configuration Guide</i>                                                                                                                                                                                                                                                                    |

## bert-algorithm

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|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>              | <code>bert-algorithm <i>algorithm</i>;</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Hierarchy Level</b>     | [edit interfaces <i>interface-name</i> ds0-options],<br>[edit interfaces <i>interface-name</i> e1-options],<br>[edit interfaces <i>interface-name</i> e3-options],<br>[edit interfaces <i>interface-name</i> t1-options],<br>[edit interfaces <i>interface-name</i> t3-options]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Release Information</b> | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b>         | Configure the pattern to send in the bit stream during a bit error rate test (BERT). Applies to T1, E3, T3, and multichannel DS3 interfaces, the channelized interfaces (DS3, OC12, STM1), and channelized IQ interfaces (E1 and DS3).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Options</b>             | <p><i>algorithm</i>—Pattern to send in the bit stream. There are two categories of test patterns: pseudorandom and repetitive. Both patterns conform to CCITT/ITU O.151, O.152, O.153, and O.161 standards. The algorithm can be one of the following patterns:</p> <ul style="list-style-type: none"> <li>■ <i>all-ones-repeating</i>—Pattern is all ones.</li> <li>■ <i>all-zeros-repeating</i>—Pattern is all zeros.</li> <li>■ <i>alternating-double-ones-zeros</i>—Pattern is alternating pairs of ones and zeros.</li> <li>■ <i>alternating-ones-zeros</i>—Pattern is alternating ones and zeros.</li> <li>■ <i>repeating-1-in-8</i>—1 bit in 8 is set.</li> <li>■ <i>pseudo-2e10</i>—Pattern is <math>2^{10} - 1</math>.</li> <li>■ <i>pseudo-2e11-o152</i>—Pattern is <math>2^{11} - 1</math>, as defined in the O152 standard.</li> <li>■ <i>pseudo-2e15-o151</i>—Pattern is <math>2^{15} - 1</math>, as defined in the O151 standard.</li> <li>■ <i>pseudo-2e17</i>—Pattern is <math>2^{17} - 1</math>.</li> <li>■ <i>pseudo-2e18</i>—Pattern is <math>2^{18} - 1</math>.</li> <li>■ <i>pseudo-2e20-o151</i>—Pattern is <math>2^{20} - 1</math>, as defined in the O151 standard.</li> <li>■ <i>pseudo-2e20-o153</i>—Pattern is <math>2^{20} - 1</math>, as defined in the O153 standard.</li> <li>■ <i>pseudo-2e21</i>—Pattern is <math>2^{21} - 1</math>.</li> <li>■ <i>pseudo-2e22</i>—Pattern is <math>2^{22} - 1</math>.</li> <li>■ <i>pseudo-2e23-o151</i>—Pattern is <math>2^9 - 1</math>, as defined in the O151 standard.</li> <li>■ <i>pseudo-2e25</i>—Pattern is <math>2^{25} - 1</math>.</li> <li>■ <i>pseudo-2e28</i>—Pattern is <math>2^{28} - 1</math>.</li> <li>■ <i>pseudo-2e29</i>—Pattern is <math>2^{29} - 1</math>.</li> </ul> |

- **pseudo-2e3**—Pattern is  $2^3 - 1$ .
- **pseudo-2e31**—Pattern is  $2^{31} - 1$ .
- **pseudo-2e32**—Pattern is  $2^{32} - 1$ .
- **pseudo-2e4**—Pattern is  $2^4 - 1$ .
- **pseudo-2e5**—Pattern is  $2^5 - 1$ .
- **pseudo-2e6**—Pattern is  $2^6 - 1$ .
- **pseudo-2e7**—Pattern is  $2^7 - 1$ .
- **pseudo-2e9-o153**—Pattern is  $2^9 - 1$ , as defined in the O153 standard.
- **repeating-1-in-4**—One bit in four is set to 1; the others are set to 0.
- **repeating-1-in-8**—One bit in eight is set to 1; the others are set to 0.
- **repeating-3-in-24**—Three bits in twenty-four are set to 1; the others are set to 0.

**Default:** pseudo-2e3

**Usage Guidelines** See “Interface Diagnostics” on page 125, “Configuring E3 BERT Properties” on page 478, “Configuring T1 BERT Properties” on page 486, “Configuring T3 BERT Properties” on page 496, and “Examples: Configuring T3 Interfaces” on page 505.

**Required Privilege Level** interface—To view this statement in the configuration.  
interface-control—To add this statement to the configuration.

**Related Topics** bert-error-rate, bert-period

**bert-error-rate**

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|                                 |                                                                                                                                                                                                                                                                                 |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>bert-error-rate rate;</code>                                                                                                                                                                                                                                              |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> ds0-options],<br>[edit interfaces <i>interface-name</i> e1-options],<br>[edit interfaces <i>interface-name</i> e3-options],<br>[edit interfaces <i>interface-name</i> t1-options],<br>[edit interfaces <i>interface-name</i> t3-options] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                  |
| <b>Description</b>              | Configure the bit error rate to use in a BERT procedure. Applies to E1, E3, T1, or T3 interfaces, and to the channelized interfaces (DS3, OC3, OC12, STM1).                                                                                                                     |
| <b>Options</b>                  | <p><i>rate</i>—Bit error rate.</p> <p><b>Range:</b> 0 through 7, which corresponds to <math>10^{-1}</math> (1 error per bit) to <math>10^{-7}</math> (1 error per 10 million bits)</p> <p><b>Default:</b> 0</p>                                                                 |
| <b>Usage Guidelines</b>         | See “Interface Diagnostics” on page 125, “Configuring E3 BERT Properties” on page 478, “Configuring T1 BERT Properties” on page 486, “Configuring T3 BERT Properties” on page 496, and “Examples: Configuring T3 Interfaces” on page 505.                                       |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                              |
| <b>Related Topics</b>           | bert-algorithm, bert-period                                                                                                                                                                                                                                                     |

## bert-period

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|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | bert-period <i>seconds</i> ;                                                                                                                                                                                                                                                    |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> ds0-options],<br>[edit interfaces <i>interface-name</i> e1-options],<br>[edit interfaces <i>interface-name</i> e3-options],<br>[edit interfaces <i>interface-name</i> t1-options],<br>[edit interfaces <i>interface-name</i> t3-options] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                  |
| <b>Description</b>              | Configure the duration of a BERT test. Applies to E1, E3, T1, and T3 interfaces, and the channelized interfaces (DS3, OC12, STM1).                                                                                                                                              |
| <b>Options</b>                  | <i>seconds</i> —Test duration.<br><b>Range:</b> PIC-dependent: either 1 through 239 seconds or 1 through 240 seconds<br><b>Default:</b> 10 seconds                                                                                                                              |
| <b>Usage Guidelines</b>         | See “Interface Diagnostics” on page 125, “Configuring E3 BERT Properties” on page 478, “Configuring T1 BERT Properties” on page 486, and “Configuring T3 BERT Properties” on page 496.                                                                                          |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                         |
| <b>Related Topics</b>           | bert-algorithm, bert-error-rate                                                                                                                                                                                                                                                 |

## broadcast

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|                                 |                                                                                                                                                                                                                                                                                          |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | broadcast <i>address</i> ;                                                                                                                                                                                                                                                               |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family <i>family</i> address <i>address</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family <i>family</i> address <i>address</i> ] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                           |
| <b>Description</b>              | Set the broadcast address on the network or subnet. On a subnet you cannot specify a host address of 0, nor can you specify a broadcast address.                                                                                                                                         |
| <b>Default</b>                  | The default broadcast address has a host portion of all ones.                                                                                                                                                                                                                            |
| <b>Options</b>                  | <i>address</i> —Broadcast address. The address must have a host portion of either all ones or all zeros. You cannot specify the addresses 0.0.0.0 or 255.255.255.255.                                                                                                                    |
| <b>Usage Guidelines</b>         | See “Configuring the Interface Address” on page 162.                                                                                                                                                                                                                                     |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                  |

## buildout

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See the following sections:

- buildout (E3 or T3 over ATM Interfaces) on page 766
- buildout (T1 Interfaces) on page 767

### ***buildout (E3 or T3 over ATM Interfaces)***

|                                 |                                                                                                                                 |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | buildout <i>feet</i> ;                                                                                                          |
| <b>Hierarchy Level</b>          | [edit interfaces <i>at-fpc/pic/port</i> e3-options],<br>[edit interfaces <i>at-fpc/pic/port</i> t3-options]                     |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                  |
| <b>Description</b>              | For E3 and T3 traffic over ATM interfaces, set the buildout value.                                                              |
| <b>Options</b>                  | <i>feet</i> —The buildout value in feet.<br><b>Range:</b> 0 through 450 feet (137 meters)<br><b>Default:</b> 10 feet (3 meters) |
| <b>Usage Guidelines</b>         | See “Configuring E3 and T3 Parameters on ATM Interfaces” on page 313.                                                           |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.         |



**buildout (T1 Interfaces)**

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | buildout <i>value</i> ;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> t1-options]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b>              | For T1 interfaces, set the buildout value.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Default</b>                  | The default buildout value is 0 through 132 feet.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Options</b>                  | <p>You can set the buildout value to one of the following:</p> <ul style="list-style-type: none"> <li>■ 0-132—0 through 132 feet (0 through 40 meters)</li> <li>■ 133-265—133 through 265 feet (40 through 81 meters)</li> <li>■ 266-398—266 through 398 feet (81 through 121 meters)</li> <li>■ 399-531—399 through 531 feet (121 through 162 meters)</li> <li>■ 532-655—532 through 655 feet (162 through 200 meters)</li> <li>■ long-0db—For J-series Services Routers only, long buildout with 0 decibel (dB) transmit attenuation</li> <li>■ long-7.5db—For J-series Services Routers only, long buildout with 7.5 dB transmit attenuation</li> <li>■ long-15db—For J-series Services Routers only, long buildout with 15 dB transmit attenuation</li> <li>■ long-22.5db—For J-series Services Routers only, long buildout with 22.5 dB transmit attenuation</li> </ul> |
| <b>Usage Guidelines</b>         | See “Configuring the T1 Buildout” on page 487.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Related Topics</b>           | <i>J-series Services Router Basic LAN and WAN Access Configuration Guide</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

## bundle

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|                                 |                                                                                                                                                                                                                                            |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>bundle (ml-fpc/pic/port   ls-fpc/pic/port);</code>                                                                                                                                                                                   |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family <i>family</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family <i>family</i> ] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                             |
| <b>Description</b>              | Associate the multilink interface with the logical interface it is joining. You can include this statement for the mlfr-end-to-end and mlfr-uni-nni protocol families only.                                                                |
| <b>Options</b>                  | <code>ml-fpc/pic/port</code> —Name of the multilink interface you are linking.<br><br><code>ls-fpc/pic/port</code> —Name of the link services interface you are linking.                                                                   |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                                                             |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                    |

## burst-size-limit

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|                                 |                                                                                                                                                                                                                                                                                                           |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>burst-size-limit bytes;</code>                                                                                                                                                                                                                                                                      |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> gigether-options ethernet-switch-profile ethernet-policer-profile policer <i>cos-policer-name</i> aggregate],<br>[edit interfaces <i>interface-name</i> gigether-options ethernet-switch-profile ethernet-policer-profile policer <i>cos-policer-name</i> premium] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                            |
| <b>Description</b>              | Define a policer to apply to nonpremium traffic.                                                                                                                                                                                                                                                          |
| <b>Options</b>                  | <code>bytes</code> —Burst length.<br><b>Range:</b> 1500 through 100,000,000 bytes                                                                                                                                                                                                                         |
| <b>Usage Guidelines</b>         | See “Configuring Gigabit Ethernet Policers” on page 609.                                                                                                                                                                                                                                                  |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                   |
| <b>Related Topics</b>           | bandwidth-limit                                                                                                                                                                                                                                                                                           |

## byte-encoding

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|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | byte-encoding (nx56   nx64);                                                                                            |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> ds0-options],<br>[edit interfaces <i>interface-name</i> t1-options]              |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                          |
| <b>Description</b>              | Set the byte encoding on a DS0 or T1 interface to use 7 bits per byte or 8 bits per byte.                               |
| <b>Default</b>                  | The default byte encoding is 8 bits per byte (nx64).                                                                    |
| <b>Options</b>                  | nx56—Use 7 bits per byte.<br><br>nx64—Use 8 bits per byte.                                                              |
| <b>Usage Guidelines</b>         | See “Configuring T1 Byte Encoding” on page 487.                                                                         |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |

## bytes

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**Syntax** bytes {  
     c2 *value*;  
     e1-quiet *value*;  
     f1 *value*;  
     f2 *value*;  
     s1 *value*;  
     z3 *value*;  
     z4 *value*;  
 }

**Hierarchy Level** [edit interfaces *interface-name* sonet-options]

**Release Information** Statement introduced before JUNOS Release 7.4.

**Description** Set values in some SONET/SDH header bytes.

**Options** c2 *value*—Path signal label SONET/SDH overhead byte. SONET/SDH frames use the C2 byte to indicate the contents of the payload inside the frame. SONET/SDH interfaces use the C2 byte to indicate whether the payload is scrambled.

**Range:** 0 through 255

**Default:** 0xCF

e1-quiet *value*—Default idle byte sent on the orderwire SONET/SDH overhead bytes. The routing platform does not support the orderwire channel, and hence sends this byte continuously.

**Range:** 0 through 255

**Default:** 0x7F

f1 *value*, f2 *value*, z3 *value*, z4 *value*—SONET/SDH overhead bytes.

**Range:** 0 through 255

**Default:** 0x00

s1 *value*—Synchronization message SONET overhead byte. This byte is normally controlled as a side effect of the system reference clock configuration and the state of the external clock coming from an interface if the system reference clocks have been configured to use an external reference.

**Range:** 0 through 255

**Default:** 0xCC

**Usage Guidelines** See “Configuring SONET/SDH Header Byte Values” on page 685.

**Required Privilege Level** interface—To view this statement in the configuration.  
 interface-control—To add this statement to the configuration.

**Related Topics** no-concatenate in the *JUNOS System Basics Configuration Guide*

## callback

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | callback;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Hierarchy Level</b>          | [edit interfaces <i>dl n</i> unit <i>logical-unit-number</i> dialer-options incoming-map],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>dl n</i> unit <i>logical-unit-number</i><br>dialer-options incoming-map]                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 7.5.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b>              | <p>(J-series Services Routers) For interfaces configured for ISDN, specify the dialer to reject incoming calls, and instead, call back the caller after a specified wait time. The default wait time is 5 seconds. To configure the wait time, include the <code>callback-wait-period</code> statement at the [edit interfaces <i>dl n</i> unit <i>logical-unit-number</i> dialer-options] hierarchy level.</p> <p>If the <code>callback</code> statement is configured, you cannot use the <code>caller <i>caller-id</i></code> statement at the [edit interfaces <i>dl n</i> unit <i>logical-unit-number</i> dialer-options] hierarchy level.</p> |
| <b>Usage Guidelines</b>         | See “Configuring Dial-In and Callback” on page 670.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Related Topics</b>           | <i>J-series Services Router Basic LAN and WAN Access Configuration Guide</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

## callback-wait-period

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>callback-wait-period <i>time</i>;</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Hierarchy Level</b>          | [edit interfaces <i>dlm</i> unit <i>logical-unit-number</i> dialer-options],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>dlm</i> unit <i>logical-unit-number</i> dialer-options]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 7.5.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b>              | <p>(J-series Services Routers) For interfaces configured for ISDN with callback, specify the amount of time the dialer waits before calling back the caller. The default wait time is 5 seconds. The wait time is necessary because, when a call is rejected, the switch waits for up to 4 seconds on point-to-multipoint connections to ensure no other device accepts the call before sending the DISCONNECT message to the originator of the call. However, the default time of 5 seconds may not be sufficient for different switches or may not be needed on point-to-point connections.</p> <p>To configure callback mode, include the <code>callback</code> statement at the [edit interfaces <i>dlm</i> unit <i>logical-unit-number</i> dialer-options] hierarchy level.</p> <p>If the <code>callback</code> statement is configured, you cannot use the <code>caller <i>caller-id</i></code> statement at the [edit interfaces <i>dlm</i> unit <i>logical-unit-number</i> dialer-options] hierarchy level.</p> |
| <b>Options</b>                  | <i>time</i> —Time the dialer waits before calling back the caller.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Usage Guidelines</b>         | See “Configuring Dial-In and Callback” on page 670.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Related Topics</b>           | <i>J-series Services Router Basic LAN and WAN Access Configuration Guide</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

## caller

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | caller ( <i>caller-id</i>   accept-all);                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Hierarchy Level</b>          | [edit interfaces <i>dl</i> n unit <i>logical-unit-number</i> dialer-options incoming-map],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>dl</i> n unit <i>logical-unit-number</i> dialer-options incoming-map]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 7.5.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Description</b>              | (J-series Services Routers) For interfaces configured for ISDN, specify the dialer to accept a specified caller number or accept all incoming calls.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Options</b>                  | <p><b>caller-id</b>—Incoming caller number. You can configure multiple caller IDs on a dialer. The caller ID of the incoming call is matched against all caller IDs configured on all dialers. The dialer matching the caller ID is looked at for further processing. Only a precise match is a valid match. For example, the configured caller ID 1-222-333-4444 or 222-333-4444 will match the incoming caller ID 1-222-333-4444.</p> <p>If the incoming caller ID has fewer digits than the number configured, it is not a valid match. Duplicate caller IDs are not allowed on different dialers; however, for example, the numbers 1-408-532-1091, 408-532-1091, and 532-1091 can still be configured on different dialers.</p> <p>Only one B-channel can map to one dialer. If one dialer is already mapped, any other call mapping to the same dialer is rejected (except in the case of a multilink dialer). If no dialer caller is configured on a dialer, that dialer will not accept any calls.</p> <p><b>accept-all</b>—Any incoming call in an associated interface is accepted.</p> |
| <b>Usage Guidelines</b>         | See “Configuring ISDN Interfaces” on page 657.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Related Topics</b>           | <i>J-series Services Router Basic LAN and WAN Access Configuration Guide</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

## calling-number

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|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | calling-number <i>number</i> ;                                                                                          |
| <b>Hierarchy Level</b>          | [edit interfaces <i>br-pim</i> /0/ <i>port</i> isdn-options]                                                            |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                          |
| <b>Description</b>              | For J-series Services Routers only. For ISDN interfaces, configure the calling number to include in outgoing calls.     |
| <b>Options</b>                  | <i>number</i> —Calling number.                                                                                          |
| <b>Usage Guidelines</b>         | See “Configuring ISDN Physical Interface Properties” on page 659.                                                       |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |
| <b>Related Topics</b>           | <i>J-series Services Router Basic LAN and WAN Access Configuration Guide</i>                                            |

## cbit-parity

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | (cbit-parity   no-cbit-parity);                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> t3-options]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b>              | For T3 interfaces only, enable or disable C-bit parity mode, which controls the type of framing that is present on the transmitted T3 signal. When C-bit parity mode is enabled, the C-bit positions are used for the far-end block error (FEBE), far-end alarm and control (FEAC), terminal data link, path parity, and mode indicator bits, as defined in ANSI T1.107a-1989. For ATM and ATM2 IQ2 interfaces, M23 framing is used when the no-cbit-parity statement is included. For all other interfaces, M13 framing is used when the no-cbit-parity statement is included. |
| <b>Default</b>                  | C-bit parity mode is enabled.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Usage Guidelines</b>         | See “Configuring E3 and T3 Parameters on ATM Interfaces” on page 313 and “Disabling T3 C-Bit Parity Mode” on page 497.                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                         |



**cbr**

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>cbr rate;</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Hierarchy Level</b>          | [edit interfaces <i>at-fpc/pic/port</i> atm-options vpi <i>vpi-identifier</i> shaping],<br>[edit interfaces <i>at-fpc/pic/port</i> unit <i>logical-unit-number</i> address <i>address</i> family <i>family</i> multipoint-destination <i>address</i> shaping],<br>[edit interfaces <i>at-fpc/pic/port</i> unit <i>logical-unit-number</i> shaping],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>at-fpc/pic/port</i> unit <i>logical-unit-number</i> address <i>address</i> family <i>family</i> multipoint-destination <i>address</i> shaping],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>at-fpc/pic/port</i> unit <i>logical-unit-number</i> shaping]                                                                                                                     |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Description</b>              | For ATM encapsulation only, define a constant bit rate bandwidth utilization in the traffic-shaping profile.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Default</b>                  | Unspecified bit rate (UBR); that is, bandwidth utilization is unlimited.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Options</b>                  | <p><b>rate</b>—Peak rate, in bits per second (bps) or cells per second (cps). You can specify a value in bits per second either as a complete decimal number or as a decimal number followed by the abbreviation k (1000), m (1,000,000), or g (1,000,000,000). You can also specify a value in cells per second by entering a decimal number followed by the abbreviation c; values expressed in cells per second are converted to bits per second by means of the formula</p> $1 \text{ cps} = 384 \text{ bps}.$ <p>For ATM1 OC3 interfaces, the maximum available rate is 100 percent of <i>line-rate</i>, or 135,600,000 bps. For ATM1 OC12 interfaces, the maximum available rate is 50 percent of <i>line-rate</i>, or 271,263,396 bps. For ATM2 IQ interfaces, the maximum available rate is 542,526,792 bps.</p> |
| <b>Usage Guidelines</b>         | See “Defining the ATM Traffic-Shaping Profile” on page 295.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Related Topics</b>           | rtvbr, shaping, vbr                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

## cell-bundle-size

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|                                 |                                                                                                                                                                                                                                                                |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | cell-bundle-size <i>cells</i> ;                                                                                                                                                                                                                                |
| <b>Hierarchy Level</b>          | [edit interfaces <i>at-fpc/pic/port</i> atm-options],<br>[edit interfaces <i>at-fpc/pic/port</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>at-fpc/pic/port</i> unit<br><i>logical-unit-number</i> ] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                 |
| <b>Description</b>              | For ATM2 IQ interfaces using ATM Layer 2 circuit cell-relay transport mode only, you can configure the maximum number of ATM cells per frame.                                                                                                                  |
| <b>Options</b>                  | <i>cells</i> —Maximum number of cells.<br><b>Default:</b> 1 cell<br><b>Range:</b> 1 through 176 cells                                                                                                                                                          |
| <b>Usage Guidelines</b>         | See “Configuring the Layer 2 Circuit Cell-Relay Cell Maximum” on page 289.                                                                                                                                                                                     |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                        |

**chap**

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**Syntax**    chap {  
               access-profile *name*;  
               default-chap-secret *name*;  
               local-name *name*;  
               passive;  
           }

**Hierarchy Level** [edit interfaces *interface-name* ppp-options],  
 [edit interfaces *interface-name* unit *logical-unit-number* ppp-options],  
 [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* ppp-options]

**Release Information** Statement introduced before JUNOS Release 7.4.

**Description** Allows each side of a link to challenge its peer, using a “secret” known only to the authenticator and that peer. The secret is not sent over the link.

By default, PPP CHAP is disabled. If CHAP is not explicitly enabled, the interface makes no CHAP challenges and denies all incoming CHAP challenges.

For ATM2 IQ interfaces only, you can configure CHAP on the logical interface unit if the logical interface is configured with one of the following PPP over ATM encapsulation types:

- atm-ppp-llc—PPP over AAL5 LLC encapsulation.
- atm-ppp-vc-mux—PPP over AAL5 multiplex encapsulation.

The statements are explained separately.

**Usage Guidelines** See “Configuring the PPP Challenge Handshake Authentication Protocol” on page 103.

**Required Privilege Level** interface—To view this statement in the configuration.  
 interface-control—To add this statement to the configuration.

**Related Topics** *JUNOS System Basics Configuration Guide*

## chap-secret

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|                                 |                                                                                                                                                                               |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>chap-secret <i>chap-secret</i>;</code>                                                                                                                                  |
| <b>Hierarchy Level</b>          | [edit access profile <i>profile-name</i> client <i>client-name</i> ]                                                                                                          |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                |
| <b>Description</b>              | For interfaces with PPP encapsulation on which the PPP Challenge Handshake Authentication Protocol (CHAP) is configured, configure the shared secret, as defined in RFC 1994. |
| <b>Options</b>                  | <i>chap-secret</i> —The secret key associated with a peer.                                                                                                                    |
| <b>Usage Guidelines</b>         | See “Configuring PPP CHAP Authentication” on page 152.                                                                                                                        |
| <b>Required Privilege Level</b> | admin—To view this statement in the configuration.<br>admin-control—To add this statement to the configuration.                                                               |
| <b>Related Topics</b>           | pap-password and the <i>JUNOS System Basics Configuration Guide</i>                                                                                                           |

## cisco-interoperability

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|                                 |                                                                                                                                       |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>cisco-interoperability send-lip-remove-link-for-link-reject;</code>                                                             |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> mlfr-uni-nni-bundle-options]                                                                   |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 7.4.                                                                                            |
| <b>Description</b>              | FRF.16 interoperability settings.                                                                                                     |
| <b>Options</b>                  | <i>send-lip-remove-link-for-link-reject</i> —Send Link Integrity Protocol remove link when an add-link rejection message is received. |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                        |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.               |

## classifier

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|                                 |                                                                                                                                                                                                                               |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <pre> classifier {     per-unit-scheduler {         forwarding-class <i>class-name</i> {             loss-priority (high   low);         }     } } </pre>                                                                     |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> together-options ethernet-switch-profile ethernet-policer-profile output-priority-map]                                                                                                 |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                |
| <b>Description</b>              | <p>For Gigabit Ethernet IQ and 10-Gigabit Ethernet interfaces only, define the classifier for the output priority map to be applied to outgoing frames on this interface.</p> <p>The statements are explained separately.</p> |
| <b>Usage Guidelines</b>         | See “Specifying an Output Priority Map” on page 610.                                                                                                                                                                          |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                            |
| <b>Related Topics</b>           | input-priority-map                                                                                                                                                                                                            |

## clear-dont-fragment-bit

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|                                 |                                                                                                                                                                                                                                                                    |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | clear-dont-fragment-bit;                                                                                                                                                                                                                                           |
| <b>Hierarchy Level</b>          | <p>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i>]</p>                                                          |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                     |
| <b>Description</b>              | Clear the don't-fragment (DF) bit on all IP version 4 (IPv4) packets entering a generic routing encapsulation (GRE) tunnel. If the encapsulated packet's size exceeds the tunnel's maximum transmission unit (MTU), the packet is fragmented before encapsulation. |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                                                                                     |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                 |

**client**

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|                                 |                                                                                                                                                                                        |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | client;                                                                                                                                                                                |
| <b>Hierarchy Level</b>          | [edit interfaces pp0 unit <i>logical-unit-number</i> pppoe-options],<br>[edit logical-systems <i>logical-system-name</i> interfaces pp0 unit <i>logical-unit-number</i> pppoe-options] |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.5.                                                                                                                                             |
| <b>Description</b>              | Configure the router to operate in the PPPoE client mode. Supported on J-series Services Routers.                                                                                      |
| <b>Usage Guidelines</b>         | See “Configuring the PPPoE Client Mode” on page 646.                                                                                                                                   |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                |

**clocking**

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | clocking (external [interface <i>interface-name</i> ]   internal);                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.<br>interface option added in JUNOS Release 8.2.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Description</b>              | For interfaces that can use various clock sources, configure the source of the transmit clock on each interface.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Options</b>                  | external—The clock source is provided by the data communication equipment (DCE).<br><br>interface <i>interface-name</i> —For interfaces operating on T1/E1 PIMs for J-series Services Routers only, configure clocking for the drop-and insert feature. When configuring this feature, both ports must use the same clock source: either the router’s internal clock or an external clock on one of the interfaces. If an external clock source is required, one interface must specify clocking external and the other must specify the same clock.<br><br>internal—Use the internal stratum 3 clock as the reference clock.<br><b>Default:</b> internal |
| <b>Usage Guidelines</b>         | See “Configuring the Clock Source” on page 119 or “Configuring the Clock Source” on page 710 and “Clock Sources on Channelized Interfaces” on page 364, and “Configuring a Channelized T1/E1 Interface to Drop and Insert Time Slots” on page 387.                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Related Topics</b>           | loop-timing                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

## clocking-mode

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|                                 |                                                                                                                                                                                                                                               |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | clocking-mode (dce   internal   loop);                                                                                                                                                                                                        |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> serial-options]                                                                                                                                                                                        |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                |
| <b>Description</b>              | For EIA-530 and V.35 interfaces, configure the clock mode. You cannot configure <b>clocking-mode dce</b> on a DTE router using an X.21 serial line protocol (detected automatically when an X.21 cable is plugged into the serial interface). |
| <b>Options</b>                  | <p>dce—DCE timing (DTE mode only, not valid for X.21).</p> <p>internal—Internal baud timing.</p> <p>loop—Loop timing.</p> <p><b>Default:</b> loop</p>                                                                                         |
| <b>Usage Guidelines</b>         | See “Configuring the Serial Clocking Mode” on page 244.                                                                                                                                                                                       |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration</p>                                                                                                             |
| <b>Related Topics</b>           | Configuring the DTE Clock Rate on page 246                                                                                                                                                                                                    |

## clock-rate

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|                                 |                                                                                                                                                                                                                                                                                                          |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | clock-rate <i>rate</i> ;                                                                                                                                                                                                                                                                                 |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> serial-options]                                                                                                                                                                                                                                                   |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                           |
| <b>Description</b>              | For EIA-530 and V.35 interfaces, configure the interface speed, in megahertz (MHz).                                                                                                                                                                                                                      |
| <b>Options</b>                  | <p><i>rate</i>—You can specify one of the following rates:</p> <ul style="list-style-type: none"><li>■ 2.048 Mhz</li><li>■ 2.341 Mhz</li><li>■ 2.731 Mhz</li><li>■ 3.277 Mhz</li><li>■ 4.096 Mhz</li><li>■ 5.461 Mhz</li><li>■ 8.192 Mhz</li><li>■ 16.384 Mhz</li></ul> <p><b>Default:</b> 16.384mhz</p> |
| <b>Usage Guidelines</b>         | See “Configuring the Serial Clocking Mode” on page 244.                                                                                                                                                                                                                                                  |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                  |



**compatibility-mode**

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | compatibility-mode (adtran   digital-link   kentrox   larscom   verilink) <subrate <i>value</i> >;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> e3-options],<br>[edit interfaces <i>interface-name</i> t3-options]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Description</b>              | Configure the E3 or T3 interface to be compatible with the channel service unit (CSU) at the remote end of the line.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Default</b>                  | If you omit this option, the full E3 or T3 rate is used.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Options</b>                  | <p>adtran—For T3 IQ interfaces only, configure compatibility with Adtran CSUs.</p> <p>digital-link—Configure compatibility with Digital Link CSUs. If you include this option on an E3 interface, you must also disable payload scrambling.</p> <p>kentrox—Configure compatibility with Kentrox CSUs. Kentrox subrate is valid for E3 IQ and T3 IQ interfaces only.</p> <p>larscom—For T3 and T3 IQ interfaces only, configure compatibility with Larscom CSUs.</p> <p>verilink—For T3 IQ interfaces only, configure compatibility with Verilink CSUs.</p> <p>subrate <i>value</i>—Subrate of the E3 or T3 line.</p> <p><b>Range:</b> For Kentrox CSUs on E3 IQ interfaces and T3 IQ interfaces the subrate value must match the value configured on the CSU. Each increment of the subrate value corresponds to a rate increment of about 0.5 Mbps.</p> |
| <b>Usage Guidelines</b>         | See “Configuring the E3 CSU Compatibility Mode” on page 479 and “Configuring the T3 CSU Compatibility Mode” on page 498.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Related Topics</b>           | payload-scrambler                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

## compression

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See the following sections:

- compression (PPP Properties) on page 784
- compression (Voice Services) on page 785

### **compression (PPP Properties)**

**Syntax**    compression {  
              acfc;  
              pfc;  
              }

**Hierarchy Level**    [edit interfaces *interface-name* ppp-options],  
                          [edit interfaces *interface-name* unit *logical-unit-number* ppp-options],  
                          [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*  
                          ppp-options]

**Release Information**    Statement introduced before JUNOS Release 7.4.

**Description**    For interfaces with PPP encapsulation, set Link Control Protocol (LCP) compression options.

The statements are explained separately.

**Usage Guidelines**    See “Configuring PPP Address and Control Field Compression” on page 111 and “Configuring the PPP Protocol Field Compression” on page 113.

**Required Privilege Level**    interface—To view this statement in the configuration.  
                                  interface-control—To add this statement to the configuration.

**compression (Voice Services)**

|                                 |                                                                                                                                                                                                    |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <pre> compression {   rtp {     f-max-period <i>number</i>;     queues [ <i>queue-numbers</i> ];     port {       minimum <i>port-number</i>;       maximum <i>port-number</i>;     }   } } </pre> |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ]   |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                     |
| <b>Description</b>              | <p>Configure the compression properties for voice services traffic.</p> <p>The remaining statements are described separately.</p>                                                                  |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                     |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                 |

**compression-device**


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|                                 |                                                                                                                                                                                                  |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | compression-device <i>interface-name</i> ;                                                                                                                                                       |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                   |
| <b>Description</b>              | Specify the compression interface for voice services traffic.                                                                                                                                    |
| <b>Options</b>                  | <i>interface-name</i> —Logical interface used for compression.                                                                                                                                   |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                   |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                               |
| <b>Related Topics</b>           | <i>J-series Services Router Basic LAN and WAN Access Configuration Guide</i>                                                                                                                     |

## connections

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**Syntax**    connections {  
                   interface-switch *connection-name* {  
                     interface *interface-name.unit-number*;  
                     interface *interface-name.unit-number*;  
                   }  
                 }

**Hierarchy Level**    [edit protocols]

**Release Information**    Statement introduced before JUNOS Release 7.4.

**Description**    Define the connection between two circuits in a circuit cross-connect (CCC) connection.

The statements are explained separately.

**Usage Guidelines**    See “Defining the Connection for Switching Cross-Connects” on page 208.

**Required Privilege Level**    routing—To view this statement in the configuration.  
                                   routing-control—To add this statement to the configuration.

**Related Topics**    *JUNOS MPLS Applications Configuration Guide*

## connectivity-fault-management

---

**Syntax**

```
connectivity-fault-management {
 action-profile profile-name {
 default-action {
 interface-down;
 }
 }
 linktrace {
 age (30m | 10m | 1m | 30s | 10s);
 path-database-size path-database-size;
 }
 maintenance-domain domain-name {
 level number;
 name-format (character-string | none | dns | mac+2oct);
 maintenance-association ma-name {
 short-name-format (character-string | vlan | 2octet | rfc-2685-vpn-id);
 continuity-check {
 hold-interval minutes;
 interval (10m | 10s | 1m | 1s | 100ms);
 loss-threshold number;
 }
 mep mep-id {
 auto-discovery;
 direction (up | down);
 interface interface-name;
 priority number;
 remote-mep mep-id {
 action-profile profile-name;
 }
 }
 }
 }
}
```

**Hierarchy Level** [edit protocols oam ethernet]

**Release Information** Statement introduced in JUNOS Release 8.4.

**Description** For Ethernet interfaces on M320, MX-series, and T-series routing platforms, specify connectivity fault management for IEEE 802.1ag Operation, Administration, and Management (OAM) support.

The remaining statements are explained separately.

**Usage Guidelines** See “Configuring IEEE 802.1ag OAM Connectivity-Fault Management” on page 583.

**Required Privilege Level** interface—To view this statement in the configuration.  
interface-control—To add this statement to the configuration.

## container-devices

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|                                 |                                                                                                                                                                                    |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | container-devices {<br>device-count <i>number</i> ;<br>}                                                                                                                           |
| <b>Hierarchy Level</b>          | [edit chassis]                                                                                                                                                                     |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 9.2.                                                                                                                                         |
| <b>Description</b>              | Specify the container devices configuration. The <b>number</b> option specifies the number of sequentially numbered container interfaces, from <b>ci0</b> to <b>ci127</b> maximum. |
| <b>Options</b>                  | <b>number</b> —Number of container devices.<br><b>Range:</b> 1 through 128                                                                                                         |
| <b>Usage Guidelines</b>         | See “Configuring Container Interfaces” on page 697.                                                                                                                                |
| <b>Required Privilege Level</b> | chassis—To view this statement in the configuration.<br>chassis-control—To add this statement to the configuration.                                                                |

## container-list

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|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | container-list [ <i>container-interface-names</i> ];                                                                    |
| <b>Hierarchy Level</b>          | [edit interfaces container-options]                                                                                     |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 9.2.                                                                              |
| <b>Description</b>              | Specify a list of container interfaces; for example: <b>ci0</b> , <b>ci1</b> , and up to <b>ci127</b> .                 |
| <b>Options</b>                  | <i>container-interface-names</i> —Name of each container interface.                                                     |
| <b>Usage Guidelines</b>         | See “Configuring Container Interfaces” on page 697.                                                                     |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |
| <b>Related Topics</b>           | container-options                                                                                                       |

## container-options

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|                                 |                                                                                                                                                                                                                                                                                                                |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <pre> container-options {   container-list [ <i>container-interface-names</i> ];   container-type aps;   member-interface-type sonet {     member-interface-speed [ <i>speed</i> ];   } } </pre>                                                                                                               |
| <b>Hierarchy Level</b>          | [edit interfaces]                                                                                                                                                                                                                                                                                              |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 9.2.                                                                                                                                                                                                                                                                     |
| <b>Description</b>              | Specify the container interface options.                                                                                                                                                                                                                                                                       |
| <b>Options</b>                  | <p><b>interface-name</b>—Name of the SONET or the container interface.</p> <p><b>aps</b>—Specify the member link interface type of the container as APS.</p> <p><b>sonet</b>—Protocol type of the container interface.</p> <p><b>speed</b>—Set interface speed to OC3, OC12, OC48, OC192, OC768, or mixed.</p> |
| <b>Usage Guidelines</b>         | See “Configuring Container Interfaces” on page 697.                                                                                                                                                                                                                                                            |
| <b>Required Privilege Level</b> | <p><b>interface</b>—To view this statement in the configuration.</p> <p><b>interface-control</b>—To add this statement to the configuration.</p>                                                                                                                                                               |

## container-type

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|                                 |                                                                                                                                                  |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <pre> container-type aps; </pre>                                                                                                                 |
| <b>Hierarchy Level</b>          | [edit interfaces container-options]                                                                                                              |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 9.2.                                                                                                       |
| <b>Description</b>              | Specify the container-options interface type.                                                                                                    |
| <b>Options</b>                  | <b>aps</b> —Configure the interface type to be Automatic Protection Switching (APS).                                                             |
| <b>Usage Guidelines</b>         | See “Configuring Container Interfaces” on page 697                                                                                               |
| <b>Required Privilege Level</b> | <p><b>interface</b>—To view this statement in the configuration.</p> <p><b>interface-control</b>—To add this statement to the configuration.</p> |

## continuity-check

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|                                 |                                                                                                                                              |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | continuity-check {<br>hold-interval <i>minutes</i> ;<br>interval (10m   10s   1m   1s  100ms   10ms);<br>loss-threshold <i>number</i> ;<br>} |
| <b>Hierarchy Level</b>          | [edit protocols oam ethernet connectivity-fault-management maintenance-domain <i>domain-name</i> maintenance-association <i>ma-name</i> ]    |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.4.                                                                                                   |
| <b>Description</b>              | Specify continuity check protocol options.                                                                                                   |
| <b>Options</b>                  | The remaining statements are explained separately.                                                                                           |
| <b>Usage Guidelines</b>         | See “Configuring the Continuity Check” on page 586.                                                                                          |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                      |

## control-polarity

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|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | control-polarity (negative   positive);                                                                                 |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> serial-options]                                                                  |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                          |
| <b>Description</b>              | For X.21 interfaces only, configure the control signal polarity.                                                        |
| <b>Options</b>                  | positive—Positive signal polarity.<br><br>negative—Negative signal polarity.<br><b>Default:</b> positive                |
| <b>Usage Guidelines</b>         | See “Configuring Serial Signal Polarities” on page 250.                                                                 |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |



## control-signal

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|                                 |                                                                                                                                                                                                                                  |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | control-signal (assert   de-assert   normal);                                                                                                                                                                                    |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> serial-options dce-options],<br>[edit interfaces <i>interface-name</i> serial-options dte-options]                                                                                        |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                   |
| <b>Description</b>              | For X.21 interfaces only, configure the to-DCE signal.                                                                                                                                                                           |
| <b>Options</b>                  | assert—The to-DCE signal must be asserted.<br><br>de-assert—The to-DCE signal must be deasserted.<br><br>normal—Normal request-to-send (RTS) signal handling, as defined by ITU-T Recommendation X.21.<br><b>Default:</b> normal |
| <b>Usage Guidelines</b>         | See “Configuring the Serial Signal Handling” on page 247.                                                                                                                                                                        |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                          |

## copy-tos-to-outer-ip-header

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|                                 |                                                                                                                                                                                                    |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | copy-tos-to-outer-ip-header;                                                                                                                                                                       |
| <b>Hierarchy Level</b>          | [edit interfaces <i>at-fpc/pic/port</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>at-fpc/pic/port</i> unit <i>logical-unit-number</i> ] |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.2.                                                                                                                                                         |
| <b>Description</b>              | For GRE tunnel interfaces only, enable the inner IP header’s TOS bits to be copied to the outer IP packet header.                                                                                  |
| <b>Default</b>                  | If you omit this statement, the TOS bits in the outer IP header are set to 0.                                                                                                                      |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Class of Service Configuration Guide</i> .                                                                                                                                        |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                            |

## core-dump

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | (core-dump   no-core-dump);                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Hierarchy Level</b>          | [edit interfaces <i>mo-fpc/pic/port</i> multiservice-options]                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Description</b>              | For monitoring services interfaces only, a useful tool for isolating the cause of a problem. Core dumping is enabled by default. The directory <code>/var/tmp</code> contains core files. The JUNOS software saves the current core file (0) and the four previous core files, which are numbered 1 through 4 (from newest to oldest): <ul style="list-style-type: none"> <li>■ <b>core-dump</b>—Enable the core dumping operation.</li> <li>■ <b>no-core-dump</b>—Disable the core dumping operation.</li> </ul> |
| <b>Usage Guidelines</b>         | See “Configuring Multiservice Physical Interface Properties” on page 129 or the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                           |

## crc-major-alarm-threshold

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|                                 |                                                                                                                                                                                                                             |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | crc-major-alarm-threshold (1e-3   5e-4   1e-4   5e-5   1e-5);                                                                                                                                                               |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> t1-options]                                                                                                                                                                          |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.5.                                                                                                                                                                                  |
| <b>Description</b>              | Major alarm error thresholds for T1 CRC errors. When the threshold is exceeded for one second, a defect condition is declared. If the defect condition continues for the monitoring period, an alarm condition is declared. |
| <b>Default</b>                  | 10-second monitoring period for all settings except 1e-5. The 1e-5 value uses a 50-second monitoring period.                                                                                                                |
| <b>Options</b>                  | rate—Error rate expressed as the number of errors per number of bits. The value 1e-3 is one error in $10^{-3}$ bits and 5e-4 is five errors in $10^{-4}$ bits.<br><b>Default:</b> 5e-5                                      |
| <b>Usage Guidelines</b>         | See “Configuring T1 CRC Error Major Alarm Thresholds” on page 487.                                                                                                                                                          |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                     |

**crc-minor-alarm-threshold**

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|                                 |                                                                                                                                                                                                                               |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | crc-minor-alarm-threshold (1e-3   5e-4   1e-4   5e-5   1e-5   5e-6   1e-6);                                                                                                                                                   |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> t1-options]                                                                                                                                                                            |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.5.                                                                                                                                                                                    |
| <b>Description</b>              | Minor alarm error thresholds for T1 CRC errors. When the threshold is exceeded for one second, a defect condition is declared. If the defect condition continues for the monitoring period, an alarm condition is declared.   |
| <b>Default</b>                  | 10-second monitoring period for values 1e-3, 5e-4, 1e-4, and 5e-5. The 1e-5 value uses a 50-second monitoring period. The 5e-6 value uses a 100-second monitoring period. The 1e-6 value uses a 500-second monitoring period. |
| <b>Options</b>                  | rate—Error rate expressed as the number of errors per number of bits. The value 1e-3 is one error in $10^{-3}$ bits and 5e-4 is five errors in $10^{-4}$ bits.<br><b>Default:</b> 5e-6                                        |
| <b>Usage Guidelines</b>         | See “Configuring T1 CRC Error Minor Alarm Thresholds” on page 488.                                                                                                                                                            |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                       |

**cts**

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|                                 |                                                                                                                                                                                                        |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | cts (ignore   normal   require);                                                                                                                                                                       |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> serial-options dce-options],<br>[edit interfaces <i>interface-name</i> serial-options dte-options]                                                              |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                         |
| <b>Description</b>              | For EIA-530 and V.35 interfaces only, configure the from-DCE signal, clear-to-send (CTS).                                                                                                              |
| <b>Options</b>                  | ignore—The from-DCE signal is ignored.<br><br>normal—Normal CTS signal handling as defined by the TIA/EIA Standard 530.<br><br>require—The from-DCE signal must be asserted.<br><b>Default:</b> normal |
| <b>Usage Guidelines</b>         | See “Configuring the Serial Signal Handling” on page 247.                                                                                                                                              |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                |

## cts-polarity

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|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | cts-polarity (negative   positive);                                                                                     |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> serial-options]                                                                  |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                          |
| <b>Description</b>              | Configure CTS signal polarity.                                                                                          |
| <b>Options</b>                  | positive—Positive signal polarity.<br><br>negative—Negative signal polarity.<br><b>Default:</b> positive                |
| <b>Usage Guidelines</b>         | See “Configuring Serial Signal Polarities” on page 250.                                                                 |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |

## current

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|                                 |                                                                                                                                                                                                                                                                                                                  |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | current <i>margin</i> ;                                                                                                                                                                                                                                                                                          |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> shdsl-options snr-margin],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> shdsl-options snr-margin]                                                                                                                                 |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 7.4.                                                                                                                                                                                                                                                                       |
| <b>Description</b>              | For J-series Services Routers only, configure the current target signal-to-noise ratio (SNR) margin to be used when training the SHDSL line. The current margin is the difference between desired SNR and the actual SNR. When configured, the line trains at higher than the current margin plus SNR threshold. |
| <b>Options</b>                  | <i>margin</i> —Desired current SNR margin. Specify either <b>disabled</b> or a value from 0 dB through 10 dB.<br><b>Default:</b> 0 dB                                                                                                                                                                            |
| <b>Usage Guidelines</b>         | See “Configuring ATM-over-SHDSL Interfaces” on page 337.                                                                                                                                                                                                                                                         |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                          |

## data-input

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | data-input (system   interface <i>interface-name</i> );                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Hierarchy Level</b>          | [edit interfaces ds-pim/0/port:channel]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.2.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Description</b>              | <p>For interfaces operating on T1/E1 PIMs for J-series Services Routers only, configure whether an interface should send and receive data from the Routing Engine or from a given interface name. On channelized T1/E1 interfaces partitioned into channels, you can insert time slots from one port directly into the other port on the same PIM, to replace time slots coming through the Routing Engine.</p> <p>To avoid slips, both ports must use the same clock source: either the router's internal clock or an external clock on one of the interfaces. If an external clock source is required, one interface must specify clocking external and the other must specify the same clock by including the <b>clocking external interface <i>interface-name</i></b> statement at the [edit interface <i>interface-name</i>] hierarchy level.</p> |
| <b>Options</b>                  | <p><b>system</b>—Interface sends and receives data from the Routing Engine.</p> <p><b>interface <i>interface-name</i></b>—Interface sends and receives data from a specific interface.<br/> <b>Default:</b> Data is sent and received from the Routing Engine (system).</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Usage Guidelines</b>         | See “Configuring a Channelized T1/E1 Interface to Drop and Insert Time Slots” on page 387 and the <i>J-series Services Router Basic LAN and WAN Access Configuration Guide</i> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Related Topics</b>           | clocking                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

**dcd**

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|                                 |                                                                                                                                                                                                        |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | dcd (ignore   normal   require);                                                                                                                                                                       |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> serial-options dce-options],<br>[edit interfaces <i>interface-name</i> serial-options dte-options]                                                              |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                         |
| <b>Description</b>              | For EIA-530 and V.35 interfaces only, configure the from-DCE signal, data-carrier-detect (DCD).                                                                                                        |
| <b>Options</b>                  | ignore—The from-DCE signal is ignored.<br><br>normal—Normal DCD signal handling as defined by the TIA/EIA Standard 530.<br><br>require—The from-DCE signal must be asserted.<br><b>Default:</b> normal |
| <b>Usage Guidelines</b>         | See “Configuring the Serial Signal Handling” on page 247.                                                                                                                                              |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                |

**dcd-polarity**

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|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | dcd-polarity (negative   positive);                                                                                     |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> serial-options]                                                                  |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                          |
| <b>Description</b>              | Configure DCD signal polarity.                                                                                          |
| <b>Options</b>                  | positive—Positive signal polarity.<br><br>negative—Negative signal polarity.<br><b>Default:</b> positive                |
| <b>Usage Guidelines</b>         | See “Configuring Serial Signal Polarities” on page 250.                                                                 |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |

**dce**

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|                                 |                                                                                                                                                                     |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | dce;                                                                                                                                                                |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> ],<br>[edit interfaces <i>interface-name</i> serial-options clocking-mode]                                                   |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                      |
| <b>Description</b>              | For Frame Relay only, respond to status enquiry message keepalives.<br><br>When you configure the routing platform to be a DCE, keepalives are disabled by default. |
| <b>Default</b>                  | The routing platform operates in DTE mode.                                                                                                                          |
| <b>Usage Guidelines</b>         | See “Configuring the Router as a DCE” on page 356.                                                                                                                  |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                             |

**dce-options**

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|                                 |                                                                                                                                                                                                                                                                                                                                                           |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | dce-options {<br>control-signal (assert   de-assert   normal);<br>cts (ignore   normal   require);<br>dcd (ignore   normal   require);<br>dsr (ignore   normal   require);<br>dtr <i>signal-handling-option</i> ;<br>ignore-all;<br>indication (ignore   normal   require);<br>rts (assert   de-assert   normal);<br>tm (ignore   normal   require);<br>} |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> serial-options]                                                                                                                                                                                                                                                                                                    |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.3.<br>Statement previously known as <b>control-leads</b>                                                                                                                                                                                                                                                          |
| <b>Description</b>              | For J-series Services Routers, configure the serial interface signal characteristics.<br><br>The statements are explained separately.                                                                                                                                                                                                                     |
| <b>Usage Guidelines</b>         | See “Configuring the Serial Signal Handling” on page 247.                                                                                                                                                                                                                                                                                                 |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                   |

## deactivation-delay

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|                                 |                                                                                                                                                                                         |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | deactivation-delay <i>seconds</i> ;                                                                                                                                                     |
| <b>Hierarchy Level</b>          | [edit interface <i>dln</i> unit <i>logical-unit-number</i> dialer-options]                                                                                                              |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                          |
| <b>Description</b>              | (J-series Services Routers) For ISDN interfaces, configure the ISDN deactivation delay. Used only for dialer backup and dialer watch cases.                                             |
| <b>Options</b>                  | <i>seconds</i> —Interval before the backup interface is deactivated after the primary interface has comes up.<br><b>Range:</b> 1 through 4294967295 seconds<br><b>Default:</b> 0 (zero) |
| <b>Usage Guidelines</b>         | See “Configuring ISDN Logical Interface Properties” on page 661.                                                                                                                        |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                 |
| <b>Related Topics</b>           | <i>J-series Services Router Basic LAN and WAN Access Configuration Guide</i>                                                                                                            |

## default-action

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|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <pre>default-action {     interface-down; }</pre>                                                                       |
| <b>Hierarchy Level</b>          | [edit protocols oam ethernet connectivity-fault-management action-profile <i>profile-name</i> ]                         |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.4.                                                                              |
| <b>Description</b>              | Define the action to be taken when connectivity to the remote MEP is lost.                                              |
| <b>Default</b>                  | If no action is configured, no action is taken.                                                                         |
| <b>Options</b>                  | <i>interface-down</i> —When a remote MEP connectivity failure is detected, bring the interface down.                    |
| <b>Usage Guidelines</b>         | See “Configuring a CFM Action Profile Action” on page 589.                                                              |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |



## default-chap-secret

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | default-chap-secret <i>name</i> ;                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> ppp-options chap],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ppp-options chap],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ppp-options chap]                                                                                                                                                                                |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.0.                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Description</b>              | <p>Define the default CHAP secret to be used when no matching CHAP access profile exists.</p> <p>For ATM2 IQ interfaces only, you can configure a default CHAP secret on the logical interface unit if the logical interface is configured with one of the following PPP over ATM encapsulation types:</p> <ul style="list-style-type: none"> <li>■ atm-ppp-llc—PPP over AAL5 LLC encapsulation.</li> <li>■ atm-ppp-vc-mux—PPP over AAL5 multiplex encapsulation.</li> </ul> |
| <b>Default</b>                  | If you do not include the <b>default-chap-secret</b> statement in the configuration, and an interface receives a CHAP challenge or response from a peer that is not in the applied access profile, the link is immediately dropped.                                                                                                                                                                                                                                          |
| <b>Usage Guidelines</b>         | See “Configuring a Default CHAP Secret” on page 105.                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                      |
| <b>Related Topics</b>           | access-profile                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

## default-pap-password

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|                                 |                                                                                                                                                                                                                                |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | default-pap-password <i>password</i> ;                                                                                                                                                                                         |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ppp-options pap],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ppp-options pap] |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.3.                                                                                                                                                                                     |
| <b>Description</b>              | For PAP authentication, the default PAP password.                                                                                                                                                                              |
| <b>Usage Guidelines</b>         | See “Configuring a Default PAP Password” on page 153.                                                                                                                                                                          |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                        |
| <b>Related Topics</b>           | access-profile                                                                                                                                                                                                                 |

## demux0

---

**Syntax**

```

demux0 {
 unit logical-unit-number {
 demux-options {
 underlying-interface interface-name
 }
 family family {
 demux-destination {
 destination-prefix;
 }
 demux-source {
 source-prefix;
 }
 unnumbered-address interface-name <preferred-source-address address>;
 }
 }
}

```

**Hierarchy Level** [edit interfaces],  
[edit logical-systems *logical-system-name* interfaces]

**Release Information** Statement introduced in JUNOS Release 9.0.

**Description** Configure the logical demultiplexing (demux) interface.

The statements are explained separately.

**Usage Guidelines** See “Configuring an IP Demux Underlying Interface” on page 231.

**Required Privilege Level** interface—To view this statement in the configuration.  
interface-control—To add this statement to the configuration.

## demux-destination

---

See the following sections:

- demux-destination (Underlying Interface) on page 801
- demux-destination (Demux Interface) on page 801

### **demux-destination (Underlying Interface)**

**Syntax** demux-destination *family*;

**Hierarchy Level** [edit interfaces *interface-name* unit *logical-unit-number*],  
[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

**Release Information** Statement introduced in JUNOS Release 9.0.

**Description** Configure the logical demultiplexing (demux) destination family type on the IP demux underlying interface.



**NOTE:** The IP demux interface feature currently supports only Fast Ethernet, Gigabit Ethernet, or 10-Gigabit Ethernet underlying interfaces.

---

**Usage Guidelines** See “Specifying the Demux Underlying Interface” on page 230.

**Required Privilege Level** interface—To view this statement in the configuration.  
interface-control—To add this statement to the configuration.

### **demux-destination (Demux Interface)**

**Syntax** demux-destination {  
    *destination-prefix*;  
}

**Hierarchy Level** [edit interfaces *interface-name* unit *logical-unit-number* family *family*],  
[edit logical-systems *logical-system-name* interfaces *interface-name* unit  
    *logical-unit-number* family *family*]

**Release Information** Statement introduced in JUNOS Release 9.0.

**Description** Configure one or more logical demultiplexing (demux) destination prefixes. The prefixes are matched against the destination address of packets that the underlying interface receives. When a match occurs, the packet is processed as if it was received on the demux interface.

**Usage Guidelines** See “Configuring IP Demux Prefixes” on page 230.

**Required Privilege Level** interface—To view this statement in the configuration.  
interface-control—To add this statement to the configuration.

## demux-options

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|                                 |                                                                                                                                                                                                  |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | demux-options {<br>underlying-interface <i>interface-name</i><br>}                                                                                                                               |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ] |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 9.0.                                                                                                                                                       |
| <b>Description</b>              | Configure logical demultiplexing (demux) interface options.<br><br>The statement is explained separately.                                                                                        |
| <b>Usage Guidelines</b>         | See “Specifying the Demux Underlying Interface” on page 230.                                                                                                                                     |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                          |

## demux-source

---

See the following sections:

- demux-source (Underlying Interface) on page 803
- demux-source (Demux Interface) on page 803

### demux-source (Underlying Interface)

**Syntax** demux-source *family*;

**Hierarchy Level** [edit interfaces *interface-name* unit *logical-unit-number*],  
[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

**Release Information** Statement introduced in JUNOS Release 9.0.

**Description** Configure the logical demultiplexing (demux) source family type on the IP demux underlying interface.



**NOTE:** The IP demux interface feature currently supports only Fast Ethernet, Gigabit Ethernet, or 10-Gigabit Ethernet underlying interfaces.

---

**Usage Guidelines** See “Specifying the IP Demux Underlying Interface Family Type” on page 605.

**Required Privilege Level** interface—To view this statement in the configuration.  
interface-control—To add this statement to the configuration.

### demux-source (Demux Interface)

**Syntax** demux-source {  
    source-prefix;  
}

**Hierarchy Level** [edit interfaces *interface-name* unit *logical-unit-number*family *family*],  
[edit logical-systems *logical-system-name* interfaces *interface-name* unit  
    *logical-unit-number*family *family*]

**Release Information** Statement introduced in JUNOS Release 9.0.

**Description** Configure one or more logical demultiplexing (demux) source prefixes. The prefixes are matched against the source address of packets that the underlying interface receives. When a match occurs, the packet is processed as if it was received on the demux interface.

**Usage Guidelines** See “Configuring IP Demux Prefixes” on page 230.

**Required Privilege Level** interface—To view this statement in the configuration.  
interface-control—To add this statement to the configuration.

## description

---

|                                 |                                                                                                                                                                                                                                                                                                                                         |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>description text;</code>                                                                                                                                                                                                                                                                                                          |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> ],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ]                                                                                           |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                          |
| <b>Description</b>              | Provide a textual description of the interface or the logical unit. Any descriptive text you include is displayed in the output of the <b>show interfaces</b> commands, and is also exposed in the <b>ifAlias</b> Management Information Base (MIB) object. It has no effect on the operation of the interface or the routing platform. |
| <b>Options</b>                  | <i>text</i> —Text to describe the interface. If the text includes spaces, enclose the entire text in quotation marks.                                                                                                                                                                                                                   |
| <b>Usage Guidelines</b>         | See “Adding an Interface Description to the Configuration” on page 88 and “Adding a Logical Unit Description to the Configuration” on page 146.                                                                                                                                                                                         |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                 |

## destination

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See the following sections:

- destination (DLSw) on page 805
- destination (IPCP) on page 806
- destination (Routing Instance) on page 806
- destination (Tunnels) on page 807



**NOTE:** For information about the `destination` statement at the [edit interfaces *interface-name* unit *unit-number* family inet address *address* (vrrp-group | vrrp-inet6-group) *group-number*] or [edit logical-systems *logical-system-name* interfaces *interface-name* unit *unit-number* family (inet | inet6) address *address* (vrrp-group | vrrp-inet6-group) *group-number*] hierarchy level, see the *JUNOS High Availability Configuration Guide*.

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### destination (DLSw)

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>destination mac-address priority-cost priority;</code>                                                                                                                                                                                                                                                                                                                                              |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family llc2 redundancy-group <i>group-number</i> track dlsw],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family llc2 redundancy-group <i>group-number</i> track dlsw]                                                                                    |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 7.5.                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b>              | For J-series Services Routers only. On Ethernet interfaces configured for DLSw Ethernet redundancy, enable tracking options for a destination MAC address.                                                                                                                                                                                                                                                |
| <b>Options</b>                  | <p><i>mac-address</i>—Local MAC address. Specify the MAC address as six hexadecimal bytes in one of the following formats: <i>nnnn.nnnn.nnnn</i> or <i>nn:nn:nn:nn:nn:nn</i>. For example, 0011.2233.4455 or 00:11:22:33:44:55.</p> <p><i>priority-cost priority</i>—Cost value that is subtracted from the priority value when remote peer connectivity is lost. Specify a value from 1 through 254.</p> |
| <b>Usage Guidelines</b>         | See “Configuring DLSw Ethernet Redundancy Using LLC2 Properties” on page 168.                                                                                                                                                                                                                                                                                                                             |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                                                                        |

**destination (IPCP)**

|                                 |                                                                                                                                                                                                                                                                                                            |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>destination address destination-profile profile-name;</code>                                                                                                                                                                                                                                         |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet unnumbered-address <i>interface-name</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet unnumbered-address <i>interface-name</i> ] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                             |
| <b>Description</b>              | For unnumbered interfaces with PPP encapsulation, specify the IP address of the remote interface.                                                                                                                                                                                                          |
| <b>Options</b>                  | <i>address</i> —IP address of the remote interface.<br><br>The <i>destination-profile</i> statement is explained separately.                                                                                                                                                                               |
| <b>Usage Guidelines</b>         | See “Configuring IPCP Options” on page 164.                                                                                                                                                                                                                                                                |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                    |
| <b>Related Topics</b>           | <i>address</i> , <i>negotiate-address</i> , <i>JUNOS System Basics Configuration Guide</i>                                                                                                                                                                                                                 |

**destination (Routing Instance)**

|                                 |                                                                                                                                                                                                                                                |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>destination routing-instance-name;</code>                                                                                                                                                                                                |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> tunnel routing-instance],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> tunnel routing-instance] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                 |
| <b>Description</b>              | Specify the destination routing instance that points to the routing table containing the tunnel destination address.                                                                                                                           |
| <b>Default</b>                  | The default Internet routing table <i>inet.0</i> .                                                                                                                                                                                             |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                                                                 |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                        |



**destination (Tunnels)**

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>destination address;</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet address <i>address</i> ],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet unnumbered-address <i>interface-name</i> ],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> tunnel],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet address <i>address</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet unnumbered-address <i>interface-name</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> tunnel] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b>              | For encryption, PPP-encapsulated, and tunnel interfaces, specify the remote address of the connection.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Options</b>                  | <i>address</i> —Address of the remote side of the connection.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Usage Guidelines</b>         | See “Configuring the Interface Address” on page 162 or the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Related Topics</b>           | point-to-point                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

**destination-class-usage**


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|                                 |                                                                                                                                                                                                                                              |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>destination-class-usage;</code>                                                                                                                                                                                                        |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet accounting],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet accounting] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                               |
| <b>Description</b>              | Enable packet counters on an interface that count packets that arrive from specific customers and are destined for specific prefixes on the provider core router.                                                                            |
| <b>Usage Guidelines</b>         | See “Enabling Source Class and Destination Class Usage” on page 194.                                                                                                                                                                         |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                      |
| <b>Related Topics</b>           | accounting, source-class-usage                                                                                                                                                                                                               |

## destination-profile

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | destination-profile <i>name</i> ;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet address <i>address</i> ],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet unnumbered-address<br><i>interface-name</i> destination <i>address</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i><br>family inet address <i>address</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i><br>family inet unnumbered-address <i>interface-name</i> destination <i>address</i> ] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Description</b>              | For interfaces with PPP encapsulation, assign PPP properties to the remote end. You define the profile at the [edit access group-profile <i>name</i> ppp] hierarchy level.                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Options</b>                  | <i>name</i> —Profile name defined at the [edit access group-profile <i>name</i> ppp] hierarchy level.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Usage Guidelines</b>         | See “Configuring IPCP Options” on page 164.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Related Topics</b>           | destination, <i>JUNOS System Basics Configuration Guide</i> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

## dialer

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|                                 |                                                                                                                                                                                                                                               |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | dialer <i>filter-name</i> ;                                                                                                                                                                                                                   |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family <i>family</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i><br>family <i>family</i> ] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                |
| <b>Description</b>              | Apply a dialer filter to an interface. To create the dialer filter, include the dialer-filter statement at the [edit firewall filter <i>family family</i> ] hierarchy level.                                                                  |
| <b>Options</b>                  | <i>filter-name</i> —Dialer filter name.                                                                                                                                                                                                       |
| <b>Usage Guidelines</b>         | See “Applying the Dial-on-Demand Dialer Filter to the Dialer Interfaces” on page 666.                                                                                                                                                         |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                       |
| <b>Related Topics</b>           | <i>J-series Services Router Basic LAN and WAN Access Configuration Guide</i>                                                                                                                                                                  |

## dialer-options

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**Syntax**

```
dialer-options {
 activation-delay seconds;
 callback;
 callback-wait-period time;
 deactivation-delay seconds;
 dial-string [dial-string-numbers];
 idle-timeout seconds;
 incoming-map {
 caller caller-number | accept-all;
 initial-route-check seconds;
 load-interval seconds;
 load-threshold percent;
 pool pool-name;
 redial-delay time;
 watch-list {
 [routes];
 }
 }
}
```

**Hierarchy Level** [edit interfaces umd0],  
[edit interfaces dln unit *logical-unit-number*],  
[edit logical-systems *logical-system-name* interfaces dln unit *logical-unit-number*]

**Release Information** Statement introduced before JUNOS Release 7.4.

**Description** Specify the dialer options for configuring logical interfaces for group and user sessions.

The statements are explained separately.

**Usage Guidelines** See “Configuring ISDN Logical Interface Properties” on page 661 and “Specifying a USB Modem Interface on J-series Routers” on page 85.

**Required Privilege Level** interface—To view this statement in the configuration.  
interface-control—To add this statement to the configuration.

**Related Topics** *JUNOS Services Interfaces Configuration Guide*

## dialin

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|                                 |                                                                                                                                                                                                                       |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | dialin (console   routable);                                                                                                                                                                                          |
| <b>Hierarchy Level</b>          | [edit interfaces umd0 modem-options]                                                                                                                                                                                  |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.5.                                                                                                                                                                            |
| <b>Description</b>              | For J-series Services Routers, configure a USB modem port to act as a dial-in console or WAN backup port.                                                                                                             |
| <b>Options</b>                  | <p>console—Configure the USB modem port to operate as a dial-in console for management.</p> <p>routable—Configure the USB modem port to operate as a dial-in WAN backup interface.</p> <p><b>Default:</b> console</p> |
| <b>Usage Guidelines</b>         | See “Specifying a USB Modem Interface on J-series Routers” on page 85.                                                                                                                                                |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                    |

## dial-options

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|                                 |                                                                                                                                                                                                                                                                            |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <pre>dial-options {   l2tp-interface-id <i>name</i>;   (shared   dedicated); }</pre>                                                                                                                                                                                       |
| <b>Hierarchy Level</b>          | <p>[edit interfaces <i>sp-fpc/pic/port</i> unit <i>logical-unit-number</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i>]</p>                                                                 |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                             |
| <b>Description</b>              | Specify the Layer 2 Tunneling Protocol (L2TP) options for configuring logical interfaces for group and user sessions.                                                                                                                                                      |
| <b>Options</b>                  | <p><i>l2tp-interface-id name</i>—Interface identifier that you specified at the [edit access profile <i>name</i>] hierarchy level.</p> <p>(shared   dedicated)—Specify whether a logical interface can host one (dedicated) or multiple (shared) sessions at one time.</p> |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                                                                                             |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                         |
| <b>Related Topics</b>           | <i>JUNOS Services Interfaces Configuration Guide</i>                                                                                                                                                                                                                       |

## dial-string

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|                                 |                                                                                                                                                                                                                                              |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | dial-string [ <i>dial-string-numbers</i> ];                                                                                                                                                                                                  |
| <b>Hierarchy Level</b>          | [edit interfaces <i>br-pim</i> /0/ <i>port</i> unit <i>logical-unit-number</i> dialer-options],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>br-pim</i> /0/ <i>port</i> unit <i>logical-unit-number</i> dialer-options] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                               |
| <b>Description</b>              | (J-series Services Routers) For ISDN interfaces, specify one or more ISDN dial strings used to reach a destination subnetwork.                                                                                                               |
| <b>Options</b>                  | <i>dial-string-numbers</i> —One or more strings of numbers to call.                                                                                                                                                                          |
| <b>Usage Guidelines</b>         | See “Configuring the Dialer Interface” on page 673.                                                                                                                                                                                          |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                      |
| <b>Related Topics</b>           | <i>J-series Services Router Basic LAN and WAN Access Configuration Guide</i>                                                                                                                                                                 |

## direction

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|                                 |                                                                                                                                                                                                                                                              |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | direction (up   down);                                                                                                                                                                                                                                       |
| <b>Hierarchy Level</b>          | [edit protocols oam ethernet connectivity-fault-management maintenance-domain <i>domain-name</i> maintenance-association <i>ma-name</i> mep <i>mep-id</i> ]                                                                                                  |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.4.                                                                                                                                                                                                                   |
| <b>Description</b>              | Configure the direction of the MEP.                                                                                                                                                                                                                          |
| <b>Options</b>                  | up—An UP MEP CCM is transmitted out of every logical interface which is part of the same bridging or vpls instance except for the interface configured on this MEP.<br><br>down—Down MEP CCMs are transmitted only out the interface configured on this MEP. |
| <b>Usage Guidelines</b>         | See “Configuring the Maintenance End Point Direction” on page 588.                                                                                                                                                                                           |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                      |

**disable**

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See the following sections:

- [disable](#) on page 812
- [disable](#) on page 812

**disable**

|                                 |                                                                                                                                                                                                                                               |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | disable;                                                                                                                                                                                                                                      |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> ],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                |
| <b>Description</b>              | Disable a physical or a logical interface, effectively unconfiguring it.                                                                                                                                                                      |
| <b>Usage Guidelines</b>         | See “Disabling a Physical Interface” on page 130 and “Disabling a Logical Interface” on page 156.                                                                                                                                             |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                       |

**disable**

|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | disable;                                                                                                                |
| <b>Hierarchy Level</b>          | [edit interfaces aeX aggregated-ether-options lacp link-protection]                                                     |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 9.3.                                                                              |
| <b>Description</b>              | Disable LACP link protection on the interface.                                                                          |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |

## disable-mlppp-inner-ppp-pfc

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|                                 |                                                                                                                                                                                                  |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | disable-mlppp-inner-ppp-pfc;                                                                                                                                                                     |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ] |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.2.                                                                                                                                                       |
| <b>Description</b>              | For MLPPP interfaces only, disable compression of the inner PPP header in the MLPPP payload. By default, compression is enabled.                                                                 |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                   |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                          |

## dlci

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | dlci <i>dlci-identifier</i> ;                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ]                                                                                                                                                                                                                                                                                        |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b>              | For Frame Relay and Multilink Frame Relay (MLFR) user-to-network interface (UNI) network-to-network interface (NNI) encapsulation only, and for link services, voice services and point-to-point interfaces only, configure the data-link connection identifier (DLCI) for a permanent virtual circuit (PVC) or an switched virtual circuit (SVC).<br><br>To configure a DLCI for a point-to-multipoint interface, use the <b>multipoint-destination</b> statement to specify the DLCI. |
| <b>Options</b>                  | <i>dlci-identifier</i> —Data-link connection identifier.<br><b>Range:</b> 16 through 1022. For Frame Relay DLCI ranges for channelized interfaces, see “Data-Link Connection Identifiers on Channelized Interfaces” on page 362.                                                                                                                                                                                                                                                        |
| <b>Usage Guidelines</b>         | See “Configuring Frame Relay DLCIs” on page 356, “Configuring a Point-to-Point Frame Relay Connection” on page 356, and the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                                                                                                                                                                                      |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Related Topics</b>           | encapsulation, multipoint-destination, multicast-dlci                                                                                                                                                                                                                                                                                                                                                                                                                                   |

**dls**


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|                                 |                                                                                                                                                                                                                                                                                                              |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | dls {<br>destination <i>mac-address</i> priority-cost <i>priority</i> ;<br>peer <i>ip-address</i> priority-cost <i>priority</i> ;<br>}                                                                                                                                                                       |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family llc2 redundancy-group <i>group-number</i> track],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family llc2 redundancy-group <i>group-number</i> track] |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 7.5.                                                                                                                                                                                                                                                                   |
| <b>Description</b>              | For J-series Services Routers only. On Ethernet interfaces configured for DLSw, enable tracking options for a remote peer or destination MAC address.<br><br>The statements are explained separately.                                                                                                        |
| <b>Usage Guidelines</b>         | See “Configuring DLSw Ethernet Redundancy Using LLC2 Properties” on page 168.                                                                                                                                                                                                                                |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                      |

**do-not-fragment**


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|                                 |                                                                                                                                                                                                                |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | do-not-fragment;                                                                                                                                                                                               |
| <b>Hierarchy Level</b>          | [edit interfaces <i>gr-fpc/pic/port</i> unit <i>logical-unit-number</i> tunnel],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>gr-fpc/pic/port</i> unit <i>logical-unit-number</i> tunnel] |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 9.2.                                                                                                                                                                     |
| <b>Description</b>              | Disable fragmentation of GRE encapsulated packets.                                                                                                                                                             |
| <b>Default</b>                  | By default fragmentation is disabled.                                                                                                                                                                          |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                                 |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                        |
| <b>Related Topics</b>           | reassemble-packets                                                                                                                                                                                             |



**dot1x**

**Syntax**

```
dot1x {
 authenticator {
 authentication-profile-name access-profile-name;
 interface interface-ids {
 maximum-requests integer;
 retries integer;
 quiet-period seconds;
 transmit-period seconds;
 reauthentication (disable | interval seconds);
 server-timeout seconds;
 supplicant (single);
 supplicant-timeout seconds;
 }
 }
}
```

**Hierarchy Level** [edit protocols]

**Release Information** Statement introduced in JUNOS Release 9.3.

**Description** For the MX-series only, specifies settings for using 802.1x Port-Based Network Access Control.

**Default** By default, dot1x is not configured.

**Options** authenticator—Specify the authentication profile name and the interface.

- authentication-profile-name—RADIUS user authentication for 802.1x Port-Based Network Access Control protocol.
- interface—Interface port configuration for 802.1x Port-Based Network Access Control protocol.
  - maximum-requests *seconds*—See maximum-requests.
  - quiet-period *seconds*—See quiet-period.
  - retries *integer*—See retries.
  - reauthentication (disable | interval *seconds*)—See reauthentication.
  - supplicant (*single*)—See supplicant.
  - server-timeout *seconds*—See server-timeout.
  - supplicant-timeout *seconds*—See supplicant-timeout.
  - transmit-period *seconds*—See transmit-period.

**Usage Guidelines** See “Configuring IEEE 802.1x Port-Based Network Access Control” on page 591.

**Required Privilege Level** interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

**Related Topics** authenticator, authentication-profile-name, interface (IEEE 802.1x (dot1x)—Port-Based Network Access Control)

## down-count

---

**Syntax** down-count *cells*;

**Hierarchy Level** [edit interfaces *interface-name* atm-options vpi *vpi-identifier* oam-liveness],  
 [edit interfaces *interface-name* unit *logical-unit-number* oam-liveness],  
 [edit interfaces *interface-name* unit *logical-unit-number* family *family* address *address* multipoint-destination *address* oam-liveness],  
 [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* oam-liveness],  
 [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family *family* address *address* multipoint-destination *address* oam-liveness]

**Release Information** Statement introduced before JUNOS Release 7.4.

**Description** For ATM encapsulation only, configure Operation, Administration, and Maintenance (OAM) F5 loopback cell count thresholds. This feature is not supported on ATM-over-SHDSL interfaces.

For ATM2 IQ PICs only, configure OAM F4 loopback cell count thresholds at the [edit interfaces *interface-name* atm-options vpi *vpi-identifier*] hierarchy level.

**Options** *cells*—Minimum number of consecutive OAM F4 or F5 loopback cells lost before a VC is declared down.

**Range:** 1 through 255

**Default:** 5 cells

**Usage Guidelines** See “Configuring the ATM OAM F5 Loopback Cell Threshold” on page 305.

**Required Privilege Level** interface—To view this statement in the configuration.  
 interface-control—To add this statement to the configuration.

## drop-timeout

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|                                 |                                                                                                                                                                                                                                                                          |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>drop-timeout milliseconds;</code>                                                                                                                                                                                                                                  |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> mlfr-uni-nni-bundle-options],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                           |
| <b>Description</b>              | For link services, multilink, and voice services interfaces only, configure the drop timeout period, in milliseconds.                                                                                                                                                    |
| <b>Options</b>                  | <i>milliseconds</i> —Drop timeout period.<br><b>Range:</b> 0 through 2000 milliseconds<br><b>Default:</b> 0 ms (disabled)                                                                                                                                                |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                                                                                           |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                  |

## ds0-options

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|                                 |                                                                                                                                                                                                                                                                                         |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | ds0-options {<br>bert-algorithm <i>algorithm</i> ;<br>bert-error-rate <i>rate</i> ;<br>bert-period <i>seconds</i> ;<br>byte-encoding (nx56   nx64);<br>fcs (16   32);<br>idle-cycle-flag (flags   ones);<br>invert-data;<br>loopback payload;<br>start-end-flag (filler   shared);<br>} |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> ]                                                                                                                                                                                                                                                |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                          |
| <b>Description</b>              | Configure DS0-specific physical interface properties.<br><br>The statements are explained separately.                                                                                                                                                                                   |
| <b>Usage Guidelines</b>         | See “Configuring Channelized DS3-to-DS0 Interfaces” on page 446.                                                                                                                                                                                                                        |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                 |

## dsl-options

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|                                 |                                                                                                                                                                |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | dsl-options {<br>loopback local;<br>operating-mode <i>mode</i> ;<br>}                                                                                          |
| <b>Hierarchy Level</b>          | [edit interfaces <i>at-fpc/pic/port</i> ]                                                                                                                      |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                 |
| <b>Description</b>              | For J-series Services Routers only, modify the properties of the digital subscriber line for an ATM interface.<br><br>The statements are explained separately. |
| <b>Usage Guidelines</b>         | See “Configuring ATM-over-ADSL Interfaces” on page 331.                                                                                                        |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                        |
| <b>Related Topics</b>           | <i>J-series Services Router Basic LAN and WAN Access Configuration Guide</i>                                                                                   |

## dsr

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|                                 |                                                                                                                                                                                                        |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | dsr (ignore   normal   require);                                                                                                                                                                       |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> serial-options dce-options],<br>[edit interfaces <i>interface-name</i> serial-options dte-options]                                                              |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                         |
| <b>Description</b>              | For EIA-530 and V.35 interfaces only, configure the from-DCE signal, data-set-ready (DSR).                                                                                                             |
| <b>Options</b>                  | ignore—The from-DCE signal is ignored.<br><br>normal—Normal DSR signal handling as defined by the TIA/EIA Standard 530.<br><br>require—The from-DCE signal must be asserted.<br><b>Default:</b> normal |
| <b>Usage Guidelines</b>         | See “Configuring the Serial Signal Handling” on page 247.                                                                                                                                              |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                |

## dsr-polarity

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|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | dsr-polarity (negative   positive);                                                                                     |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> serial-options]                                                                  |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                          |
| <b>Description</b>              | Configure DSR signal polarity.                                                                                          |
| <b>Options</b>                  | positive—Positive signal polarity.<br><br>negative—Negative signal polarity.<br><b>Default:</b> positive                |
| <b>Usage Guidelines</b>         | See “Configuring Serial Signal Polarities” on page 250.                                                                 |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |

## dte-options

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|                                 |                                                                                                                                                                                                                                                                                                                                                         |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <pre>dte-options {   control-signal (assert   de-assert   normal);   cts (ignore   normal   require);   dcd (ignore   normal   require);   dsr (ignore   normal   require);   dtr <i>signal-handling-option</i>;   ignore-all;   indication (ignore   normal   require);   rts (assert   de-assert   normal);   tm (ignore   normal   require); }</pre> |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> serial-options]                                                                                                                                                                                                                                                                                                  |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.3.<br>Statement previously known as <b>control-leads</b> .                                                                                                                                                                                                                                                      |
| <b>Description</b>              | For M-series and T-series routing platforms, configure the serial interface signal characteristics.<br><br>The statements are explained separately.                                                                                                                                                                                                     |
| <b>Usage Guidelines</b>         | See “Configuring the Serial Signal Handling” on page 247.                                                                                                                                                                                                                                                                                               |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                 |

**dtr**

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>dtr signal-handling-option;</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> serial-options dce-options],<br>[edit interfaces <i>interface-name</i> serial-options dte-options]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Description</b>              | For EIA-530 and V.35 interfaces only, configure the to-DCE signal, data-transmit-ready (DTR).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Options</b>                  | <p><i>signal-handling-option</i>—Signal handling for the DTR signal. The signal handling can be one of the following:</p> <p><i>assert</i>—The to-DCE signal must be asserted.</p> <p><i>auto-synchronize</i>—Normal DTR signal with automatic synchronization. This statement has two substatements:</p> <p><i>duration milliseconds</i>—Pulse duration of resynchronization.<br/> <b>Range:</b> 1 through 1000 milliseconds<br/> <b>Default:</b> 1000 milliseconds</p> <p><i>interval seconds</i>—Offset interval for resynchronization.<br/> <b>Range:</b> 1 through 31 seconds<br/> <b>Default:</b> 15 seconds</p> <p><i>de-assert</i>—The to-DCE signal must be deasserted.</p> <p><i>normal</i>—Normal DTR signal handling as defined by the TIA/EIA Standard 530.<br/> <b>Default:</b> normal</p> |
| <b>Usage Guidelines</b>         | See “Configuring the Serial Signal Handling” on page 247.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

## dtr-circuit

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|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | dtr-circuit (balanced   unbalanced);                                                                                    |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> serial-options]                                                                  |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                          |
| <b>Description</b>              | For EIA-530 and V.35 interfaces only, configure a DTR circuit.                                                          |
| <b>Options</b>                  | balanced—Balanced DTR signal.<br>unbalanced—Unbalanced DTR signal.<br><b>Default:</b> balanced                          |
| <b>Usage Guidelines</b>         | See “Configuring the Serial DTR Circuit” on page 250.                                                                   |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |

## dtr-polarity

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|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | dtr-polarity (negative   positive);                                                                                     |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> serial-options]                                                                  |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                          |
| <b>Description</b>              | Configure DTR signal polarity.                                                                                          |
| <b>Options</b>                  | positive—Positive signal polarity.<br>negative—Negative signal polarity.<br><b>Default:</b> positive                    |
| <b>Usage Guidelines</b>         | See “Configuring Serial Signal Polarities” on page 250.                                                                 |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |

## dynamic-call-admission-control

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | dynamic-call-admission-control {<br>activation-priority <i>priority</i> ;<br>bearer-bandwidth-limit <i>kilobits-per-second</i> ;<br>}                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.2.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Description</b>              | <p>(J4350 and J6350 Services Routers supporting voice over IP with the TGM550 media gateway module) For Fast Ethernet and Gigabit Ethernet interfaces, ISDN BRI interfaces, and serial interfaces with PPP or Frame Relay encapsulation, configure dynamic call admission control (CAC). Dynamic CAC provides enhanced control over WAN bandwidth. When dynamic CAC is configured on an interface responsible for providing call bandwidth, the TGM550 informs the Media Gateway Controller (MGC) of the bandwidth limit available for voice packets on the interface and requests the MGC to block new calls when the bandwidth is exhausted.</p> <p>Dynamic CAC must be configured on each Services Router interface responsible for providing call bandwidth.</p> <p>The statements are explained separately.</p> |
| <b>Usage Guidelines</b>         | See “Configuring Dynamic Call Admission Control” on page 155.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Related Topics</b>           | <i>JUNOS Services Interfaces Configuration Guide, J-series Services Router Basic LAN and WAN Access Configuration Guide</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |



## e1-options

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**Syntax**    e1-options {  
               bert-algorithm *algorithm*;  
               bert-error-rate *rate*;  
               bert-period *seconds*;  
               fcs (16 | 32);  
               framing (g704 | g704-no-crc4 | unframed);  
               idle-cycle-flag (flags | ones);  
               invert-data;  
               loopback (local | remote);  
               start-end-flag (filler | shared);  
               timeslots *time-slot-range*;  
               }

**Hierarchy Level**    [edit interfaces *interface-name*]

**Release Information**    Statement introduced before JUNOS Release 7.4.

**Description**    Configure E1-specific physical interface properties.

The statements are explained separately.

**Usage Guidelines**    See “Configuring Channelized E1 Interfaces” on page 377, “Configuring Channelized STM1 Interfaces” on page 423, “Configuring E1 Interfaces” on page 469, and “Configuring T1 Interfaces” on page 485.

**Required Privilege Level**    interface—To view this statement in the configuration.  
                                   interface-control—To add this statement to the configuration.

## e3-options

---

**Syntax** e3-options {  
     atm-encapsulation (direct | plcp);  
     bert-algorithm *algorithm*;  
     bert-error-rate *rate*;  
     bert-period *seconds*;  
     buildout *feet*;  
     compatibility-mode (digital-link | kentrox | larscom) <subrate *value*>;  
     fcs (16 | 32);  
     framing (g.751 | g.832);  
     idle-cycle-flag *value*;  
     invert-data;  
     loopback (local | remote);  
     (payload-scrambler | no-payload-scrambler);  
     start-end-flag *value*;  
     (unframed | no-unframed);  
 }

**Hierarchy Level** [edit interfaces *interface-name*]

**Release Information** Statement introduced before JUNOS Release 7.4.

**Description** Configure E3-specific physical interface properties.

For ATM1 interfaces, you can configure a subset of E3 options statements.

The statements are explained separately.

**Usage Guidelines** See “Configuring E3 Interfaces” on page 477 and “Configuring T3 Interfaces” on page 495.

**Required Privilege Level** interface—To view this statement in the configuration.  
 interface-control—To add this statement to the configuration.

**Related Topics** atm-options

## encapsulation

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See the following sections:

- encapsulation (Container Interface) on page 825
- encapsulation (Logical Interface) on page 826
- encapsulation (Physical Interface) on page 829

### ***encapsulation (Container Interface)***

|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | encapsulation (cisco-hdlc   ppp);                                                                                       |
| <b>Hierarchy Level</b>          | [edit interfaces cin]                                                                                                   |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 9.2.                                                                              |
| <b>Description</b>              | Container link-layer encapsulation type.                                                                                |
| <b>Options</b>                  | cisco-hdlc—Use Cisco-compatible High-Level Data Link Control (HDLC) framing.<br><br>ppp—Use serial PPP encapsulation.   |
| <b>Usage Guidelines</b>         | See “Configuring Container Interfaces” on page 697.                                                                     |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |

**encapsulation (Logical Interface)**

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>              | encapsulation (atm-ccc-cell-relay   atm-ccc-vc-mux   atm-cisco-nlpid   atm-tcc-vc-mux   atm-mlppp-llc   atm-nlpid   atm-ppp-llc   atm-ppp-vc-mux   atm-snap   atm-tcc-snap   atm-vc-mux   ether-over-atm-llc   ether-vpls-over-atm-llc   ethernet   frame-relay-ccc   frame-relay-ppp   frame-relay-tcc   frame-relay-ether-type   frame-relay-ether-type-tcc   multilink-frame-relay-end-to-end   multilink-ppp   ppp-over-ether   ppp-over-ether-over-atm-llc   vlan-bridge   vlan-ccc   vlan-vci-ccc   vlan-tcc   vlan-vpls);                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Hierarchy Level</b>     | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Release Information</b> | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b>         | Logical link-layer encapsulation type.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Options</b>             | <p><b>atm-ccc-cell-relay</b>—Use ATM cell-relay encapsulation.</p> <p><b>atm-ccc-vc-mux</b>—Use ATM virtual circuit (VC) multiplex encapsulation on CCC circuits. When you use this encapsulation type, you can configure the <b>ccc</b> family only.</p> <p><b>atm-cisco-nlpid</b>—Use Cisco ATM network layer protocol ID (NLPID) encapsulation. When you use this encapsulation type, you can configure the <b>inet</b> family only.</p> <p><b>atm-mlppp-llc</b>—For ATM2 IQ interfaces only, use Multilink PPP (MLPPP) over AAL5 LLC. For this encapsulation type, your routing platform must be equipped with a Link Services or Voice Services PIC. MLPPP over ATM encapsulation is not supported on ATM2 IQ OC48 interfaces.</p> <p><b>atm-nlpid</b>—Use ATM NLPID encapsulation. When you use this encapsulation type, you can configure the <b>inet</b> family only.</p> <p><b>atm-ppp-llc</b>—For ATM2 IQ interfaces only, use PPP over AAL5 LLC encapsulation.</p> <p><b>atm-ppp-vc-mux</b>—For ATM2 IQ interfaces only, use PPP over ATM AAL5 multiplex encapsulation.</p> <p><b>atm-snap</b>—Use ATM subnetwork attachment point (SNAP) encapsulation.</p> <p><b>atm-tcc-snap</b>—Use ATM SNAP encapsulation on translational cross-connect (TCC) circuits.</p> <p><b>atm-tcc-vc-mux</b>—Use ATM VC multiplex encapsulation on TCC circuits. When you use this encapsulation type, you can configure the <b>tcc</b> family only.</p> <p><b>atm-vc-mux</b>—Use ATM VC multiplex encapsulation. When you use this encapsulation type, you can configure the <b>inet</b> family only.</p> <p><b>ether-over-atm-llc</b>—For interfaces that carry IPv4 traffic, use Ethernet over ATM LLC encapsulation. When you use this encapsulation type, you cannot configure multipoint interfaces.</p> <p><b>ether-vpls-over-atm-llc</b>—For ATM2 IQ interfaces only, use the Ethernet virtual private LAN service (VPLS) over ATM LLC encapsulation to bridge Ethernet interfaces</p> |

and ATM interfaces over a VPLS routing instance (as described in RFC 2684, *Multiprotocol Encapsulation over ATM Adaptation Layer 5*). Packets from the ATM interfaces are converted to standard ENET2/802.3 encapsulated Ethernet frames with the frame check sequence (FCS) field removed.

**ethernet**—Use Ethernet II encapsulation (as described in RFC 894, *A Standard for the Transmission of IP Datagrams over Ethernet Networks*).

**ethernet-vpls**—Use Ethernet VPLS encapsulation on Ethernet interfaces that have VPLS enabled and that must accept packets carrying standard Tag Protocol ID (TPID) values.

**extended-vlan-vpls**—Use extended virtual LAN (VLAN) VPLS encapsulation on Ethernet interfaces that have VLAN 802.1Q tagging and VPLS enabled and that must accept packets carrying TPIDs 0x8100, 0x9100, and 0x9901.



**NOTE:** The built-in Gigabit Ethernet PIC on an M7i router does not support extended VLAN VPLS encapsulation.

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**frame-relay-ccc**—Use Frame Relay encapsulation on CCC circuits. When you use this encapsulation type, you can configure the **ccc** family only.

**frame-relay-ppp**—Use Frame Relay encapsulation on PPP circuits. When you use this encapsulation type, you can configure the **ppp** family only.

**frame-relay-tcc**—Use Frame Relay encapsulation on TCC circuits for connecting unlike media. When you use this encapsulation type, you can configure the **tcc** family only.

**frame-relay-ether-type**—Use Frame Relay ether type encapsulation for compatibility with Cisco Frame Relay. The physical interface must be configured with flexible-frame-relay encapsulation.

**frame-relay-ether-type-tcc**—Use Frame Relay ether type TCC for Cisco-compatible Frame Relay on TCC circuits to connect unlike media. The physical interface must be configured with flexible-frame-relay encapsulation.

**multilink-frame-relay-end-to-end**—Use MLFR FRF.15 encapsulation. This encapsulation is used only on multilink, link services, and voice services interfaces and their constituent T1 or E1 interfaces.

**multilink-ppp**—Use MLPPP encapsulation. This encapsulation is used only on multilink, link services, and voice services interfaces and their constituent T1 or E1 interfaces.

**ppp-over-ether**—For underlying Ethernet interfaces on J-series Services Routers only, use PPP over Ethernet encapsulation. When you use this encapsulation type, you cannot configure the interface address. Instead, configure the interface address on the PPP interface.

**ppp-over-ether-over-atm-llc**—For underlying ATM interfaces on J-series Services Routers only, use PPP over Ethernet over ATM LLC encapsulation. When you use this encapsulation type, you cannot configure the interface address. Instead, configure the interface address on the PPP interface.

**vlan-bridge**—Use Ethernet VLAN bridge encapsulation on Ethernet interfaces that have IEEE 802.1Q tagging, flexible-ethernet-services, and bridging enabled and that must accept packets carrying TPID 0x8100 or a user-defined TPID.

**vlan-ccc**—Use Ethernet virtual LAN (VLAN) encapsulation on CCC circuits. When you use this encapsulation type, you can configure the **ccc** family only.

**vlan-vci-ccc**—Use ATM-to-Ethernet interworking encapsulation on CCC circuits. When you use this encapsulation type, you can configure the **ccc** family only.

**vlan-tcc**—Use Ethernet VLAN encapsulation on TCC circuits. When you use this encapsulation type, you can configure the **tcc** family only.

**vlan-vpls**—Use Ethernet VLAN encapsulation on VPLS circuits.

**Usage Guidelines** See “Configuring Interface Encapsulation” on page 149, “Configuring Circuit and Translational Cross-Connects” on page 203, “Identifying the Access Concentrator” on page 644, “Configuring ATM Interface Encapsulation” on page 306, “Configuring VLAN Encapsulation” on page 532, “Configuring Extended VLAN Encapsulation” on page 533, “Configuring ISDN Logical Interface Properties” on page 661, “Configuring ATM-to-Ethernet Interworking” on page 210, and the *JUNOS Services Interfaces Configuration Guide*.

**Required Privilege Level** interface—To view this statement in the configuration.  
interface-control—To add this statement to the configuration.

**encapsulation (Physical Interface)**

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>              | encapsulation (atm-ccc-cell-relay   atm-pvc   cisco-hdlc   cisco-hdlc-ccc   cisco-hdlc-tcc   ethernet-bridge   ethernet-ccc   ethernet-over-atm   ethernet-tcc   ethernet-vpls   extended-frame-relay-ccc   extended-frame-relay-ether-type-tcc   extended-frame-relay-tcc   extended-vlan-bridge   extended-vlan-ccc   extended-vlan-tcc   extended-vlan-vpls   flexible-ethernet-services   flexible-frame-relay   frame-relay   frame-relay-ccc   frame-relay-ether-type   frame-relay-ether-type-tcc   frame-relay-port-ccc   frame-relay-tcc   multilink-frame-relay-uni-nni   ppp   ppp-ccc   ppp-tcc   vlan-ccc   vlan-vci-ccc   vlan-vpls);                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Hierarchy Level</b>     | [edit interfaces <i>interface-name</i> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Release Information</b> | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Description</b>         | Physical link-layer encapsulation type.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Default</b>             | PPP encapsulation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Options</b>             | <p>atm-ccc-cell-relay—Use ATM cell-relay encapsulation.</p> <p>atm-pvc—Use ATM PVC encapsulation.</p> <p>cisco-hdlc—Use Cisco-compatible High-Level Data Link Control (HDLC) framing.</p> <p>cisco-hdlc-ccc—Use Cisco-compatible HDLC framing on CCC circuits.</p> <p>cisco-hdlc-tcc—Use Cisco-compatible HDLC framing on TCC circuits for connecting unlike media.</p> <p>ethernet-bridge—Use Ethernet bridge encapsulation on Ethernet interfaces that have bridging enabled and that must accept all packets.</p> <p>ethernet-ccc—Use Ethernet CCC encapsulation on Ethernet interfaces that must accept packets carrying standard Tag Protocol ID (TPID) values.</p> <p>ethernet-over-atm—For interfaces that carry IPv4 traffic, use Ethernet over ATM encapsulation. When you use this encapsulation type, you cannot configure multipoint interfaces. As defined in RFC 1483, <i>Multiprotocol Encapsulation over ATM Adaptation Layer 5</i>, this encapsulation type allows ATM interfaces to connect to devices that support only bridged protocol data units (BPDUs). The JUNOS software does not completely support bridging, but accepts BPDU packets as a default gateway. If you use the router as an edge device, then the router acts as a default gateway. It accepts Ethernet LLC/SNAP frames with IP or ARP in the payload, and drops the rest. For packets destined to the Ethernet LAN, a route lookup is done using the destination IP address. If the route lookup yields a full address match, the packet is encapsulated with an LLC/SNAP and MAC header, and the packet is forwarded to the ATM interface.</p> <p>ethernet-tcc—For interfaces that carry IPv4 traffic, use Ethernet TCC encapsulation on interfaces that must accept packets carrying standard TPID values. For 8-port, 12-port, and 48-port Fast Ethernet PICs, TCC is not supported.</p> <p>ethernet-vpls—Use Ethernet VPLS encapsulation on Ethernet interfaces that have VPLS enabled and that must accept packets carrying standard TPID values.</p> |

**extended-frame-relay-ccc**—Use Frame Relay encapsulation on CCC circuits. This encapsulation type allows you to dedicate DLCIs 1 through 1022 to CCC.

**extended-frame-relay-tcc**—Use Frame Relay encapsulation on TCC circuits to connect unlike media. This encapsulation type allows you to dedicate DLCIs 1 through 1022 to TCC.

**extended-vlan-bridge**—Use extended VLAN bridge encapsulation on Ethernet interfaces that have IEEE 802.1Q VLAN tagging and bridging enabled and that must accept packets carrying TPID 0x8100 or a user-defined TPID.

**extended-vlan-ccc**—Use extended VLAN encapsulation on CCC circuits with Gigabit Ethernet and 4-port Fast Ethernet interfaces that must accept packets carrying 802.1Q values. For 8-port, 12-port, and 48-port Fast Ethernet PICs, extended VLAN CCC is not supported. For 4-port Gigabit Ethernet PICs, extended VLAN CCC is not supported.

**extended-vlan-tcc**—For interfaces that carry IPv4 traffic, use extended VLAN encapsulation on TCC circuits with Gigabit Ethernet interfaces on which you want to use 802.1Q tagging. For 4-port Gigabit Ethernet PICs, extended VLAN TCC is not supported.

**extended-vlan-vpls**—Use extended VLAN VPLS encapsulation on Ethernet interfaces that have VLAN 802.1Q tagging and VPLS enabled and that must accept packets carrying TPIDs 0x8100, 0x9100, and 0x9901.



**NOTE:** The built-in Gigabit Ethernet PIC on an M7i router does not support extended VLAN VPLS encapsulation.

---

**flexible-ethernet-services**—For Gigabit Ethernet IQ interfaces and Gigabit Ethernet PICs with small form-factor pluggable transceivers (SFPs) (except the 10-port Gigabit Ethernet PIC and the built-in Gigabit Ethernet port on the M7i platform), use flexible Ethernet services encapsulation when you want to configure multiple per-unit Ethernet encapsulations. This encapsulation type allows you to configure any combination of route, TCC, CCC, Layer 2 virtual private networks (VPNs), and VPLS encapsulations on a single physical port. Aggregated Ethernet bundles cannot use this encapsulation type. If you configure flexible Ethernet services encapsulation on the physical interface, VLAN IDs from 1 through 511 are no longer reserved for normal VLANs.

**flexible-frame-relay**—For IQ interfaces only, use flexible Frame Relay encapsulation when you want to configure multiple per-unit Frame Relay encapsulations. This encapsulation type allows you to configure any combination of TCC, CCC, and standard Frame Relay encapsulations on a single physical port. Also, each logical interface can have any DLCI value from 1 through 1022.

**frame-relay**—Use Frame Relay encapsulation.

**frame-relay-ccc**—Use Frame Relay encapsulation on CCC circuits.



**frame-relay-port-ccc**—Use Frame Relay port CCC encapsulation to transparently carry all the DLCIs between two customer edge (CE) routers without explicitly configuring each DLCI on the two provider edge (PE) routers with Frame Relay transport. When you use this encapsulation type, you can configure the **ccc** family only.

**frame-relay-tcc**—Use Frame Relay encapsulation on TCC circuits to connect unlike media.

**frame-relay-ether-type**—Use Frame Relay ether type encapsulation for compatibility with Cisco Frame Relay.

**frame-relay-ether-type-tcc**—Use Frame Relay ether type TCC for Cisco-compatible Frame Relay on TCC circuits to connect unlike media.

**extended-frame-relay-ether-type-tcc**—Use extended Frame Relay ether type TCC for Cisco-compatible Frame Relay for DLCIs 1 through 1022. This encapsulation is used for circuits with different media on either side of the connection.

**multilink-frame-relay-uni-nni**—Use MLFR UNI NNI encapsulation. This encapsulation is used only on link services and voice services interfaces functioning as FRF.16 bundles and their constituent T1 or E1 interfaces.

**ppp**—Use serial PPP encapsulation.

**ppp-ccc**—Use serial PPP encapsulation on CCC circuits. When you use this encapsulation type, you can configure the **ccc** family only.

**ppp-tcc**—Use serial PPP encapsulation on TCC circuits for connecting unlike media. When you use this encapsulation type, you can configure the **tcc** family only.

**vlan-ccc**—Use Ethernet VLAN encapsulation on CCC circuits.

**vlan-vci-ccc**—Use ATM-to-Ethernet interworking encapsulation on CCC circuits. When you use this encapsulation type, you can configure the **ccc** family only. All logical interfaces configured on the Ethernet interface must also have the encapsulation type set to **vlan-vci-ccc**.

**vlan-vpls**—Use VLAN VPLS encapsulation on Ethernet interfaces with VLAN tagging and VPLS enabled. Interfaces with VLAN VPLS encapsulation accept packets carrying standard TPID values only.

**Usage Guidelines** See “Configuring Interface Encapsulation” on page 98, “Defining the Encapsulation for Switching Cross-Connects” on page 205, “Configuring ATM Interface Encapsulation” on page 306, “Configuring VLAN Encapsulation” on page 532, “Configuring ATM-to-Ethernet Interworking” on page 210, and “Configuring Extended VLAN Encapsulation” on page 533 .

**Required Privilege Level** interface—To view this statement in the configuration.  
interface-control—To add this statement to the configuration.

## encoding

---

|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | encoding (nrz   nrzi);                                                                                                  |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> serial-options]                                                                  |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                          |
| <b>Description</b>              | For serial interfaces, set the line encoding format.                                                                    |
| <b>Default</b>                  | The default line encoding is non-return to zero (NRZ).                                                                  |
| <b>Options</b>                  | nrz—Use NRZ line encoding.<br><br>nrzi—Use non-return to zero inverted (NRZI) line encoding.                            |
| <b>Usage Guidelines</b>         | See “Configuring Serial Line Encoding” on page 253.                                                                     |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |

## epd-threshold

---

See the following sections:

- `epd-threshold` (Logical Interface) on page 833
- `epd-threshold` (Physical Interface) on page 834

### ***epd-threshold (Logical Interface)***

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>epd-threshold cells plp1 cells;</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Hierarchy Level</b>          | <p>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i>],<br/>         [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> address <i>address</i> family <i>family</i> multipoint-destination <i>address</i>],<br/>         [edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i>],<br/>         [edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> address <i>address</i> family <i>family</i> multipoint-destination <i>address</i>]</p> |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Description</b>              | For ATM2 IQ interfaces only, define the early packet discard (EPD) threshold on a VC. The EPD threshold is a limit on the number of transmit packets that can be queued. Packets that exceed the limit are discarded. This threshold applies to packets that have a packet-loss priority (PLP) of 0.                                                                                                                                                                                                                                                                                                       |
| <b>Default</b>                  | <p>Approximately 1 percent of the available cell buffers. If shaping is enabled, the default EPD threshold is proportional to the shaping rate according to the following formula:</p> $\text{default epd-threshold} = \text{number of buffers} * \text{shaping rate} / \text{line rate}$ <p>The minimum EPD threshold value is 48 cells. If the default EPD threshold formula results in an EPD threshold of less than 48 cells, the result will be ignored, and the minimum value of 48 cells will be used.</p>                                                                                          |
| <b>Options</b>                  | <p><i>cells</i>—Maximum number of cells.</p> <p><b>Range:</b> For 1-port and 2-port OC12 interfaces, 48 through 425,984 cells.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Usage Guidelines</b>         | See “Configuring the ATM2 IQ EPD Threshold” on page 302.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

**epd-threshold (Physical Interface)**

|                                 |                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>epd-threshold <i>cells</i> plp1 <i>cells</i>;</code>                                                                                                                                                                                                                                                                                                                       |
| <b>Hierarchy Level</b>          | [edit interfaces <i>at-fpc/pic/port</i> atm-options scheduler-maps <i>map-name</i> forwarding-class <i>class-name</i> ]                                                                                                                                                                                                                                                          |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                   |
| <b>Description</b>              | For ATM2 IQ interfaces only, define the EPD threshold on a VC. The EPD threshold is a limit on the number of transmit packets that can be queued. Packets that exceed the limit are discarded.                                                                                                                                                                                   |
| <b>Default</b>                  | If you do not include either the <b>epd-threshold</b> or the <b>linear-red-profile</b> statement in the forwarding class configuration, the JUNOS software uses an EPD threshold based on the available bandwidth and other parameters.                                                                                                                                          |
| <b>Options</b>                  | <p><i>cells</i>—Maximum number of cells.</p> <p><b>Range:</b> For 1-port and 2-port OC12 interfaces, 48 through 425,984 cells. For 1-port OC48 interfaces, 48 through 425,984 cells. For 2-port OC3, DS3, and E3 interfaces, 48 through 212,992 cells. For 4-port DS3 and E3 interfaces, 48 through 106,496 cells.</p> <p>The <b>plp1</b> statement is explained separately.</p> |
| <b>Usage Guidelines</b>         | See “Configuring an ATM Scheduler Map” on page 317.                                                                                                                                                                                                                                                                                                                              |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                                               |
| <b>Related Topics</b>           | linear-red-profile                                                                                                                                                                                                                                                                                                                                                               |

**es-options**


---

|                                 |                                                                                                                                                      |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>es-options {<br/>    backup-interface <i>interface-name</i>;<br/>}</code>                                                                      |
| <b>Hierarchy Level</b>          | [edit interfaces <i>es-fpc/pic/port</i> ]                                                                                                            |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                       |
| <b>Description</b>              | <p>On ES interfaces, configure ES interface-specific interface properties.</p> <p>The <b>backup-interface</b> statement is explained separately.</p> |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                       |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                   |

**ethernet**

```

Syntax ethernet {
 connectivity-fault-management {
 action-profile profile-name {
 default-action {
 interface-down;
 }
 }
 }
 linktrace {
 age (30m | 10m | 1m | 30s | 10s);
 path-database-size path-database-size;
 }
 maintenance-domain domain-name {
 level number;
 name-format (character-string | none | dns | mac+2octet);
 maintenance-association ma-name {
 short-name-format (character-string | vlan | 2octet | rfc-2685-vpn-id);
 continuity-check {
 hold-interval minutes;
 interval (10m | 10s | 1m | 1s | 100ms);
 loss-threshold number;
 }
 mep mep-id {
 action-profile profile-name;
 auto-discovery;
 direction (up | down);
 interface interface-name;
 priority number;
 remote-mep mep-id {
 action-profile profile-name;
 }
 }
 }
 }
}
link-fault-management {
 action-profile profile-name {
 action {
 syslog;
 link-down;
 send-critical-event;
 }
 event {
 link-adjacency-loss;
 link-event-rate {
 frame-error count;
 frame-period count;
 frame-period-summary count;
 symbol-period count;
 }
 protocol-down;
 }
 }
}

```

```

 }
 interface interface-name {
 apply-action-profile;
 link-discovery (active | passive);
 pdu-interval interval;
 pdu-threshold threshold-value;
 remote-loopback;
 event-thresholds {
 frame-error count;
 frame-period count;
 frame-period-summary count;
 symbol-period count;
 }
 negotiation-options {
 allow-remote-loopback;
 no-allow-link-events;
 }
 }
}

```

|                                 |                                                                                                                                                                                                                                                         |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Hierarchy Level</b>          | [edit protocols oam]                                                                                                                                                                                                                                    |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.2.                                                                                                                                                                                                              |
| <b>Description</b>              | <p>For Ethernet interfaces on M320, MX-series, and T-series routing platforms, provide fault signaling and detection for 802.3ah Operation, Administration, and Management (OAM) support.</p> <p>The remaining statements are explained separately.</p> |
| <b>Usage Guidelines</b>         | See “Enabling IEEE 802.3ah OAM Support” on page 596.                                                                                                                                                                                                    |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                      |

## ethernet-policer-profile

---

**Syntax**

```
ethernet-policer-profile {
 input-priority-map {
 ieee802.1p premium [values];
 }
 output-priority-map {
 classifier {
 premium {
 forwarding-class class-name {
 loss-priority (high | low);
 }
 }
 }
 }
 policer cos-policer-name {
 aggregate {
 bandwidth-limit bps;
 burst-size-limit bytes;
 }
 premium {
 bandwidth-limit bps;
 burst-size-limit bytes;
 }
 }
}
```

**Hierarchy Level** [edit interfaces *interface-name* gigether-options ethernet-switch-profile],  
[edit interfaces *interface-name* aggregated-ether-options ethernet-switch-profile]

**Release Information** Statement introduced before JUNOS Release 7.4.

**Description** For Gigabit Ethernet IQ, 10-Gigabit Ethernet, and Gigabit Ethernet PICs with SFPs (except the 10-port Gigabit Ethernet PIC and the built-in Gigabit Ethernet port on the M7i platform), configure a class of service (CoS)-based policer. Policing applies to the inner VLAN identifiers, not to the outer tag. For Gigabit Ethernet interfaces with SFPs (except the 10-port Gigabit Ethernet PIC and the built-in Gigabit Ethernet port on the M7i platform), the premium policer is not supported.

The statements are explained separately.

**Usage Guidelines** See “Configuring Gigabit Ethernet Policers” on page 609.

**Required Privilege Level** interface—To view this statement in the configuration.  
interface-control—To add this statement to the configuration.

## ethernet-switch-profile

---

**Syntax**

```
ethernet-switch-profile {
 ethernet-policer-profile {
 input-priority-map {
 ieee802.1p premium [values];
 }
 output-priority-map {
 classifier {
 premium {
 forwarding-class class-name {
 loss-priority (high | low);
 }
 }
 }
 }
 }
 policer cos-policer-name {
 aggregate {
 bandwidth-limit bps;
 burst-size-limit bytes;
 }
 premium {
 bandwidth-limit bps;
 burst-size-limit bytes;
 }
 }
 tag-protocol-id tpid;
}
(mac-learn-enable | no-mac-learn-enable);
```

**Hierarchy Level** [edit interfaces *interface-name* *gigether-options*],  
[edit interfaces *interface-name* *aggregated-ether-options*]

**Release Information** Statement introduced before JUNOS Release 7.4.

**Description** For Gigabit Ethernet IQ, 10-Gigabit Ethernet IQ2, and Gigabit Ethernet PICs with SFPs (except the 10-port Gigabit Ethernet PIC, aggregated Ethernet with Gigabit Ethernet IQ interfaces, and the built-in Gigabit Ethernet port on the M7i platform), configure VLAN tag and MAC address accounting and filtering properties.

The statements are explained separately.

**Default** If the `ethernet-switch-profile` statement is not configured, Gigabit Ethernet IQ and Gigabit Ethernet PICs with SFPs (except the 10-port Gigabit Ethernet PIC and the built-in Gigabit Ethernet port on the M7i platform) behave like Gigabit Ethernet interfaces.

**Usage Guidelines** See “Configuring Gigabit Ethernet Policers” on page 609, “Configuring MAC Address Filtering” on page 613, and “Configuring the Management Ethernet Interface” on page 627.



**Required Privilege Level** interface—To view this statement in the configuration.  
 interface-control—To add this statement to the configuration.

## event

---

**Syntax** event {  
     link-adjacency-loss;  
     link-event-rate {  
         frame-error *count*;  
         frame-period *count*;  
         frame-period-summary *count*;  
         symbol-period *count*;  
     }  
     protocol-down;  
 }

**Hierarchy Level** [edit protocols oam ethernet link-fault-management action-profile]

**Release Information** Statement introduced in JUNOS Release 8.5.

**Description** Configure threshold values for link events in an action profile.  
 The remaining statements are explained separately.

**Usage Guidelines** See “Monitoring Protocol Status” on page 600.

**Required Privilege Level** interface—To view this statement in the configuration.  
 interface-control—To add this statement to the configuration.

## event-thresholds

---

**Syntax** event-thresholds {  
     frame-error *count*;  
     frame-period *count*;  
     frame-period-summary *count*;  
     symbol-period *count*;  
 }

**Hierarchy Level** [edit protocols oam link-fault-management interface *interface-name*]

**Release Information** Statement introduced in JUNOS Release 8.4.

**Description** Configure threshold limit values for link events in periodic OAM PDUs.  
 The remaining statements are explained separately.

**Usage Guidelines** See “Configuring Threshold Values for Local Fault Events on an Interface” on page 597.

**Required Privilege Level** interface—To view this statement in the configuration.  
 interface-control—To add this statement to the configuration.

## eui-64

---

|                                 |                                                                                                                               |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | eui-64;                                                                                                                       |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>number</i> family ipv6 address <i>address</i> ]                                |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                |
| <b>Description</b>              | For interfaces that carry IP version 6 (IPv6) traffic, automatically generate the host number portion of interface addresses. |
| <b>Usage Guidelines</b>         | See “Configuring the Interface Address” on page 162.                                                                          |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.       |

## facility-override

---

|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | facility-override <i>facility-name</i> ;                                                                                |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> services-options syslog host <i>hostname</i> ]                                   |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                          |
| <b>Description</b>              | Override default facility for system log reporting.                                                                     |
| <b>Options</b>                  | <i>facility-name</i> —Name of facility that overrides the default assignment.                                           |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                          |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |

## family

---

**Syntax** family *family* {  
     accounting {  
         destination-class-usage;  
         source-class-usage {  
             *direction*;  
         }  
     }  
     address *address* {  
         destination *address*;  
     }  
     bundle *interface-name*;  
     filter {  
         dialer *filter-name*;  
         input *filter-name*;  
         output *filter-name*;  
         group *filter-group-number*;  
     }  
     interface-mode (access | trunk);  
     ipsec-sa *sa-name*;  
     keep-address-and-control;  
     llc2 {  
         ack-delay-time *time*;  
         ack-max *count*;  
         idle-time *time*;  
         local-window *count*;  
         max-retry *count*;  
         p-bit-timeout *time*;  
         redundancy-group *group-number* {  
             advertise-interval *seconds*;  
             map {  
                 local-mac *mac-address* request *mac-address*;  
             }  
             preempt hold-time *seconds*;  
             no-preempt;  
             priority *priority*;  
             track {  
                 dls {  
                     peer *ip-address* priority-cost *priority*;  
                     destination *mac-address* priority-cost *priority*;  
                 }  
                 interface *interface-name* priority-cost *priority*;  
             }  
         }  
         t1-time *time*;  
         t2-time *time*;  
         trej-time *time*;  
     }  
     mac-validate (loose | strict);  
     mtu *bytes*;  
     multicast-only;  
     negotiate-address;

```

no-redirects:
policer {
 arp policer-template-name;
 input policer-template-name;
 output policer-template-name;
}
primary;
protocols [inet iso mpls];
proxy inet-address address;
receive-options-packets;
receive-ttl-exceeded;
remote (inet-address address | mac-address address);
rpf-check <fail-filter filter-name>;
sampling {
 direction;
}
service {
 input {
 service-set service-set-name <service-filter filter-name>;
 post-service-filter filter-name;
 }
 output {
 service-set service-set-name <service-filter filter-name>;
 }
}
(translate-discard-eligible | no-translate-discard-eligible);
(translate-fecn-and-becn | no-translate-fecn-and-becn);
vlan-id number;
vlan-id-list [number number-number];
unnumbered-address interface-name destination address destination-profile
 profile-name;
address address {
 arp ip-address (mac | multicast-mac) mac-address <publish>;
 broadcast address;
 destination address;
 destination-profile name;
 eui-64;
 multipoint-destination address dlci dlci-identifier;
 multipoint-destination address {
 epd-threshold cells;
 inverse-arp;
 oam-liveness {
 up-count cells;
 down-count cells;
 }
 oam-period (disable | seconds);
 shaping {
 (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained
 rate burst length);
 queue-length number;
 }
 vci vpi-identifier.vci-identifier;
 }
 primary;
 preferred;
 (vrrp-group | vrrp-inet6-group) group-number {

```

```

 (accept-data | no-accept-data);
 advertise-interval seconds;
 authentication-type authentication;
 authentication-key key;
 fast-interval milliseconds;
 (preempt | no-preempt) {
 hold-time seconds;
 }
 priority-number number;
 track {
 priority-cost seconds;
 priority-hold-time interface-name {
 interface priority;
 bandwidth-threshold bits-per-second {
 priority;
 }
 }
 route ip-address/mask routing-instance instance-name priority-cost cost;
 }
 virtual-address [addresses];
}
}
}

```

**Hierarchy Level** [edit interfaces *interface-name* unit *logical-unit-number*],  
[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

**Release Information** Statement introduced before JUNOS Release 7.4.

**Description** Configure protocol family information for the logical interface.

**Options** *family*—Protocol family:

- **any**—Protocol-independent family used for Layer 2 packet filtering
- **bridge**—(M-series and T-series routing platforms only) Configure only when the physical interface is configured with **ethernet-bridge** type encapsulation or when the logical interface is configured with **vlan-bridge** type encapsulation
- **ccc**—Circuit cross-connect protocol suite
- **inet**—Internet Protocol version 4 suite
- **inet6**—Internet Protocol version 6 suite
- **iso**—International Organization for Standardization Open Systems Interconnection (ISO OSI) protocol suite
- **mlfr-end-to-end**—Multilink Frame Relay FRF.15
- **mlfr-uni-nni**—Multilink Frame Relay FRF.16
- **multilink-ppp**—Multilink Point-to-Point Protocol
- **mpls**—Multiprotocol Label Switching (MPLS)
- **tcc**—Translational cross-connect protocol suite
- **tnp**—Trivial Network Protocol
- **vpls**—(M-series and T-series routing platforms only) Virtual private LAN service

The remaining statements are explained separately.

**Usage Guidelines** See “Configuring the Protocol Family” on page 160 and the *JUNOS Services Interfaces Configuration Guide*.

**Required Privilege Level** *interface*—To view this statement in the configuration.  
*interface-control*—To add this statement to the configuration.

## fastether-options

---

**Syntax**

```
fastether-options {
 802.3ad {
 aex (primary | backup);
 lacp {
 port-priority;
 }
 }
 (flow-control | no-flow-control);
 ignore-l3-incompletes;
 ingress-rate-limit rate;
 (loopback | no-loopback);
 mpls {
 pop-all-labels {
 required-depth number;
 }
 }
 source-address-filter {
 mac-address;
 }
 (source-filtering | no-source-filtering);
}
```

**Hierarchy Level** [edit interfaces *interface-name*]

**Release Information** Statement introduced before JUNOS Release 7.4.

**Description** Configure Fast Ethernet-specific interface properties.

The statements are explained separately.

**Usage Guidelines** See “Configuring Ethernet Interfaces” on page 511.

**Required Privilege Level** interface—To view this statement in the configuration.  
interface-control—To add this statement to the configuration.

**fcs**

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>fcs (16   32);</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> ds0-options],<br>[edit interfaces <i>interface-name</i> e1-options],<br>[edit interfaces <i>interface-name</i> e3-options],<br>[edit interfaces <i>interface-name</i> sonet-options],<br>[edit interfaces <i>interface-name</i> t1-options],<br>[edit interfaces <i>interface-name</i> t3-options]                                                                                                                                                                                                                       |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b>              | <p>For E1/E3, SONET/SDH, and T1/T3 interfaces, configure the frame checksum (FCS) on the interface. The checksum must be the same on both ends of the interface.</p> <p>On a channelized OC12 interface, the SONET/SDH <b>fcs</b> statement is not supported. To configure FCS on each DS3 channel, you must include the <b>t3-options fcs</b> statement in the configuration for each channel. For SONET/SDH, the channelized OC12 interface supports DS3 to STS-1 to OC12. For SDH, the channelized OC12 interface supports NxDS3 to NxVC3 to AU3 to STM.</p> |
| <b>Options</b>                  | <p><b>16</b>—Use a 16-bit frame checksum on the interface.</p> <p><b>32</b>—Use a 32-bit frame checksum on the interface. Using a 32-bit checksum provides more reliable packet verification, but some older equipment might not support 32-bit checksums.</p> <p><b>Default:</b> 16</p>                                                                                                                                                                                                                                                                        |
| <b>Usage Guidelines</b>         | See “Configuring the E1 Frame Checksum” on page 471, “Configuring the E3 Frame Checksum” on page 480, “Configuring the SONET/SDH Frame Checksum” on page 687, “Configuring the T1 Frame Checksum” on page 489, and “Configuring the T3 Frame Checksum” on page 500.                                                                                                                                                                                                                                                                                             |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                                                                                                                                                                                                                              |



## feac-loop-respond

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | (feac-loop-respond   no-feac-loop-respond);                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> t3-options]                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Description</b>              | <p>For T3 interfaces only, configure the routing platform so a remote CSU can place the local routing platform into loopback.</p> <p>If you configure remote or local loopback with the T3 <b>loopback</b> statement, the routing platform does not respond to FEAC requests from the CSU even if you include the <b>feac-loop-respond</b> statement in the configuration. For the routing platform to respond, you must delete the <b>loopback</b> statement from the configuration.</p> |
| <b>Default</b>                  | The routing platform does not respond to FEAC requests.                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Usage Guidelines</b>         | See “Configuring the T3 FEAC Response” on page 500.                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Related Topics</b>           | loopback, remote-loopback-respond                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

## filter

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <pre>filter {   group filter-group-number;   input filter-name;   input-list;   [ filter-names ];   output filter-name;   output-list;   [ filter-names ]; }</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family <i>family</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family <i>family</i> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b>              | Apply a filter to an interface. You can also use filters for encrypted traffic. When you configure filters, you can configure the family <i>inet</i> , <i>inet6</i> , <i>mpls</i> , or <i>vpls</i> only.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Options</b>                  | <p><b>group</b> <i>filter-group-number</i>—Define an interface to be part of a filter group. The default filter group number is 0.<br/> <b>Range:</b> 0 through 255</p> <p><b>input</b> <i>filter-name</i>—Name of one filter to evaluate when packets are received on the interface.</p> <p><b>input-list</b> [ <i>filter-names</i> ]—Group of filters to evaluate when packets are received on the interface. Up to 16 filenames can be included in an input list.</p> <p><b>output</b> <i>filter-name</i>—Name of one filter to evaluate when packets are transmitted on the interface.</p> <p><b>output-list</b> [ <i>filter-names</i> ]—Group of filters to evaluate when packets are transmitted on the interface. Up to 16 filenames can be included in an output list.</p> |
| <b>Usage Guidelines</b>         | See “Applying a Filter to an Interface” on page 184 and the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Required Privilege Level</b> | <i>interface</i> —To view this statement in the configuration.<br><i>interface-control</i> —To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Related Topics</b>           | <i>JUNOS Policy Framework Configuration Guide</i> , <i>JUNOS System Basics Configuration Guide</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

## flexible-vlan-tagging

---

**Syntax** flexible-vlan-tagging;  
 unit *logical-unit-number* {  
   vlan-id *number*;  
   family *family* {  
     address *address*;  
   }  
 }  
 unit *logical-unit-number* {  
   vlan-tags inner *tpid.vlan-id* outer *tpid.vlan-id*;  
   family *family* {  
     address *address*;  
   }  
 }

**Hierarchy Level** [edit interfaces *ge-fpc/pic/port*]

**Release Information** Statement introduced in JUNOS Release 8.1.

**Description** On M-series and T-series routing platforms, for Fast Ethernet and Gigabit Ethernet interfaces only on Gigabit Ethernet IQ2 IQPICs, and for aggregated Ethernet interfaces with member links in IQ2 PICs or in MX-series DPCs, simultaneously support transmission of 802.1Q VLAN single-tag and dual-tag frames on logical interfaces on the same Ethernet port.

The statements are explained separately.

**Usage Guidelines** See “Configuring Mixed Tagging” on page 526.

**Required Privilege Level** interface—To view this statement in the configuration.  
 interface-control—To add this statement to the configuration.

## flow-control

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|                                 |                                                                                                                                                                                                                                                                                                                                                                       |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | (flow-control   no-flow-control);                                                                                                                                                                                                                                                                                                                                     |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> aggregated-ether-options],<br>[edit interfaces <i>interface-name</i> fastether-options],<br>[edit interfaces <i>interface-name</i> gigether-options]                                                                                                                                                                           |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                        |
| <b>Description</b>              | For aggregated Ethernet, Fast Ethernet, and Gigabit Ethernet interfaces only, explicitly enable flow control, which regulates the flow of packets from the routing platform to the remote side of the connection. Enabling flow control is useful when the remote device is a Gigabit Ethernet switch. Flow control is not supported on the 4-port Fast Ethernet PIC. |
| <b>Default</b>                  | Flow control is the default behavior.                                                                                                                                                                                                                                                                                                                                 |
| <b>Usage Guidelines</b>         | See “Configuring Flow Control” on page 520.                                                                                                                                                                                                                                                                                                                           |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                               |

## f-max-period

---

|                                 |                                                                                                                                                                                                                                                                 |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | f-max-period <i>number</i> ;                                                                                                                                                                                                                                    |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> compression rtp]                                                                                            |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                  |
| <b>Description</b>              | For all adaptive services interfaces and for ISDN interfaces on J-series Services Routers. Specify the maximum number of compressed packets allowed between the transmission of full headers in a compressed Real-Time Transport Protocol (RTP) traffic stream. |
| <b>Options</b>                  | <i>number</i> —Maximum number of packets. The value can be from 1 through 65535.                                                                                                                                                                                |
| <b>Usage Guidelines</b>         | See “Configuring Bandwidth on Demand” on page 667 and the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                                |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                         |

**force**

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|                                 |                                                                                                                                                                                                                                                                    |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | force (protect   working);                                                                                                                                                                                                                                         |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> sonet-options aps]                                                                                                                                                                                                          |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                     |
| <b>Description</b>              | Perform a forced switch between the protect and working circuits. This statement is honored only if there are no higher-priority reasons to switch. It can be overridden by a signal failure on the protect circuit, thus causing a switch to the working circuit. |
| <b>Options</b>                  | protect—Request the circuit to become the protect circuit.<br><br>working—Request the circuit to become the working circuit.                                                                                                                                       |
| <b>Usage Guidelines</b>         | See “Configuring Switching Between the Working and Protect Circuits” on page 700.                                                                                                                                                                                  |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                            |
| <b>Related Topics</b>           | request                                                                                                                                                                                                                                                            |

## forwarding-class

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See the following sections:

- forwarding-class (ATM2 IQ Scheduler Maps) on page 852
- forwarding-class (Gigabit Ethernet IQ Classifier) on page 853

### ***forwarding-class (ATM2 IQ Scheduler Maps)***

**Syntax** forwarding-class *class-name* {  
     epd-threshold *cells* plp1 *cells*;  
     linear-red-profile *profile-name*;  
     priority (high | low);  
     transmit-weight (cells *number* | percent *number*);  
 }

**Hierarchy Level** [edit interfaces *at-fpc/pic/port* atm-options scheduler-maps *map-name*]

**Release Information** Statement introduced before JUNOS Release 7.4.

**Description** For ATM2 IQ interfaces only, define forwarding class name and option values.

**Options** *class-name*—Name of forwarding class.

The statements are explained separately.

**Usage Guidelines** See “Configuring ATM2 IQ VC Tunnel CoS Components” on page 315.

**Required Privilege Level** interface—To view this statement in the configuration.  
 interface-control—To add this statement to the configuration.

**Related Topics** forwarding-class statement in the *JUNOS Class of Service Configuration Guide*

**forwarding-class (Gigabit Ethernet IQ Classifier)**

|                                 |                                                                                                                                                      |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | forwarding-class <i>class-name</i> {<br>loss-priority (high   low);<br>}                                                                             |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> gigeether-options ethernet-switch-profile<br>ethernet-policer-profile output-priority-map classifier premium] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                       |
| <b>Description</b>              | For Gigabit Ethernet IQ interfaces only, define forwarding class name and option values.                                                             |
| <b>Options</b>                  | <i>class-name</i> —Name of forwarding class.<br><br>The statements are explained separately.                                                         |
| <b>Usage Guidelines</b>         | See “Specifying an Output Priority Map” on page 610.                                                                                                 |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                              |
| <b>Related Topics</b>           | input-priority-map, forwarding-class statement in the <i>JUNOS Class of Service Configuration Guide</i>                                              |

**fragment-threshold**

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|                                 |                                                                                                                                                                                                                                                                          |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | fragment-threshold <i>bytes</i> ;                                                                                                                                                                                                                                        |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> mlfr-uni-nni-bundle-options],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                           |
| <b>Description</b>              | For multilink, link services, and voice services interfaces, and for J-series Services Routers ISDN interfaces, set the fragmentation threshold.                                                                                                                         |
| <b>Options</b>                  | <i>bytes</i> —Maximum size, in bytes, for multilink packet fragments. Any nonzero value must be a multiple of 64 bytes.<br><b>Range:</b> 128 through 16,320 bytes<br><b>Default:</b> 0 bytes (no fragmentation)                                                          |
| <b>Usage Guidelines</b>         | See “Configuring ISDN Logical Interface Properties” on page 661 and the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                           |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                  |

**frame-error**

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|                                 |                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>frame-error count;</code>                                                                                                                                                                                                                                                                                                                  |
| <b>Hierarchy Level</b>          | [edit protocols oam ethernet link-fault-management action-profile event link-event-rate],<br>[edit protocols oam link-fault-management interface <i>interface-name</i> event-thresholds]                                                                                                                                                         |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.4.                                                                                                                                                                                                                                                                                                       |
| <b>Description</b>              | <p>Threshold for sending frame error events or taking the action specified in the action profile.</p> <p>A frame error is any frame error on the underlying physical layer. The threshold is reached when the number of frame errors reaches the configured value within the window. The default window is 1 second and is not configurable.</p> |
| <b>Options</b>                  | <p><i>count</i>—Threshold count for frame error events.</p> <p><b>Range:</b> 1 through 100</p>                                                                                                                                                                                                                                                   |
| <b>Usage Guidelines</b>         | See “Configuring Threshold Values for Local Fault Events on an Interface” on page 597 and “Configuring Threshold Values for Fault Events in an Action Profile” on page 600.                                                                                                                                                                      |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                               |



## frame-period

---

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | frame-period <i>count</i> ;                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Hierarchy Level</b>          | [edit protocols oam ethernet link-fault-management action-profile event link-event-rate],<br>[edit protocols oam link-fault-management interface <i>interface-name</i> event-thresholds]                                                                                                                                                                                                                                                                                                 |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.4.                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b>              | <p>Threshold for sending frame period error events or taking the action specified in the action profile.</p> <p>A frame error is any frame error on the underlying physical layer. The frame period threshold is reached when the number of frame errors reaches the configured value within the period window. The default period window is the number of minimum-size frames that can be transmitted on the underlying physical layer in 1 second. The window is not configurable.</p> |
| <b>Options</b>                  | <p><i>count</i>—Threshold count for frame period error events.</p> <p><b>Range:</b> 1 through 100</p>                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Usage Guidelines</b>         | See “Configuring Threshold Values for Local Fault Events on an Interface” on page 597 and “Configuring Threshold Values for Fault Events in an Action Profile” on page 600.                                                                                                                                                                                                                                                                                                              |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                                                                                                                                                       |

## frame-period-summary

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | frame-period-summary <i>count</i> ;                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Hierarchy Level</b>          | [edit protocols oam ethernet link-fault-management action-profile event link-event-rate],<br>[edit protocols oam link-fault-management interface <i>interface-name</i> event-thresholds]                                                                                                                                                                                                                                     |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.4.                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Description</b>              | <p>Threshold for sending frame period summary error events or taking the action specified in the action profile.</p> <p>An errored frame second is any 1-second period that has at least one errored frame. This event is generated if the number of errored frame seconds is equal to or greater than the specified threshold for that period window. The default window is 60 seconds. The window is not configurable.</p> |
| <b>Options</b>                  | <p><i>count</i>—Threshold count for frame period summary error events.</p> <p><b>Range:</b> 1 through 100</p>                                                                                                                                                                                                                                                                                                                |
| <b>Usage Guidelines</b>         | See “Configuring Threshold Values for Local Fault Events on an Interface” on page 597 and “Configuring Threshold Values for Fault Events in an Action Profile” on page 600.                                                                                                                                                                                                                                                  |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                                                                                           |

## framing

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See the following sections:

- framing (E1, E3, and T1 Interfaces) on page 857
- framing (10-Gigabit Ethernet Interfaces) on page 858
- framing (SONET and SDH Interfaces) on page 858

### **framing (E1, E3, and T1 Interfaces)**

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | framing (g704   g704-no-crc4   g.751   g.832   unframed   sf   esf);                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Hierarchy Level</b>          | [edit interfaces <i>at-fpc/pic/port</i> e3-options],<br>[edit interfaces <i>e1-fpc/pic/port</i> e1-options],<br>[edit interfaces <i>t1-fpc/pic/port</i> t1-options]                                                                                                                                                                                                                                                                           |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b>              | Configure the framing format.                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Default</b>                  | esf for T1 interfaces; g704 for E1 interfaces. There is no default value for E3 over ATM interfaces.                                                                                                                                                                                                                                                                                                                                          |
| <b>Options</b>                  | <p>esf—Extended superframe (ESF) mode for T1 interfaces.</p> <p>g704—G.704 framing format for E1 interfaces.</p> <p>g704-no-crc4—G.704 framing with no cyclic redundancy check 4 (CRC4) for E1 interfaces.</p> <p>g.751—G.751 framing format for E3 over ATM interfaces.</p> <p>g.832—G.832 framing format for E3 over ATM interfaces.</p> <p>sf—Superframe (SF) mode for T1 interfaces.</p> <p>unframed—Unframed mode for E1 interfaces.</p> |
| <b>Usage Guidelines</b>         | See “Configuring E1 Framing” on page 471, “Configuring E3 and T3 Parameters on ATM Interfaces” on page 313, and “Configuring T1 Framing” on page 490.                                                                                                                                                                                                                                                                                         |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                                                                                                            |

**framing (10-Gigabit Ethernet Interfaces)**

|                                 |                                                                                                                                                                                                                                                                                                                      |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | framing (lan-phy   wan-phy);                                                                                                                                                                                                                                                                                         |
| <b>Hierarchy Level</b>          | [edit interfaces xe-fpc/pic/port]                                                                                                                                                                                                                                                                                    |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.0.                                                                                                                                                                                                                                                                           |
| <b>Description</b>              | For M120, M320, and T-series routers using the 10-Gigabit Ethernet IQ2 PIC, configure the framing format.                                                                                                                                                                                                            |
| <b>Default</b>                  | Operates in LAN PHY mode.                                                                                                                                                                                                                                                                                            |
| <b>Options</b>                  | lan-phy—10GBASE-R interface framing format that bypasses the WIS sublayer to directly stream block-encoded Ethernet frames on a 10-Gigabit Ethernet serial interface.<br><br>wan-phy—10GBASE-W interface framing format that allows 10-Gigabit Ethernet wide area links to use fiber-optic cables and SONET devices. |
| <b>Usage Guidelines</b>         | See “Configuring 10-Gigabit Ethernet Framing” on page 633 and “Configuring SONET Options for 10-Gigabit Ethernet Interfaces” on page 707.                                                                                                                                                                            |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                              |

**framing (SONET and SDH Interfaces)**

|                                 |                                                                                                                                                                                                                                                             |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | framing (sdh   sonet);                                                                                                                                                                                                                                      |
| <b>Hierarchy Level</b>          | [edit interfaces so-fpc/pic/port]                                                                                                                                                                                                                           |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.1.                                                                                                                                                                                                                  |
| <b>Description</b>              | For the 4-port OC48 PIC with SFP installed and the 4-port OC192 PIC in T-series and M-series routing platforms, configure SONET or SDH framing on a per-port basis. This functionality allows you to mix SONET and SDH modes on interfaces on the same PIC. |
| <b>Options</b>                  | sdh—SDH framing.<br><br>sonet—SONET framing.                                                                                                                                                                                                                |
| <b>Usage Guidelines</b>         | See “Configuring SONET/SDH Framing” on page 682.                                                                                                                                                                                                            |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                     |

**gigether-options**

```

Syntax gigether-options {
 802.3ad {
 aex (primary | backup);
 lacp {
 port-priority;
 }
 }
 (asynchronous-notification | no-asynchronous-notification);
 auto-negotiation | no-auto-negotiation) remote-fault
 <local-interface-online | local-interface-offline>
 (flow-control | no-flow-control);
 ignore-l3-incompletes;
 (loopback | no-loopback);
 mpls {
 pop-all-labels {
 required-depth number;
 }
 }
 source-address-filter {
 mac-address;
 }
 (source-filtering | no-source-filtering);
 ethernet-switch-profile {
 (mac-learn-enable | no-mac-learn-enable);
 tag-protocol-id [tpids];
 ethernet-policer-profile {
 input-priority-map {
 ieee802.1p premium [values];
 }
 output-priority-map {
 classifier {
 premium {
 forwarding-class class-name {
 loss-priority (high | low);
 }
 }
 }
 }
 }
 }
 policer cos-policer-name {
 aggregate {
 bandwidth-limit bps;
 burst-size-limit bytes;
 }
 premium {
 bandwidth-limit bps;
 burst-size-limit bytes;
 }
 }
 }

```

|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> ]                                                                                |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                          |
| <b>Description</b>              | Configure Gigabit Ethernet-specific interface properties.<br><br>The statements are explained separately.               |
| <b>Usage Guidelines</b>         | See “Configuring Ethernet Interfaces” on page 511.                                                                      |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |

## gratuitous-arp-reply

---

|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | (gratuitous-arp-reply   no-gratuitous-arp-reply);                                                                       |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> ]                                                                                |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                          |
| <b>Description</b>              | For Ethernet interfaces, enable updating of the ARP cache for replies received in response to gratuitous ARP requests.  |
| <b>Default</b>                  | Updating of the ARP cache is disabled on all Ethernet interfaces.                                                       |
| <b>Options</b>                  | gratuitous-arp-reply—Update the ARP cache.<br><br>no-gratuitous-arp-reply—Do not update the ARP cache.                  |
| <b>Usage Guidelines</b>         | See “Configuring Gratuitous ARP” on page 521.                                                                           |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |
| <b>Related Topics</b>           | no-gratuitous-arp-request                                                                                               |

## hello-timer

---

|                                 |                                                                                                                                                                                               |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | hello-timer <i>milliseconds</i> ;                                                                                                                                                             |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> mlfr-uni-nni-bundle-options]                                                                                                                           |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                |
| <b>Description</b>              | For link services and voice services interfaces only, configure the rate at which hello messages are sent. A hello message is transmitted after a period defined in milliseconds has elapsed. |
| <b>Options</b>                  | <i>milliseconds</i> —The rate at which hello messages are sent.<br><b>Range:</b> 1 through 180 milliseconds<br><b>Default:</b> 10 milliseconds                                                |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                       |
| <b>Related Topics</b>           | address, acknowledge-timer                                                                                                                                                                    |

## high-plp-max-threshold

---

|                                 |                                                                                                                                                                       |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | high-plp-max-threshold <i>percent</i> ;                                                                                                                               |
| <b>Hierarchy Level</b>          | [edit interfaces <i>at-fpc/pic/port</i> atm-options linear-red-profiles <i>profile-name</i> ]                                                                         |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                        |
| <b>Description</b>              | For ATM2 IQ interfaces only, define the drop profile fill-level for the high PLP CoS VC. When the fill level exceeds the defined percentage, all packets are dropped. |
| <b>Options</b>                  | <i>percent</i> —Fill-level percentage when linear random early discard (RED) is applied to cells with PLP.                                                            |
| <b>Usage Guidelines</b>         | See “Configuring ATM2 IQ VC Tunnel CoS Components” on page 315.                                                                                                       |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                               |
| <b>Related Topics</b>           | low-plp-max-threshold, low-plp-threshold, queue-depth                                                                                                                 |

## high-plp-threshold

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|                                 |                                                                                                                                                                                                                                                                      |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>high-plp-threshold percent;</code>                                                                                                                                                                                                                             |
| <b>Hierarchy Level</b>          | <code>[edit interfaces at-fpc/pic/port atm-options linear-red-profiles profile-name]</code>                                                                                                                                                                          |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                       |
| <b>Description</b>              | For ATM2 IQ interfaces only, define CoS VC drop profile fill-level percentage when linear RED is applied to cells with high PLP. When the fill level exceeds the defined percentage, packets with high PLP are randomly dropped by RED. This statement is mandatory. |
| <b>Options</b>                  | <i>percent</i> —Fill-level percentage when linear RED is applied to cells with PLP.                                                                                                                                                                                  |
| <b>Usage Guidelines</b>         | See “Configuring ATM2 IQ VC Tunnel CoS Components” on page 315.                                                                                                                                                                                                      |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                              |
| <b>Related Topics</b>           | high-plp-max-threshold, low-plp-max-threshold, low-plp-threshold, queue-depth                                                                                                                                                                                        |

## hold-interval

---

|                                 |                                                                                                                                                          |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>hold-interval minutes;</code>                                                                                                                      |
| <b>Hierarchy Level</b>          | <code>[edit protocols oam ethernet connectivity-fault-management maintenance-domain domain-name maintenance-association ma-name continuity-check]</code> |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.4.                                                                                                               |
| <b>Description</b>              | The time to wait before flushing the maintenance end point (MEP) database, if no updates occur.                                                          |
| <b>Options</b>                  | <i>minutes</i> —Minutes to wait.                                                                                                                         |
| <b>Usage Guidelines</b>         | See “Configuring the Continuity Check Hold Interval” on page 587.                                                                                        |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                  |



## hold-time

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See the following sections:

- hold-time (APS) on page 863
- hold-time (DLSw) on page 864
- hold-time (Physical Interface) on page 865
- hold-time (SONET/SDH Defect Triggers) on page 866



**NOTE:** For information about the hold-time statement at the [edit interfaces *interface-name* unit *logical-unit-number* family (inet | inet6) address *address* (vrrp-group | vrrp-inet6-group) *group-number* preempt] and [edit logical-systems *logical-system-name* interface *interface-name* unit *logical-unit-number* family (inet | inet6) address *address* (vrrp-group | vrrp-inet6-group) *group-number* preempt], see the *JUNOS High Availability Configuration Guide*.

---

### hold-time (APS)

|                                 |                                                                                                                                                                |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | hold-time <i>milliseconds</i> ;                                                                                                                                |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> sonet-options aps]                                                                                                      |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                 |
| <b>Description</b>              | Hold-time value to use to determine whether a neighbor APS router is operational.                                                                              |
| <b>Options</b>                  | <i>milliseconds</i> —Hold-time value.<br><b>Range:</b> 1 through 65,534 milliseconds<br><b>Default:</b> 3000 milliseconds (3 times the advertisement interval) |
| <b>Usage Guidelines</b>         | See “Configuring APS Timers” on page 703.                                                                                                                      |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                        |
| <b>Related Topics</b>           | advertise-interval                                                                                                                                             |

**hold-time (DLSw)**

|                                 |                                                                                                                                                                                                                                                                                                                  |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | hold-time <i>seconds</i> ;                                                                                                                                                                                                                                                                                       |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family llc2 redundancy-group <i>group-number</i> preempt],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family llc2 redundancy-group <i>group-number</i> preempt] |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 7.5.                                                                                                                                                                                                                                                                       |
| <b>Description</b>              | Hold time before a higher-priority backup router preempts the master router.                                                                                                                                                                                                                                     |
| <b>Default</b>                  | DLSw preemption is not timed.                                                                                                                                                                                                                                                                                    |
| <b>Options</b>                  | <i>seconds</i> —Hold-time period.<br><b>Range:</b> 0 through 3600<br><b>Default:</b> 0 seconds (DLSw preemption is not timed.)                                                                                                                                                                                   |
| <b>Usage Guidelines</b>         | See “Configuring DLSw Ethernet Redundancy Using LLC2 Properties” on page 168.                                                                                                                                                                                                                                    |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                          |

**hold-time (Physical Interface)**

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | hold-time up <i>milliseconds</i> down <i>milliseconds</i> ;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Description</b>              | Hold-time value to use to damp interface transitions. When an interface goes from up to down, it is not advertised to the rest of the system as being down until it has remained down for the hold-time period. Similarly, an interface is not advertised as being up until it has remained up for the hold-time period.                                                                                                                                                                                                                                                                                                                                                            |
| <b>Default</b>                  | Interface transitions are not damped.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Options</b>                  | <p>down <i>milliseconds</i>—Hold time to use when an interface transitions from up to down. The JUNOS software advertises the transition within 100 milliseconds of the time value you specify.</p> <p><b>Range:</b> 0 through 4,294,967,295 milliseconds</p> <p><b>Default:</b> 0 milliseconds (interface transitions are not damped)</p> <p>up <i>milliseconds</i>—Hold time to use when an interface transitions from down to up. The JUNOS software advertises the transition within 100 milliseconds of the time value you specify.</p> <p><b>Range:</b> 0 through 4,294,967,295 milliseconds</p> <p><b>Default:</b> 0 milliseconds (interface transitions are not damped)</p> |
| <b>Usage Guidelines</b>         | See “Damping Interface Transitions” on page 128.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Related Topics</b>           | advertise-interval                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

**hold-time (SONET/SDH Defect Triggers)**

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | hold-time up <i>milliseconds</i> down <i>milliseconds</i> ;                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Hierarchy Level</b>          | [edit interface <i>interface-name</i> sonet-options trigger <i>defect</i> ]                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b>              | For ATM over SONET/SDH and SONET/SDH interfaces only, apply up and down hold times to SONET/SDH defect triggers. When you apply a down hold time to a defect, the defect must remain present for at least the hold-time period before the interface is marked down. When you apply an up hold time to a defect, the defect must remain absent for at least the hold-time period before the interface is marked up, assuming no other defect is outstanding. |
| <b>Default</b>                  | If you do not include this statement, when a defect is detected the interface is marked down immediately, and when the defect becomes absent the interface is marked up immediately.                                                                                                                                                                                                                                                                        |
| <b>Options</b>                  | <p>down <i>milliseconds</i>—Hold time to wait before the interface is marked down.</p> <p><b>Range:</b> 1 through 65,534 milliseconds</p> <p><b>Default:</b> No hold time</p> <p>up <i>milliseconds</i>—Hold time to wait before the interface is marked up.</p> <p><b>Range:</b> 1 through 65,534 milliseconds</p> <p><b>Default:</b> No hold time</p>                                                                                                     |
| <b>Usage Guidelines</b>         | See “Configuring SONET/SDH Defect Hold Times” on page 692.                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                                                                                                                          |

## host

---

**Syntax**    `host hostname {  
             facility-override;  
             log-prefix prefix-number;  
             services priority-level;  
             }`

**Hierarchy Level**    [edit interfaces *interface-name* services-options syslog]

**Release Information**    Statement introduced before JUNOS Release 7.4.

**Description**    Specify hostname for system logging utility.

**Options**    *hostname*—Name of system logging utility host machine.

The remaining statements are explained separately.

**Usage Guidelines**    See the *JUNOS Services Interfaces Configuration Guide*.

**Required Privilege Level**    interface—To view this statement in the configuration.  
                                 interface-control—To add this statement to the configuration.

## idle-cycle-flag

---

|                                 |                                                                                                                                                                                                                                                                                                                                            |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>idle-cycle-flag value;</code>                                                                                                                                                                                                                                                                                                        |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> ds0-options],<br>[edit interfaces <i>interface-name</i> e1-options],<br>[edit interfaces <i>interface-name</i> e3-options],<br>[edit interfaces <i>interface-name</i> serial-options],<br>[edit interfaces <i>interface-name</i> t1-options],<br>[edit interfaces <i>interface-name</i> t3-options] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                             |
| <b>Description</b>              | Configure the value that the DS0, E1, E3, T1, or T3 interface transmits during idle cycles.                                                                                                                                                                                                                                                |
| <b>Options</b>                  | <p><i>value</i>—Value to transmit in the idle cycles:</p> <ul style="list-style-type: none"> <li>■ <b>flags</b>—Transmit the value 0x7E.</li> <li>■ <b>ones</b>—Transmit the value 0xFF (all ones).</li> </ul> <p><b>Default:</b> Flags</p>                                                                                                |
| <b>Usage Guidelines</b>         | See “Configuring the E1 Idle Cycle Flag” on page 472, “Configuring the E3 Idle Cycle Flag” on page 481, “Configuring the T1 Idle Cycle Flag” on page 492, and “Configuring the T3 Idle Cycle Flag” on page 501.                                                                                                                            |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                         |

## idle-time

---

|                                 |                                                                                                                                                                                                                        |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>idle-time time;</code>                                                                                                                                                                                           |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family llc2],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family llc2] |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 7.4.                                                                                                                                                                             |
| <b>Description</b>              | For J-series Services Routers only. On Ethernet interfaces configured for DLSw, configure the time for which a TCP connection between DLSw peers will stay up without any circuit using the connection.                |
| <b>Options</b>                  | <i>time</i> —Number of seconds.<br><b>Range:</b> 1 through 60000 seconds<br><b>Default:</b> 10 seconds                                                                                                                 |
| <b>Usage Guidelines</b>         | See “Configuring LLC2 Options” on page 167.                                                                                                                                                                            |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                |
| <b>Related Topics</b>           | <i>J-series Services Router Advanced WAN Access Configuration Guide</i>                                                                                                                                                |

## idle-timeout

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|                                 |                                                                                                                                                                                                                                 |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>idle-timeout seconds;</code>                                                                                                                                                                                              |
| <b>Hierarchy Level</b>          | [edit interface <i>dlIn</i> unit <i>logical-unit-number</i> dialer-options]                                                                                                                                                     |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                  |
| <b>Description</b>              | (J-series Services Routers) For ISDN interfaces, configure the number of seconds the link is idle before losing connectivity.                                                                                                   |
| <b>Options</b>                  | <i>seconds</i> —Time for which the connection can remain idle. For interfaces configured to use a filter for traffic, the idle timeout is based on traffic.<br><b>Range:</b> 1 through 429497295<br><b>Default:</b> 120 seconds |
| <b>Usage Guidelines</b>         | See “Configuring ISDN Logical Interface Properties” on page 661.                                                                                                                                                                |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                         |
| <b>Related Topics</b>           | <i>J-series Services Router Basic LAN and WAN Access Configuration Guide</i>                                                                                                                                                    |

## ieee802.1p

---

|                                 |                                                                                                                                   |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | ieee802.1p premium [ <i>values</i> ];                                                                                             |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> gigether-options ethernet-switch-profile ethernet-policer-profile input-priority-map]      |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                    |
| <b>Description</b>              | For Gigabit Ethernet IQ and 10-Gigabit Ethernet interfaces only, configure premium priority values for IEEE 802.1p input traffic. |
| <b>Options</b>                  | <i>values</i> —Define IEEE 802.1p priority values to be treated as premium.<br><b>Range:</b> 0 through 7                          |
| <b>Usage Guidelines</b>         | See “Specifying an Input Priority Map” on page 610.                                                                               |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.           |

## ignore

---

|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | ignore;                                                                                                                 |
| <b>Hierarchy Level</b>          | [edit interface <i>interface-name</i> sonet-options trigger defect]                                                     |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                          |
| <b>Description</b>              | For ATM over SONET/SDH and SONET/SDH interfaces only, ignore a specific SONET/SDH defect trigger.                       |
| <b>Default</b>                  | If you do not include this statement, all defects are honored with no hold time.                                        |
| <b>Usage Guidelines</b>         | See “Configuring SONET/SDH Defect Triggers to Be Ignored” on page 691.                                                  |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |
| <b>Related Topics</b>           | hold-time                                                                                                               |



## ignore-all

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|                                 |                                                                                                                                                                                                              |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | ignore-all;                                                                                                                                                                                                  |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> serial-options dce-options],<br>[edit interfaces <i>interface-name</i> serial-options dte-options]                                                                    |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                               |
| <b>Description</b>              | Ignore all control leads. You can include the <b>ignore-all</b> statement in the configuration only if you do not explicitly enable other signal handling options at the <b>dte-options</b> hierarchy level. |
| <b>Usage Guidelines</b>         | See “Configuring the Serial Signal Handling” on page 247.                                                                                                                                                    |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                      |

## ignore-l3-incompletes

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|                                 |                                                                                                                          |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | ignore-l3-incompletes;                                                                                                   |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> fastether-options],<br>[edit interfaces <i>interface-name</i> gigheter-options]   |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 9.0.                                                                               |
| <b>Description</b>              | Ignore the counting of Layer 3 incomplete errors on Fast Ethernet, Gigabit Ethernet, and 10-Gigabit Ethernet interfaces. |
| <b>Usage Guidelines</b>         | See “Ignoring Layer 3 Incomplete Errors” on page 520                                                                     |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.  |

**ilmi**

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|                                 |                                                                                                                                                                                                                                                                                                                                                            |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | ilmi;                                                                                                                                                                                                                                                                                                                                                      |
| <b>Hierarchy Level</b>          | [edit interfaces <i>at-fpc/pic/port</i> atm-options]                                                                                                                                                                                                                                                                                                       |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                             |
| <b>Description</b>              | Enable the routing platform to communicate with directly attached ATM switches and routers. The routing platform uses the VC 0.16 to communicate with the ATM switch or router. Once configured, you can display the IP address and port number of an ATM switch or router using the <code>show interfaces <i>interface-name</i> switch-id</code> command. |
| <b>Usage Guidelines</b>         | See “Configuring Communication with Directly Attached ATM Switches and Routers” on page 267.                                                                                                                                                                                                                                                               |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                    |
| <b>Related Topics</b>           | show ilmi and show ilmi statistics commands in the <i>JUNOS Interfaces Command Reference</i>                                                                                                                                                                                                                                                               |

**inactivity-timeout**

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|                                 |                                                                                                                                                                                      |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | inactivity-timeout <i>seconds</i> ;                                                                                                                                                  |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> services-options]                                                                                                                             |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                       |
| <b>Description</b>              | For adaptive services interfaces, configure the inactivity timeout period for established flows. The timeout configured in the application protocol definition overrides this value. |
| <b>Options</b>                  | <i>seconds</i> —Timeout period, in seconds.<br><b>Range:</b> 4 through 86,400 seconds<br><b>Default:</b> 30 seconds                                                                  |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                       |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                              |

## incoming-called-number

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|                                 |                                                                                                                                                                                                                                                                                                                                                               |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>incoming-called-number <i>number</i> &lt;reject&gt;;</code>                                                                                                                                                                                                                                                                                             |
| <b>Hierarchy Level</b>          | [edit interfaces <i>br-pim/0/port</i> isdn-options]                                                                                                                                                                                                                                                                                                           |
| <b>Release Information</b>      | Statement introduced on JUNOS Release 7.5.                                                                                                                                                                                                                                                                                                                    |
| <b>Description</b>              | (J-series Services Routers) For interfaces configured for ISDN, screen incoming calls. If the incoming number is configured, the call is accepted. If the reject option is specified with the number, the call is rejected. If no numbers are configured, all calls are accepted.                                                                             |
| <b>Options</b>                  | <p><i>number</i>—(Optional) Incoming caller number. Multiple numbers can be configured, up to a maximum of 30 entries. Only a precise match is a valid match. For example, the configured caller number 1-222-333-4444 or 222-333-4444 will match the incoming caller number 1-222-333-4444.</p> <p><i>reject</i>—(Optional) Rejects the incoming number.</p> |
| <b>Usage Guidelines</b>         | See “Configuring an ISDN Interface to Screen Incoming Calls” on page 661.                                                                                                                                                                                                                                                                                     |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                            |
| <b>Related Topics</b>           | <i>JUNOS Services Interfaces Configuration Guide</i>                                                                                                                                                                                                                                                                                                          |

## incoming-map

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|                                 |                                                                                                                                                                                                        |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>incoming-map {<br/>    caller <i>caller-number</i>   accept-all;<br/>}</code>                                                                                                                    |
| <b>Hierarchy Level</b>          | [edit interfaces <i>dlm</i> unit <i>logical-unit-number</i> dialer-options],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>dlm</i> unit <i>logical-unit-number</i> dialer-options] |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 7.5.                                                                                                                                                             |
| <b>Description</b>              | <p>(J-series Services Routers) For interfaces configured for ISDN, specify the dialer to accept incoming calls.</p> <p>The statements are explained separately.</p>                                    |
| <b>Usage Guidelines</b>         | See “Configuring Dial-In and Callback” on page 670.                                                                                                                                                    |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                     |
| <b>Related Topics</b>           | <i>J-series Services Router Basic LAN and WAN Access Configuration Guide</i>                                                                                                                           |

## indication

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|                                 |                                                                                                                                                                                                                |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | indication (ignore   normal   require);                                                                                                                                                                        |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> serial-options dce-options],<br>[edit interfaces <i>interface-name</i> serial-options dte-options]                                                                      |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                 |
| <b>Description</b>              | For X.21 interfaces only, configure the from-DCE signal indication.                                                                                                                                            |
| <b>Options</b>                  | ignore—The from-DCE signal is ignored.<br><br>normal—Normal indication signal handling as defined by ITU-T Recommendation X.21.<br><br>require—The from-DCE signal must be asserted.<br><b>Default:</b> normal |
| <b>Usage Guidelines</b>         | See “Configuring the Serial Signal Handling” on page 247.                                                                                                                                                      |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                        |

## indication-polarity

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|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | indication-polarity (negative   positive);                                                                              |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> serial-options]                                                                  |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                          |
| <b>Description</b>              | For X.21 interfaces only, configure the indication signal polarity.                                                     |
| <b>Options</b>                  | positive—Positive signal polarity.<br><br>negative—Negative signal polarity.<br><b>Default:</b> positive                |
| <b>Usage Guidelines</b>         | See “Configuring Serial Signal Polarities” on page 250.                                                                 |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |

## ingress-rate-limit

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|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | ingress-rate-limit <i>rate</i> ;                                                                                        |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> fastether-options]                                                               |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                          |
| <b>Description</b>              | Perform port-based rate limiting on ingress traffic arriving on Fast Ethernet 8-port, 12-port, and 48-port PICs.        |
| <b>Options</b>                  | <i>rate</i> —Traffic rate, in megabits per second (Mbps).<br><b>Range:</b> 1 through 100 Mbps.                          |
| <b>Usage Guidelines</b>         | See “Configuring the Ingress Rate Limit” on page 523.                                                                   |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |

## init-command-string

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|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>init-command-string <i>initialization-command-string</i>;</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Hierarchy Level</b>          | [edit interfaces umd0 modem-options]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.2.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b>              | <p>For J-series Services Routers, configure the command string used to initialize the USB modem.</p> <p>When you connect the USB modem to the USB port on a Services Router, the router applies the modem AT commands configured in the <code>init-command-string</code> command to the initialization commands on the modem.</p> <p>For example, the initialization command string <code>ATSO = 2\n</code> configures the USB modem to pick up a call after 2 rings.</p> <p>If you do not include the <code>init-command-string</code> statement, the router applies the default initialization string to the modem.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Options</b>                  | <p><i>initialization-command-string</i>—Specify an initialization command string using the following AT command values:</p> <ul style="list-style-type: none"> <li>■ <code>%C0</code>—Disables data compression.</li> <li>■ <code>&amp;C1</code>—Disables reset of the modem when it loses the carrier signal.</li> <li>■ <code>&amp;Q8</code>—Enables Microcom Networking Protocol (MNP) error control mode.</li> <li>■ <code>AT</code>—Attention. Informs the modem that a command follows.</li> <li>■ <code>E0</code>—Disables the display on the local terminal of commands issued to the modem from the local terminal.</li> <li>■ <code>Q0</code>—Enables the display of result codes.</li> <li>■ <code>S0=0</code>—Disables the auto-answer feature, whereby the modem automatically answers calls.</li> <li>■ <code>S7=45</code>—Instructs the modem to wait 45 seconds for a telecommunications service provider (carrier) signal before terminating the call.</li> <li>■ <code>V1</code>—Displays result codes as words.</li> </ul> <p><b>Default:</b> <code>AT S7 = 45 S0 = 0 V1 X4 &amp;C1 E0 Q0 &amp;Q8 %C0</code></p> |
| <b>Usage Guidelines</b>         | See “Specifying a USB Modem Interface on J-series Routers” on page 85.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

## initial-route-check

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|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>initial-route-check seconds;</code>                                                                                                                                               |
| <b>Hierarchy Level</b>          | <code>[edit interface dln unit logical-unit-number dialer-options]</code>                                                                                                               |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                          |
| <b>Description</b>              | (J-series Services Routers) For ISDN interfaces, allows the router to check whether the primary route is up after the initial startup of the router is complete and the timer expires.  |
| <b>Options</b>                  | <p><b>seconds</b>—How long to wait to check if the primary interface is up after the router comes up.</p> <p><b>Range:</b> 1 through 300 seconds</p> <p><b>Default:</b> 120 seconds</p> |
| <b>Usage Guidelines</b>         | See “Configuring ISDN Interfaces” on page 657.                                                                                                                                          |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                      |
| <b>Related Topics</b>           | <i>J-series Services Router Basic LAN and WAN Access Configuration Guide</i>                                                                                                            |

## inner-tag-protocol-id

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>inner-tag-protocol-id tpid;</code>                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Hierarchy Level</b>          | <p><code>[edit interfaces interface-name unit logical-unit-number input-vlan-map],</code><br/> <code>[edit interfaces interface-name unit logical-unit-number output-vlan-map],</code><br/> <code>[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number input-vlan-map],</code><br/> <code>[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number output-vlan-map]</code></p>                |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.1.                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b>              | For Gigabit Ethernet IQ and IQ2 interfaces, and for aggregated Ethernet interfaces using Gigabit Ethernet IQ2 or 10-Gigabit Ethernet PICs on MX-series routing platforms, configure the IEEE 802.1Q TPID value to rewrite for the inner tag. All TPIDs you include in input and output VLAN maps must be among those you specify at the <code>[edit interfaces interface-name gigether-options ethernet-switch-profile tag-protocol-id [ tpids ]]</code> hierarchy level. |
| <b>Default</b>                  | If the <code>inner-tag-protocol-id</code> statement is not configured, the TPID value is 0x8100.                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Usage Guidelines</b>         | See “Configuring Inner and Outer TPIDs and VLAN IDs” on page 551.                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                                                                                                                                        |

## inner-vlan-id

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>inner-vlan-id <i>number</i>;</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> input-vlan-map],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> output-vlan-map],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i><br>input-vlan-map],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i><br>output-vlan-map]                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.1.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b>              | <p>For Gigabit Ethernet IQ and IQ2 interfaces, and for aggregated Ethernet interfaces using Gigabit Ethernet IQ2 or 10-Gigabit Ethernet PICs on MX-series routing platforms, specify the VLAN ID to rewrite for the inner tag of the final packet.</p> <p>You cannot include the <code>inner-vlan-id</code> statement with the <code>swap</code> statement, <code>swap-push</code> statement, <code>push-push</code> statement, or <code>push-swap</code> statement and the <code>inner-vlan-id</code> statement at the [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> output-vlan-map] hierarchy level. If you include any of those statements in the output VLAN map, the VLAN ID in the outgoing frame is rewritten to the <code>inner-vlan-id</code> statement you include at the [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i>] hierarchy level.</p> |
| <b>Options</b>                  | <p><i>number</i>—VLAN ID number.</p> <p><b>Range:</b> 0 through 4094</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Usage Guidelines</b>         | See “Configuring Inner and Outer TPIDs and VLAN IDs” on page 551.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |



## inner-vlan-id-range

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|                                 |                                                                                                                                                                                                   |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>inner-vlan-id-range start <i>start-id</i> end <i>end-id</i>;</code>                                                                                                                         |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ], |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 9.0.                                                                                                                                                        |
| <b>Description</b>              | The range of VLAN IDs to be used in the ATM-to-Ethernet interworking cross-connect. Specify the starting VLAN ID and ending VLAN ID.                                                              |
| <b>Options</b>                  | <code>start-id</code> —The lowest VLAN ID to be used.<br><br><code>end-id</code> —The highest VLAN ID to be used.<br><b>Range:</b> 32 through 4094                                                |
| <b>Usage Guidelines</b>         | See “Configuring ATM-to-Ethernet Interworking” on page 210.                                                                                                                                       |
| <b>Required Privilege Level</b> | <code>interface</code> —To view this statement in the configuration.<br><code>interface-control</code> —To add this statement to the configuration.                                               |

## input

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|                                 |                                                                                                                                                                                                                                       |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>input {<br/>    service-set <i>service-set-name</i> &lt;service-filter <i>filter-name</i>&gt;;<br/>    post-service-filter <i>filter-name</i>;<br/>}</code>                                                                     |
| <b>Hierarchy Level</b>          | [edit interface <i>interface-name</i> unit <i>logical-unit-number</i> family inet service],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet service] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                        |
| <b>Description</b>              | Define one or more input service sets and filters, and one postservice filter to be applied to traffic.                                                                                                                               |
| <b>Options</b>                  | The remaining statements are explained separately.                                                                                                                                                                                    |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                                                        |
| <b>Required Privilege Level</b> | <code>interface</code> —To view this statement in the configuration.<br><code>interface-control</code> —To add this statement to the configuration.                                                                                   |

## input-list

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|                                 |                                                                                                                                                                                                                                                           |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | input-list;<br>[ <i>filter-names</i> ];                                                                                                                                                                                                                   |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family <i>family</i> filter],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i><br>family <i>family</i> filter] |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 7.6.                                                                                                                                                                                                                |
| <b>Description</b>              | Apply a group of filters to evaluate when packets are received on an interface.                                                                                                                                                                           |
| <b>Options</b>                  | [ <i>filter-names</i> ]—Name of a filter to evaluate when packets are received on the interface. Up to 16 filters can be included in a filter input list.                                                                                                 |
| <b>Usage Guidelines</b>         | See “Applying a Filter to an Interface” on page 184 and the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                        |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                   |
| <b>Related Topics</b>           | output-list, output-list, <i>JUNOS Policy Framework Configuration Guide</i> , <i>JUNOS System Basics Configuration Guide</i>                                                                                                                              |

## input-policer

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|                                 |                                                                                                                                  |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | input-policer <i>policer-name</i> ;                                                                                              |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> layer2-policer]                                           |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.2.                                                                                       |
| <b>Description</b>              | Associate a Layer 2 policer with a logical interface. The input-policer and input-three-color statements are mutually exclusive. |
| <b>Options</b>                  | <i>policer-name</i> —Name of the policer that you define at the [edit firewall] hierarchy level.                                 |
| <b>Usage Guidelines</b>         | See “Applying a Policer” on page 611.                                                                                            |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.          |
| <b>Related Topics</b>           | output-policer                                                                                                                   |

## input-priority-map

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|                                 |                                                                                                                                                                                                            |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | input-priority-map {<br>ieee802.1p premium [ <i>values</i> ];<br>}                                                                                                                                         |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> together-options ethernet-switch-profile<br>ethernet-policer-profile]                                                                                               |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                             |
| <b>Description</b>              | For Gigabit Ethernet IQ and 10-Gigabit Ethernet interfaces only, define the input policer priority map to be applied to incoming frames on this interface.<br><br>The statements are explained separately. |
| <b>Usage Guidelines</b>         | See “Specifying an Input Priority Map” on page 610.                                                                                                                                                        |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                    |
| <b>Related Topics</b>           | output-priority-map                                                                                                                                                                                        |

## input-three-color

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|                                 |                                                                                                                                               |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | input-three-color <i>policer-name</i> ;                                                                                                       |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> layer2-policer]                                                        |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.2.                                                                                                    |
| <b>Description</b>              | Associate a Layer 2, three-color policer with a logical interface. The input-three-color and input-policer statements are mutually exclusive. |
| <b>Options</b>                  | <i>policer-name</i> —Name of the three-color policer that you define at the [edit firewall] hierarchy level.                                  |
| <b>Usage Guidelines</b>         | See “Applying a Policer” on page 611.                                                                                                         |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                       |
| <b>Related Topics</b>           | output-three-color                                                                                                                            |

## input-vlan-map

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See the following sections:

- input-vlan-map (Gigabit Ethernet IQ) on page 882
- input-vlan-map (Aggregated Ethernet) on page 883

### ***input-vlan-map (Gigabit Ethernet IQ)***

**Syntax** input-vlan-map {  
     (pop | pop-pop | pop-swap | push | push-push | swap | swap-push | swap-swap);  
     inner-tag-protocol-id *tpid*;  
     inner-vlan-id *number*;  
     tag-protocol-id *tpid*;  
     vlan-id *number*;  
 }

**Hierarchy Level** [edit interfaces *interface-name* unit *logical-unit-number*],  
 [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

**Release Information** Statement introduced before JUNOS Release 7.4.  
 pop-pop, pop-swap, push-push, swap-push, and swap-swap statements introduced in JUNOS Release 8.1.

**Description** For Gigabit Ethernet IQ interfaces only, define the rewrite profile to be applied to incoming frames on this logical interface.

The statements are explained separately.

**Usage Guidelines** See “Stacking a VLAN Tag” on page 554.

**Required Privilege Level** interface—To view this statement in the configuration.  
 interface-control—To add this statement to the configuration.

**Related Topics** output-vlan-map

***input-vlan-map (Aggregated Ethernet)***

|                                 |                                                                                                                                                                                                                                                  |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | input-vlan-map {<br>(pop   push   swap);<br>tag-protocol-id <i>tpid</i> ;<br>vlan-id <i>number</i> ;<br>}                                                                                                                                        |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ]                                                 |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.2.                                                                                                                                                                                                       |
| <b>Description</b>              | For aggregated Ethernet interfaces using Gigabit Ethernet IQ and 10-Gigabit Ethernet IQ2 interfaces only, define the rewrite profile to be applied to incoming frames on this logical interface.<br><br>The statements are explained separately. |
| <b>Usage Guidelines</b>         | See “Stacking a VLAN Tag” on page 554.                                                                                                                                                                                                           |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                          |
| <b>Related Topics</b>           | output-vlan-map                                                                                                                                                                                                                                  |

## interface

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See the following sections:

- interface (DLSw Ethernet Redundancy) on page 884
- interface (Hierarchical CoS Schedulers) on page 885
- interface (IEEE 802.1ag OAM Connectivity-Fault Management) on page 885
- interface (IEEE 802.3ah OAM Link-Fault Management) on page 886



**NOTE:** For information about the `interface` statement available at the [edit interfaces *interface-name* unit *logical-unit-number* family (inet | inet6) address *address* (vrrp-group | vrrp-inet6-group) *group-number* track] and [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family (inet | inet6) address *address* (vrrp-group | vrrp-inet6-group) *group-number* track] hierarchy levels, see the *JUNOS High Availability Configuration Guide*.

---

### interface (DLSw Ethernet Redundancy)

|                                 |                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | interface <i>interface-name</i> priority-cost <i>cost</i> ;                                                                                                                                                                                                                                                                                                  |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family llc2 redundancy-group <i>group-number</i> track],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family llc2 redundancy-group <i>group-number</i> track]                                                 |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 7.5.                                                                                                                                                                                                                                                                                                                   |
| <b>Description</b>              | For J-series Services Routers only, on Ethernet interfaces configured for DLSw Ethernet redundancy, enable tracking options for an interface.                                                                                                                                                                                                                |
| <b>Options</b>                  | <p><i>interface-name</i>—Interface name. Include the logical portion of the name, which corresponds to the logical unit number. The statements are explained separately.</p> <p><i>priority-cost cost</i>—Cost value that is subtracted from the priority value when remote peer connectivity is lost. Specify a value from <b>1</b> through <b>254</b>.</p> |
| <b>Usage Guidelines</b>         | See “Configuring DLSw Ethernet Redundancy Using LLC2 Properties” on page 168.                                                                                                                                                                                                                                                                                |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                           |
| <b>Related Topics</b>           | <i>JUNOS Services Interfaces Configuration Guide</i>                                                                                                                                                                                                                                                                                                         |

**interface (Hierarchical CoS Schedulers)**

|                                 |                                                                                                                                   |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | interface <i>interface-name</i> ;                                                                                                 |
| <b>Hierarchy Level</b>          | [edit interfaces interface-set (Ethernet Interfaces) <i>interface-set-name</i> ]                                                  |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.5.                                                                                        |
| <b>Description</b>              | Interface that is a member of the interface set. Supported on Ethernet interfaces and IP demux interfaces on an MX-series router. |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Class of Service Configuration Guide</i> .                                                                       |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.           |

**interface (IEEE 802.1ag OAM Connectivity-Fault Management)**

|                                 |                                                                                                                                                             |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | interface <i>interface-name</i> ;                                                                                                                           |
| <b>Hierarchy Level</b>          | [edit protocols oam ethernet connectivity-fault-management maintenance-domain <i>domain-name</i> maintenance-association <i>ma-name</i> mep <i>mep-id</i> ] |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.4.                                                                                                                  |
| <b>Description</b>              | For Ethernet interfaces on M320, MX-series, and T-series routing platforms, configure IEEE 802.1ag Operation, Administration, and Management (OAM) support. |
| <b>Options</b>                  | <i>interface-name</i> —Interface to which the MEP is attached. It could be a physical Ethernet interface or logical Ethernet interface.                     |
| <b>Usage Guidelines</b>         | See “Configuring the Maintenance End Point Interface” on page 588.                                                                                          |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                     |

**interface (IEEE 802.3ah OAM Link-Fault Management)**

**Syntax** interface *interface-name* {  
     apply-action-profile *profile-name*;  
     link-discovery (active | passive);  
     pdu-interval *interval*;  
     pdu-threshold *threshold-value*;  
     remote-loopback;  
     event-thresholds {  
         frame-error *count*;  
         frame-period *count*;  
         frame-period-summary *count*;  
         symbol-period *count*;  
     }  
     negotiation-options {  
         allow-remote-loopback;  
         no-allow-link-events;  
     }  
 }

**Hierarchy Level** [edit protocols oam ethernet link-fault-management]

**Release Information** Statement introduced in JUNOS Release 8.2.

**Description** For Ethernet interfaces on M320, MX-series, and T-series routing platforms, configure IEEE 802.3ah Operation, Administration, and Management (OAM) support.

**Options** interface *interface-name*—Interface to be enabled for IEEE 802.3ah link fault management OAM support.

**Range:** 1 through 10 interfaces can be tracked.

The remaining statements are described separately.

**Usage Guidelines** See “Enabling IEEE 802.3ah OAM Support” on page 596.

**Required Privilege Level** interface—To view this statement in the configuration.  
 interface-control—To add this statement to the configuration.



## interface (IEEE 802.1x (dot1x)—Port-Based Network Access Control)

---

**Syntax** interface *interface-ids* {  
     supplicant *single*;  
     retries *integer*;  
     quiet-period *seconds*;  
     transmit-period *seconds*;  
     reauthentication (disable | interval *seconds*);  
     supplicant-timeout *seconds*;  
     server-timeout *seconds*;  
     maximum-requests *seconds*;  
 }

**Hierarchy Level** [edit protocols dot1x authenticator]

**Release Information** Statement introduced in JUNOS Release 9.3.

**Description** Use this statement to configure the 802.1x Port-Based Network Access Control protocolspecific Ethernet interface options.

**Default** The default values are provided for the options below on the respective statement pages.

**Options** maximum-requests—Specify the maximum number of retransmission times for an EAPOL Request packet to the client before it times out the authentication session.

quiet-period—Specify the number of seconds the port remains in the wait state following a failed authentication exchange with the client, before reattempting the authentication.

reauthentication—Includes two options:

- disable—Periodic reauthentication of the client is disabled.
- interval—Specify the periodic reauthentication time interval.

retries—Specify the number of tries after which the port remains in the wait state for quiet-period seconds before reattempting the authentication.

server-timeout—Specify the number of seconds the port waits for a reply when relaying a response from the client to the authentication server before timing out and invoking the server-fail action.

supplicant (*single*)—Specify supplicant single mode. See the usage guidelines to configure other modes.

supplicant-timeout—Specify the number of seconds the port waits for a response when relaying a request from the authentication server to the client before resending the request.

transmit-period—Specify the number of seconds the port waits before retransmitting the initial EAPOL PDUs to the client.

|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Usage Guidelines</b>         | See “Configuring IEEE 802.1x Port-Based Network Access Control” on page 591,                                            |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |
| <b>Related Topics</b>           | authenticator, dot1x                                                                                                    |

## interfaces

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|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | interfaces { ... }                                                                                                      |
| <b>Hierarchy Level</b>          | [edit]                                                                                                                  |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                          |
| <b>Description</b>              | Configure interfaces on the routing platform.                                                                           |
| <b>Default</b>                  | The management and internal Ethernet interfaces are automatically configured. You must configure all other interfaces.  |
| <b>Usage Guidelines</b>         | See individual chapters.                                                                                                |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |

## interface-down

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|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | interface-down;                                                                                                         |
| <b>Hierarchy Level</b>          | [edit protocols oam ethernet connectivity-fault-management action-profile <i>profile-name</i> default-action]           |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.5.                                                                              |
| <b>Description</b>              | Bring the interface down when a remote MEP connectivity failure is detected.                                            |
| <b>Usage Guidelines</b>         | See “Configuring a CFM Action Profile Action” on page 589.                                                              |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |

## interface-mode

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | interface-mode (access   trunk);                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family bridge],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family bridge]                                                                                                                                                                                                                                                                                                                              |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 9.2.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b>              | Determines whether the logical interface accepts or discards packets based on VLAN tags. Specify the <b>trunk</b> option to accept packets with a VLAN ID that matches the list of VLAN IDs specified in the <b>vlan-id-list</b> statement, then forward the packet within the bridge domain configured with the matching VLAN ID. Specify the <b>access</b> option to accept packets with no VLAN ID, then forward the packet within the bridge domain configured with the VLAN ID that matches the VLAN ID specified in the <b>vlan-id</b> statement. |
| <b>Options</b>                  | <p><b>access</b>—Configure a logical interface to accept untagged packets. Specify the VLAN to which this interface belongs using the <b>vlan-id</b> statement.</p> <p><b>trunk</b>—Configure a single logical interface to accept packets tagged with any VLAN ID specified with the <b>vlan-id-list</b> statement.</p>                                                                                                                                                                                                                                |
| <b>Usage Guidelines</b>         | See “Configuring a Logical Interface for Access Mode” on page 529 and “Configuring a Logical Interface for Trunk Mode” on page 528.                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                                                                                                                                                                                                                      |

## interface-set

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See the following sections:

- [interface-set \(Ethernet Interfaces\)](#) on page 890
- [interface-set \(IP Demux Interfaces\)](#) on page 890

### ***interface-set (Ethernet Interfaces)***

**Syntax**    `interface-set interface-set-name {  
                  interface ethernet-interface-name {  
                    (unit unit-number | vlan-tags-outer vlan-tag);  
                  }  
                }`

**Hierarchy Level**    [edit interfaces]

**Release Information**    Statement introduced in JUNOS Release 8.5.

**Description**    The set of interfaces used to configure hierarchical CoS schedulers on Ethernet interfaces on the MX-series router.

The remaining statements are described separately.

**Usage Guidelines**    See the *JUNOS Class of Service Configuration Guide*.

**Required Privilege Level**    interface—To view this statement in the configuration.  
                                  interface-control—To add this statement to the configuration.

### ***interface-set (IP Demux Interfaces)***

**Syntax**    `interface-set interface-set-name {  
                  interface interface-name {  
                    unit unit-number;  
                  }  
                }`

**Hierarchy Level**    [edit interfaces]

**Release Information**    Statement introduced in JUNOS Release 9.2.

**Description**    The set of interfaces used to configure hierarchical CoS schedulers for subscribers on IP demux interfaces on the MX-series router.

The remaining statements are described separately.

**Usage Guidelines**    See the *JUNOS Subscriber Access Configuration Guide*.

**Required Privilege Level**    interface—To view this statement in the configuration.  
                                  interface-control—To add this statement to the configuration.

## interface-switch

---

|                                 |                                                                                                                                                                                                                                                                                                                                                    |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <pre>interface-switch <i>connection-name</i> {     interface <i>interface-name.unit-number</i>;     interface <i>interface-name.unit-number</i>; }</pre>                                                                                                                                                                                           |
| <b>Hierarchy Level</b>          | [edit protocols connections]                                                                                                                                                                                                                                                                                                                       |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                     |
| <b>Description</b>              | <p>Configure Layer 2 switching cross-connects. The cross-connect is bidirectional, so packets received on the first interface are transmitted out the second interface, and those received on the second interface are transmitted out the first interface.</p> <p>For Layer 2 switching cross-connects to work, you must also configure MPLS.</p> |
| <b>Options</b>                  | <p>interface <i>interface-name.unit-number</i>—Interface name. Include the logical portion of the name, which corresponds to the logical unit number.</p>                                                                                                                                                                                          |
| <b>Usage Guidelines</b>         | See “Defining the Connection for Switching Cross-Connects” on page 208.                                                                                                                                                                                                                                                                            |
| <b>Required Privilege Level</b> | <p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                     |
| <b>Related Topics</b>           | <i>JUNOS MPLS Applications Configuration Guide</i>                                                                                                                                                                                                                                                                                                 |

## interface-type

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|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>              | interface-type (bc   coc1   ct1   ct3   dc   ds   so   t1   t3);                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Hierarchy Level</b>     | [edit interfaces <i>interface-name</i> no-partition],<br>[edit interfaces <i>interface-name</i> partition <i>partition-number</i> ],<br>[edit interfaces <i>interface-name</i> partition <i>partition-number</i> oc-slice <i>oc-slice-range</i> ],<br>[edit interfaces <i>interface-name</i> partition <i>partition-number</i> timeslot <i>timeslot-range</i> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Release Information</b> | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Description</b>         | For IQ interfaces only, configure the sublevel interface type.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Options</b>             | <p><b>bc</b>—Dual—Port Channelized E1 and T1 ISDN PRI interface type. You can specify this interface type at the [edit interfaces <i>interface-name</i> partition <i>partition-number</i> timeslot <i>timeslot-range</i>] hierarchy level to create a bearer (B) channel <i>bc-pim/O/portchannel</i> interface for each time you want to function as an ISDN PRI B-channel.</p> <p><b>coc1</b>—Channelized OC1 interface type. You can specify this interface type at the [edit interfaces <i>interface-name</i> partition <i>partition-number</i> oc-slice <i>oc-slice-range</i> interface-type <i>coc12-fpc/pic/port</i>] hierarchy level.</p> <p><b>ct1</b>—Channelized T1 interface type. You can specify this interface type at the [edit interfaces <i>interface-name</i> partition <i>partition-number</i> interface-type <i>ct3-fpc/pic/port&lt;:channel&gt;</i>] hierarchy level.</p> <p><b>ct3</b>—Channelized T3 interface type. You can specify this interface type at the [edit interfaces <i>interface-name</i> partition <i>partition-number</i> oc-slice <i>oc-slice-range</i> interface-type <i>coc1-fpc/pic/port:channel</i> no-partition] hierarchy level.</p> <p><b>dc</b>—Dual-Port Channelized E1 and T1 ISDN PRI interface type. You can specify this interface type at the [edit interfaces <i>interface-name</i> partition <i>partition-number</i> timeslot <i>timeslot-range</i>] hierarchy level to create a (D) channel <i>dc-pim/O/port</i> to control the B-channels.</p> <p><b>ds</b>—DS0 interface type. You can specify this interface type at the [edit interfaces <i>interface-name</i> partition <i>partition-number</i> interface-type (<i>ce1-fpc/pic/port</i>   <i>ct1-fpc/pic/port&lt;:channel&gt;</i>)] hierarchy level.</p> <p><b>so</b>—SONET/SDH interface type. You can specify this interface type at the [edit interfaces <i>interface-name</i> partition <i>partition-number</i> oc-slice <i>oc-slice-range</i> interface-type <i>coc12-fpc/pic/port</i>] hierarchy level.</p> <p><b>t1</b>—T1 interface type. You can specify this interface type at the [edit interfaces <i>interface-name</i> partition <i>partition-number</i> oc-slice <i>oc-slice-range</i> interface-type (<i>coc12-fpc/pic/port</i>   <i>coc1-fpc/pic/port</i>)] hierarchy level.</p> <p><b>t3</b>—T3 interface type. You can specify this interface type at the [edit interfaces <i>interface-name</i> partition <i>partition-number</i> oc-slice <i>oc-slice-range</i> interface-type (<i>coc12-fpc/pic/port</i>   <i>coc1-fpc/pic/port:channel</i> no-partition)] hierarchy level.</p> |

**Usage Guidelines** See “Configuring Channelized E1 Interfaces” on page 377, “Configuring Channelized OC12 Interfaces” on page 401, and “Configuring Channelized T3 Interfaces” on page 443.

**Required Privilege Level** interface—To view this statement in the configuration.  
interface-control—To add this statement to the configuration.

## interleave-fragments

---

**Syntax** interleave-fragments;

**Hierarchy Level** [edit interfaces *interface-name* unit *logical-unit-number*],  
[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

**Release Information** Statement introduced before JUNOS Release 7.4.

**Description** For link services interfaces only, interleave long packets with high-priority packets.  
  
Allows small delay-sensitive packets, such as Voice over IP (VoIP) packets, to interleave with long fragmented packets. This minimizes the latency of delay-sensitive packets.

**Usage Guidelines** See the *JUNOS Services Interfaces Configuration Guide*.

**Required Privilege Level** interface—To view this statement in the configuration.  
interface-control—To add this statement to the configuration.

## interval

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|                                 |                                                                                                                                                           |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | interval (10m   10s   1m   1s   100ms   10ms);                                                                                                            |
| <b>Hierarchy Level</b>          | [edit protocols oam ethernet connectivity-fault-management maintenance-domain <i>domain-name</i> maintenance-association <i>ma-name</i> continuity-check] |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.4.<br>Ten milliseconds option introduced in JUNOS Release 9.1.                                                    |
| <b>Description</b>              | The time between continuity check messages.                                                                                                               |
| <b>Options</b>                  | 10m—10 minutes.<br><br>10s—10 seconds.<br><br>1m—1 minute.<br><br>1s—1 second.<br><br>100ms—100 milliseconds.<br><br>10ms—10 milliseconds.                |
| <b>Usage Guidelines</b>         | See “Configuring the Continuity Check Interval” on page 587.                                                                                              |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                   |



## inverse-arp

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | inverse-arp;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet address <i>address</i> multipoint-destination <i>destination</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet address <i>address</i> multipoint-destination <i>destination</i> ] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b>              | For ATM encapsulation, enable responses to received inverse ATM ARP requests. For Frame Relay encapsulation, enable responses to received inverse Frame Relay ARP requests.                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Default</b>                  | Inverse ARP is disabled on all ATM and Frame Relay interfaces.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Usage Guidelines</b>         | See “Configuring Inverse ATM1 or ATM2 ARP” on page 294 or “Configuring Inverse Frame Relay ARP” on page 355.                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                         |

## invert-data

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|                                 |                                                                                                                                                                                                                          |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | invert-data;                                                                                                                                                                                                             |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> ds0-options],<br>[edit interfaces <i>interface-name</i> e1-options],<br>[edit interfaces <i>interface-name</i> t1-options],<br>[edit interfaces <i>interface-name</i> e3-options] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                           |
| <b>Description</b>              | Invert the transmission of unused data bits on the DS0, E1, E3, and T1 interface.                                                                                                                                        |
| <b>Usage Guidelines</b>         | See “Configuring E1 Data Inversion” on page 472, “Configuring E3 Data Inversion” on page 481, and “Configuring T1 Data Inversion” on page 489.                                                                           |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                  |

## ipsec-sa

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|                                 |                                                                                                                                                                                                                          |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>ipsec-sa sa-name;</code>                                                                                                                                                                                           |
| <b>Hierarchy Level</b>          | [edit interfaces <i>es-fpc/pic/port</i> unit <i>logical-unit-number</i> family inet],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>es-fpc/pic/port</i> unit <i>logical-unit-number</i> family inet] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                           |
| <b>Description</b>              | Specify the Internet Protocol security architecture (IPSec) security association (SA) name associated with the interface.                                                                                                |
| <b>Options</b>                  | <i>sa-name</i> —IPSec security association name.                                                                                                                                                                         |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                                           |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                  |
| <b>Related Topics</b>           | <i>JUNOS System Basics Configuration Guide</i>                                                                                                                                                                           |

## isdn-options

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <pre>isdn-options {     bchannel-allocation (ascending   descending);     calling-number <i>number</i>;     incoming-called-number <i>number</i> &lt;reject&gt;;     spid1 <i>spid-string</i>;     spid2 <i>spid-string</i>;     static-tei-val <i>value</i>;     switch-type (att5e   etsi   ni1   ntdms100   ntt);     t310 <i>seconds</i>;     tei-option (first-call   power-up); }</pre> |
| <b>Hierarchy Level</b>          | [edit interfaces <i>br-pim</i> /0/ <i>port</i> ],<br>[edit interfaces <i>ct1-pim</i> /0/ <i>port</i> ],<br>[edit interfaces <i>ce1-pim</i> /0/ <i>port</i> ]                                                                                                                                                                                                                                  |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.<br>bchannel-allocation option added in JUNOS Release 8.3                                                                                                                                                                                                                                                                                       |
| <b>Description</b>              | <p>For J-series Services Routers only. Specify the ISDN options for configuring ISDN interfaces for group and user sessions.</p> <p>The statements are explained separately.</p>                                                                                                                                                                                                              |
| <b>Usage Guidelines</b>         | See “Configuring ISDN Physical Interface Properties” on page 659 and “Allocating B-Channels for Dialout” on page 389.                                                                                                                                                                                                                                                                         |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                       |
| <b>Related Topics</b>           | <i>J-series Services Router Basic LAN and WAN Access Configuration Guide</i>                                                                                                                                                                                                                                                                                                                  |

## keep-address-and-control

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|                                 |                                                                                                                                                                                                                      |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | keep-address-and-control;                                                                                                                                                                                            |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family ccc],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family ccc] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                       |
| <b>Description</b>              | For interfaces with encapsulation type PPP CCC, do not remove the address and control bytes before encapsulating the packet into a tunnel.                                                                           |
| <b>Default</b>                  | If you do not include this statement, address and control bytes are removed before encapsulating the packet into a tunnel.                                                                                           |
| <b>Usage Guidelines</b>         | See “Disabling the Removal of Address and Control Bytes” on page 178.                                                                                                                                                |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                              |

## keepalives

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | keepalives <interval seconds> <down-count <i>number</i> > <up-count <i>number</i> >;                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> ],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ]                                                                                                                                                                                                                                                                                                                     |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Description</b>              | <p>Enable the sending of keepalives on a physical interface configured with PPP, Frame Relay, or Cisco HDLC encapsulation.</p> <p>For ATM2 IQ interfaces only, you can enable keepalives on a logical interface unit if the logical interface is configured with one of the following PPP over ATM encapsulation types:</p> <ul style="list-style-type: none"> <li>■ atm-ppp-llc—PPP over AAL5 LLC encapsulation.</li> <li>■ atm-ppp-vc-mux—PPP over AAL5 multiplex encapsulation.</li> </ul>                                                                     |
| <b>Default</b>                  | Sending of keepalives is enabled by default. The default keepalive interval is 10 seconds for PPP, Frame Relay, or Cisco HDLC. The default down-count is 3 and the default up-count is 1 for PPP or Cisco HDLC.                                                                                                                                                                                                                                                                                                                                                   |
| <b>Options</b>                  | <p>down-count <i>number</i>—The number of keepalive packets a destination must fail to receive before the network takes down a link.<br/> <b>Range:</b> 1 through 255<br/> <b>Default:</b> 3</p> <p>interval <i>seconds</i>—The time in seconds between successive keepalive requests.<br/> <b>Range:</b> 1 through 32767 seconds<br/> <b>Default:</b> 10 seconds</p> <p>up-count <i>number</i>—The number of keepalive packets a destination must receive to change a link's status from down to up.<br/> <b>Range:</b> 1 through 255<br/> <b>Default:</b> 1</p> |
| <b>Usage Guidelines</b>         | See “Configuring Keepalives” on page 118 or “Configuring Frame Relay Keepalives” on page 353.                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                |

**key**

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|                                 |                                                                                                                                                                                                                      |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>key number;</code>                                                                                                                                                                                             |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> tunnel],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> tunnel]         |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                       |
| <b>Description</b>              | For Adaptive Services PICs on M-series platforms (except the M320 and M120 routers), identify an individual traffic flow within a tunnel, as defined in RFC 2890, <i>Key and Sequence Number Extensions to GRE</i> . |
| <b>Options</b>                  | <i>number</i> —Value of the key.<br><b>Range:</b> 0 through 4,294,967,295                                                                                                                                            |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                                       |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                              |

**l2tp-interface-id**

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|                                 |                                                                                                                                                                                                                                                            |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>l2tp-interface-id name;</code><br>(dedicated   shared);                                                                                                                                                                                              |
| <b>Hierarchy Level</b>          | [edit interfaces sp-fpc/pic/port unit <i>logical-unit-number</i> dialer-options],<br>[edit logical-systems <i>logical-system-name</i> interfaces sp-fpc/pic/port unit <i>logical-unit-number</i> dialer-options]                                           |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                             |
| <b>Description</b>              | Specify the L2TP options for configuring logical interfaces for group and user sessions.                                                                                                                                                                   |
| <b>Options</b>                  | (dedicated   shared)—Specifies whether a logical interface can host one (dedicated) or multiple (shared) sessions at one time.<br><br><i>name</i> —Interface identifier that must be replicated at the [edit access profile <i>name</i> ] hierarchy level. |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                                                                             |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                    |

## lacp

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See the following sections:

- lacp (802.3ad) on page 901
- lacp (aggregated-ether-options) on page 902

### **lacp (802.3ad)**

**Syntax** lacp {  
}

**Hierarchy Level** [edit interfaces *interface-name* gigether-options 802.3ad aeX]

**Release Information** Statement introduced in JUNOS Release 9.3.

**Description** For aggregated Ethernet interfaces only, configure Link Aggregation Control Protocol (LACP).

**Default** If you do not specify lacp as either active or passive, LACP remains passive.

- Options**
- active—Initiate transmission of LACP packets.
  - passive—Respond to LACP packets.

The remaining statements are explained separately.

**Usage Guidelines** See “Configuring Aggregated Ethernet LACP” on page 539.

**Required Privilege Level** interface—To view this statement in the configuration.  
interface-control—To add this statement to the configuration.

***lACP (aggregated-ether-options)***

**Syntax**    lACP {  
               (active | passive);  
               link-protection {  
                   disable;  
               (revertive | non-revertive);  
               periodic *interval*;  
               system-priority *priority*;  
               }

**Hierarchy Level**    [edit interfaces aex aggregated-ether-options]

**Release Information**    Statement introduced before JUNOS Release 7.4.

**Description**    For aggregated Ethernet interfaces only, configure Link Aggregation Control Protocol (LACP).

**Default**    If you do not specify **lACP** as either active or passive, LACP remains passive.

- Options**    ■    active—Initiate transmission of LACP packets.  
               ■    passive—Respond to LACP packets.

The remaining statements are explained separately.

**Usage Guidelines**    See “Configuring Aggregated Ethernet LACP” on page 539.

**Required Privilege Level**    interface—To view this statement in the configuration.  
                                   interface-control—To add this statement to the configuration.



## layer2-policer

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <pre>layer2-policer {     input-policer <i>policer-name</i>;     input-three-color <i>policer-name</i>;     output-policer <i>policer-name</i>;     output-three-color <i>policer-name</i>; }</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.2.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Description</b>              | <p>For 1-Gigabit Ethernet and 10-Gigabit Ethernet IQ2 interfaces on M-series and T-series routing platforms, apply Layer 2 logical interface policers. The following policers are supported:</p> <ul style="list-style-type: none"> <li>■ Two-color</li> <li>■ Single-rate tricolor marking (srTCM)</li> <li>■ Two-rate tricolor marking (trTCM)</li> </ul> <p>Two-color and tricolor policers are configured at the [edit firewall] hierarchy level.</p>                                                                                                                                                                                                                                                                                                                       |
| <b>Options</b>                  | <p><b>input-policer <i>policer-name</i></b>—Two-color input policer to associate with the interface. This statement is mutually exclusive with the <b>input-three-color</b> statement.</p> <p><b>input-three-color <i>policer-name</i></b>—Tricolor input policer to associate with the interface. This statement is mutually exclusive with the <b>input-policer</b> statement.</p> <p><b>output-policer <i>policer-name</i></b>—Two-color output policer to associate with the interface. This statement is mutually exclusive with the <b>output-three-color</b> statement.</p> <p><b>output-three-color <i>policer-name</i></b>—Tricolor output policer to associate with the interface. This statement is mutually exclusive with the <b>output-policer</b> statement.</p> |
| <b>Usage Guidelines</b>         | See “Configuring Gigabit Ethernet Two-Color and Tricolor Policers” on page 614.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Related Topics</b>           | <i>JUNOS Class of Service Configuration Guide, JUNOS Policy Framework Configuration Guide</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

## lcp-restart-timer

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|                                 |                                                                                                                                                                                                                        |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>lcp-restart-timer milliseconds;</code>                                                                                                                                                                           |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ppp-options],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ppp-options] |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.1.                                                                                                                                                                             |
| <b>Description</b>              | For interfaces with PPP, PPP TCC, PPP over Ethernet, PPP over ATM, and PPP over Frame Relay encapsulations, configure a restart timer for the Link Control Protocol (LCP) component of a PPP session.                  |
| <b>Options</b>                  | <i>milliseconds</i> —The time in milliseconds between successive LCP configuration requests.<br><b>Range:</b> 20 through 10000 milliseconds.<br><b>Default:</b> 3 seconds                                              |
| <b>Usage Guidelines</b>         | See “Configuring the PPP Restart Timers” on page 151.                                                                                                                                                                  |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                |

## level

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|                                 |                                                                                                                                |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>level number;</code>                                                                                                     |
| <b>Hierarchy Level</b>          | [edit protocols oam ethernet connectivity-fault-management maintenance-domain <i>domain-name</i> ]                             |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.4.                                                                                     |
| <b>Description</b>              | A number used in CFM messages to identify the maintenance association.                                                         |
| <b>Options</b>                  | <i>number</i> —A number used to identify the maintenance domain to which the CFM message belongs.<br><b>Range:</b> 0 through 7 |
| <b>Usage Guidelines</b>         | See “Configuring the Maintenance Domain Level” on page 586.                                                                    |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.        |

## linear-red-profile

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|                                 |                                                                                                                                                                                                                                                            |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>linear-red-profile <i>profile-name</i>;</code>                                                                                                                                                                                                       |
| <b>Hierarchy Level</b>          | [edit interfaces <i>at-fpc/pic/port</i> atm-options scheduler-maps <i>map-name</i> forwarding-class <i>class-name</i> ]                                                                                                                                    |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                             |
| <b>Description</b>              | For ATM2 IQ interfaces only, assign a linear RED profile to a specified forwarding class. To define the linear RED profiles, include the <b>linear-red-profiles</b> statement at the [edit interfaces <i>at-fpc/pic/port</i> atm-options] hierarchy level. |
| <b>Default</b>                  | If you do not include either the <b>epd-threshold</b> or the <b>linear-red-profile</b> statement in the forwarding class configuration, the JUNOS software uses an EPD threshold based on the available bandwidth and other parameters.                    |
| <b>Options</b>                  | <i>profile-name</i> —Name of the linear RED profile.                                                                                                                                                                                                       |
| <b>Usage Guidelines</b>         | See “Configuring an ATM Scheduler Map” on page 317.                                                                                                                                                                                                        |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                    |
| <b>Related Topics</b>           | epd-threshold, linear-red-profiles                                                                                                                                                                                                                         |

## linear-red-profiles

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|                                 |                                                                                                                                                                                                                                                                       |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | linear-red-profiles <i>profile-name</i> {<br>high-plp-threshold <i>percent</i> ;<br>low-plp-threshold <i>percent</i> ;<br>queue-depth <i>cells</i> ;<br>}                                                                                                             |
| <b>Hierarchy Level</b>          | [edit interfaces <i>at-fpc/pic/port</i> atm-options]                                                                                                                                                                                                                  |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                        |
| <b>Description</b>              | For ATM2 IQ interfaces only, define CoS virtual circuit drop profiles for RED. When a packet arrives, RED checks the queue fill level. If the fill level corresponds to a nonzero drop probability, the RED algorithm determines whether to drop the arriving packet. |
| <b>Options</b>                  | <i>profile-name</i> —Name of the drop profile.<br><br>The statements are explained separately.                                                                                                                                                                        |
| <b>Usage Guidelines</b>         | See “Configuring ATM2 IQ VC Tunnel CoS Components” on page 315.                                                                                                                                                                                                       |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                               |

## line-encoding

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|                                 |                                                                                                                               |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | line-encoding (ami   b8zs);                                                                                                   |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> t1-options]                                                                            |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                |
| <b>Description</b>              | Set the line encoding format on the T1 interface.                                                                             |
| <b>Default</b>                  | The default line encoding is B8ZS.                                                                                            |
| <b>Options</b>                  | ami—Use Alternate Mark Inversion (AMI) line encoding.<br><br>b8zs—Use bipolar with 8-zeros substitution (B8ZS) line encoding. |
| <b>Usage Guidelines</b>         | See “Configuring T1 Line Encoding” on page 490.                                                                               |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.       |

## line-protocol

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|                                 |                                                                                                                                                                                                                                                             |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>line-protocol protocol;</code>                                                                                                                                                                                                                        |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> serial-options]                                                                                                                                                                                                      |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                              |
| <b>Description</b>              | For serial interfaces only, configure the line protocol.                                                                                                                                                                                                    |
| <b>Options</b>                  | <p><i>protocol</i>—You can specify the one of the following line protocols:</p> <ul style="list-style-type: none"> <li>■ <i>eia530</i>—Line protocol EIA-530</li> <li>■ <i>v.35</i>—Line protocol V.35</li> <li>■ <i>x.21</i>—Line protocol X.21</li> </ul> |
| <b>Usage Guidelines</b>         | See “Configuring the Serial Line Protocol” on page 241.                                                                                                                                                                                                     |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                          |

## line-rate

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>line-rate line-rate;</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Hierarchy Level</b>          | <p>[edit interfaces <i>interface-name</i> shdsl-options],</p> <p>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> shdsl-options]</p>                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Description</b>              | For J-series Services Routers only, configure the SHDSL line rate.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Options</b>                  | <p><i>line-rate</i>—SHDSL line rate, in Kbps. Possible values are:</p> <p>2-wire (Kbps): 192, 256, 320, 384, 448, 512, 576, 640, 704, 768, 832, 896, 960, 1024, 1088, 1152, 1216, 1280, 1344, 1408, 1472, 1536, 1600, 1664, 1728, 1792, 1856, 1920, 1984, 2048, 2112, 2176, 2240, 2304, auto</p> <p>4-wire (Kbps): 384, 512, 640, 768, 896, 1024, 1152, 1280, 1408, 1536, 1664, 1792, 1920, 2048, 2176, 2304, 2432, 2560, 2688, 2816, 2944, 3072, 3200, 3328, 3456, 3584, 3712, 3840, 3968, 4096, 4224, 4352, 4480, 4608</p> <p><b>Default:</b> For 2-wire mode, auto; for 4-wire mode, 4608 Kbps</p> |
| <b>Usage Guidelines</b>         | See “Configuring ATM-over-SHDSL Interfaces” on page 337.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

## link-adjacency-loss

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|                                 |                                                                                                                                                                                   |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | link-adjacency-loss;                                                                                                                                                              |
| <b>Hierarchy Level</b>          | [edit protocols oam ethernet link-fault-management action-profile event]                                                                                                          |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.5.                                                                                                                                        |
| <b>Description</b>              | Loss of adjacency with IEEE 802.3ah link-fault management peer event. When included, the loss-of-adjacency event triggers the action specified under the <b>action</b> statement. |
| <b>Usage Guidelines</b>         | See “Monitoring the Loss of Link Adjacency” on page 600.                                                                                                                          |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                           |

## link-down

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|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | link-down;                                                                                                              |
| <b>Hierarchy Level</b>          | [edit protocols oam ethernet link-fault-management action-profile action]                                               |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.5.                                                                              |
| <b>Description</b>              | Mark the interface down for transit traffic.                                                                            |
| <b>Usage Guidelines</b>         | See “Specifying the Actions to Be Taken for Link-Fault Management Events” on page 599.                                  |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |

## link-discovery

---

|                                 |                                                                                                                                                                                                                                                                                                                                                                       |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | link-discovery (active   passive);                                                                                                                                                                                                                                                                                                                                    |
| <b>Hierarchy Level</b>          | [edit protocols oam ethernet link-fault-management interface <i>interface-name</i> ]                                                                                                                                                                                                                                                                                  |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.2.                                                                                                                                                                                                                                                                                                                            |
| <b>Description</b>              | For Ethernet interfaces on M320, M120, MX-series, and T-series routing platforms, specify the discovery mode used for IEEE 802.3ah Operation, Administration, and Management (OAM) support. The discovery process is triggered automatically when OAM 802.3ah functionality is enabled on a port. Link monitoring is done when the interface sends periodic OAM PDUs. |
| <b>Options</b>                  | (active   passive)—Passive or active mode. In active mode, the interface discovers and monitors the peer on the link if the peer also supports IEEE 802.3ah OAM functionality. In passive mode, the peer initiates the discovery process. Once the discovery process is initiated, both sides participate in discovery.                                               |
| <b>Usage Guidelines</b>         | See “Configuring Link Discovery” on page 596.                                                                                                                                                                                                                                                                                                                         |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                               |

## link-event-rate

---

|                                 |                                                                                                                                                            |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | link-event-rate {<br>frame-error <i>count</i> ;<br>frame-period <i>count</i> ;<br>frame-period-summary <i>count</i> ;<br>symbol-period <i>count</i> ;<br>} |
| <b>Hierarchy Level</b>          | [edit protocols oam ethernet link-fault-management action-profile event]                                                                                   |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.5.                                                                                                                 |
| <b>Description</b>              | Configure the number of link-fault management events per second.                                                                                           |
| <b>Usage Guidelines</b>         | See “Configuring Threshold Values for Fault Events in an Action Profile” on page 600.                                                                      |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                    |

## link-fault-management

---

**Syntax**

```

link-fault-management {
 action-profile profile-name {
 action {
 syslog;
 link-down;
 send-critical-event;
 }
 event {
 link-adjacency-loss;
 link-event-rate {
 frame-error count;
 frame-period count;
 frame-period-summary count;
 symbol-period count;
 }
 protocol-down;
 }
 }
 interface interface-name {
 apply-action-profile profile-name;
 link-discovery (active | passive);
 pdu-interval interval;
 pdu-threshold threshold-value;
 remote-loopback;
 event-thresholds {
 frame-error count;
 frame-period count;
 frame-period-summary count;
 symbol-period count;
 }
 negotiation-options {
 allow-remote-loopback;
 no-allow-link-events;
 }
 }
}

```

**Hierarchy Level** [edit protocols oam ethernet]

**Release Information** Statement introduced in JUNOS Release 8.2.

**Description** For Ethernet interfaces on M320, M120, MX-series, and T-series routing platforms, specify fault signaling and detection for IEEE 802.3ah Operation, Administration, and Management (OAM) support.

The remaining statements are explained separately.

**Usage Guidelines** See “Enabling IEEE 802.3ah OAM Support” on page 596.

**Required Privilege Level** interface—To view this statement in the configuration.



interface-control—To add this statement to the configuration.


## link-layer-overhead

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|                                 |                                                                                                                                                                                                                                                                          |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | link-layer-overhead <i>percent</i> ;                                                                                                                                                                                                                                     |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> mlfr-uni-nni-bundle-options],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                           |
| <b>Description</b>              | For AS PIC or MultiServices PIC link services IQ interfaces (lsq) only, configure the percentage of total bundle bandwidth to be set aside for link-layer overhead.                                                                                                      |
| <b>Options</b>                  | <i>percent</i> —Percentage of total bundle bandwidth to be set aside for link-layer overhead.<br><b>Range:</b> 0 through 50 percent<br><b>Default:</b> 4 percent                                                                                                         |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                                                                                           |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                  |

## link-mode

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|                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                                                                       | link-mode (full-duplex   half-duplex);                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Hierarchy Level</b>                                                              | [edit interfaces <i>interface-name</i> ],<br>[edit interfaces <i>ge-pim</i> /0/0 switch-options switch-port <i>port-number</i> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Release Information</b>                                                          | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Description</b>                                                                  | Set the device's link connection characteristic.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Options</b>                                                                      | <p>full-duplex—Connection is full duplex.</p> <p>half-duplex—Connection is half duplex.</p> <p><b>Default:</b> Fast Ethernet interfaces, except the J-series ePIM Fast Ethernet interfaces, can operate in either full-duplex or half-duplex mode. The routing platform's management Ethernet interface, <i>fxp0</i>, the built-in Fast Ethernet interfaces on the FIC (M7i routing platform), and the Gigabit Ethernet ports on J-series Services Routers with uPIMs installed and configured for access switching mode autonegotiate whether to operate in full-duplex or half-duplex mode. Unless otherwise noted here, all other interfaces operate only in full-duplex mode.</p> |
|  | <p><b>NOTE:</b> On J-series ePIM Fast Ethernet interfaces, if you specify half-duplex (or if full-duplex mode is not autonegotiated), the following message is written to the system log: "Half-duplex mode not supported on this PIC, forcing full-duplex mode."</p>                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Usage Guidelines</b>                                                             | See "Configuring the Link Characteristics" on page 520.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Required Privilege Level</b>                                                     | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

## link-protection

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | link-protection {<br>disable;<br>(revertive   non-revertive);<br>}                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Hierarchy Level</b>          | [edit interfaces aex aggregated-ether-options]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.3.<br>Support for <b>disable</b> , <b>revertive</b> , and <b>non-revertive</b> statements added in JUNOS Release 9.3.                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b>              | For aggregated Ethernet interfaces only, configure link protection. In addition to enabling link protection, a primary and a secondary (backup) link must be configured to specify what links egress traffic should traverse. To configure primary and secondary links, include the <b>primary</b> and <b>secondary</b> statements at the [edit interfaces <i>ge-fpc/pic/port</i> <b>gigether-options</b> 802.3ad aex] hierarchy level or the [edit interfaces <i>fe-fpc/pic/port</i> <b>fastether-options</b> 802.3ad aex] hierarchy level. |
| <b>Options</b>                  | The statements are explained separately.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Usage Guidelines</b>         | See “Configuring Aggregated Ethernet Link Protection” on page 537.                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                      |

## link-speed

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See the following sections:

- link-speed (Aggregated Ethernet) on page 914
- link-speed (Aggregated SONET/SDH) on page 915

### ***link-speed (Aggregated Ethernet)***

**Syntax** link-speed *speed*;

**Hierarchy Level** [edit interfaces aex aggregated-ether-options]

**Release Information** Statement introduced before JUNOS Release 7.4.

**Description** For aggregated Ethernet interfaces only, set the required link speed.

**Options** *speed*—For aggregated Ethernet links, you can specify *speed* in bits per second either as a complete decimal number or as a decimal number followed by the abbreviation k (1000), m (1,000,000), or g (1,000,000,000).

Aggregated Ethernet links on the M120 routing platform can have one of the following speed values,

- 100m—Links are 100 Mbps.
- 10g—Links are 10 Gbps.
- 1g—Links are 1 Gbps.
- OC192—Links are OC192 or STM64c.

**Usage Guidelines** See “Configuring Aggregated Ethernet Link Speed” on page 546.

**Required Privilege Level** interface—To view this statement in the configuration.  
interface-control—To add this statement to the configuration.

**link-speed (Aggregated SONET/SDH)**

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | link-speed ( <i>speed</i>   mixed);                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Hierarchy Level</b>          | [edit interfaces asx aggregated-sonet-options]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.<br>mixed option added in Release 8.0.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Description</b>              | For aggregated SONET/SDH interfaces only, set the required link speed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Options</b>                  | <p><i>speed</i>—Aggregated SONET/SDH links can have one of the following speed values.</p> <ul style="list-style-type: none"> <li>■ <i>oc3</i>—Links are OC3c or STM1c.</li> <li>■ <i>oc12</i>—Links are OC12c or STM4c.</li> <li>■ <i>oc48</i>—Links are OC48c or STM16c.</li> <li>■ <i>oc192</i>—Links are OC192c or STM64c.</li> <li>■ <i>oc768</i>—Links are OC768c or STM256c.</li> </ul> <p><i>mixed</i>—For aggregated SONET/SDH links on T-series routing platforms, you can mix interface speeds in SONET/SDH aggregation bundles. Interface speeds from OC3 through OC768 are supported.</p> |
| <b>Usage Guidelines</b>         | See “Configuring Aggregated Ethernet Link Speed” on page 546 and “Configuring Aggregated SONET/SDH Link Speed” on page 718.                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

**linktrace**


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|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <pre>linktrace {   age (30m   10m   1m   30s   10s);   path-database-size <i>path-database-size</i>; }</pre>            |
| <b>Hierarchy Level</b>          | [edit protocols oam ethernet connectivity-fault-management]                                                             |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.5.                                                                              |
| <b>Description</b>              | Configure connectivity fault management linktrace parameters.                                                           |
| <b>Usage Guidelines</b>         | See “Linktrace Protocol” on page 585.                                                                                   |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |

## llc2

---

**Syntax** llc2 {  
     ack-delay-time *time*;  
     ack-max *count*;  
     idle-time *time*;  
     local-window *count*;  
     max-retry *count*;  
     p-bit-timeout *time*;  
     redundancy-group *group-number* {  
         advertise-interval *seconds*;  
         map {  
             local-mac *mac-address* request *mac-address*;  
         }  
         preempt hold-time *seconds*;  
         no-preempt;  
         priority *priority*;  
         track {  
             dls {  
                 peer *ip-address* priority-cost *priority*;  
                 destination *mac-address* priority-cost *priority*;  
             }  
             interface *interface-name* priority-cost *priority*;  
         }  
     }  
     t1-time *time*;  
     t2-time *time*;  
     trej-time *time*;  
 }

**Hierarchy Level** [edit interfaces *interface-name* unit *logical-unit-number* family],  
 [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family]

**Release Information** Statement introduced in JUNOS Release 7.4.

**Description** For J-series Services Routers only, configure the data link-layer protocol logical link control 2 (LLC2) used on a LAN. LLC2 provides connection-oriented data transfer for Ethernet interfaces configured for DLSw.

The statements are explained separately.

**Usage Guidelines** See “Configuring LLC2 Options” on page 167.

**Required Privilege Level** interface—To view this statement in the configuration.  
 interface-control—To add this statement to the configuration.

**Related Topics** *JUNOS Services Interfaces Configuration Guide*

**lmi**

**Syntax**    lmi {  
               lmi-type (ansi | itu);  
               n391dte *number*;  
               n392dce *seconds*;  
               n392dte *number*;  
               n393dce *number*;  
               n393dte *number*;  
               t391dte *number*;  
               t392dce *seconds*;  
               }

**Hierarchy Level**    [edit interfaces *interface-name*]

**Release Information**    Statement introduced before JUNOS Release 7.4.

**Description**    Set Frame Relay keepalive parameters.

**Options**    n391dte—DTE full status polling interval.

**Range:**    1 through 255

**Default:**    6

n392dce—DCE error threshold, in number of errors.

**Range:**    1 through 10

**Default:**    3

n392dte—DTE error threshold, in number of errors.

**Range:**    1 through 10

**Default:**    3

n393dce—DCE monitored event-count.

**Range:**    1 through 10

**Default:**    4

n393dte—DTE monitored event-count.

**Range:**    1 through 10

**Default:**    4

t391dte—DTE polling timer.

**Range:**    5 through 30 seconds

**Default:**    10 seconds

t392dce—DCE polling timer.

**Range:**    5 through 30 seconds

**Default:**    15 seconds

The remaining statements are explained separately.

**Usage Guidelines**    See “Configuring Tunable Keepalives for Frame Relay LMI” on page 354.

**Required Privilege Level** interface—To view this statement in the configuration.  
interface-control—To add this statement to the configuration.

**Related Topics** lmi-type

## lmi-type

---

**Syntax** lmi-type (ansi | itu);

**Hierarchy Level** [edit interfaces *interface-name* lmi],  
[edit interfaces *interface-name* mlfr-uni-nni-bundle-options]

**Release Information** Statement introduced before JUNOS Release 7.4.

**Description** Set Frame Relay Local Management Interface (LMI) type.

**Options** ansi—Use ANSI T1.167 Annex D LMIs.

itu—Use ITU Q933 Annex A LMIs.

**Default:** ansi

**Usage Guidelines** See “Configuring Tunable Keepalives for Frame Relay LMI” on page 354 and the *JUNOS Services Interfaces Configuration Guide*.

**Required Privilege Level** interface—To view this statement in the configuration.  
interface-control—To add this statement to the configuration.

## load-interval

---

**Syntax** load-interval *seconds*;

**Hierarchy Level** [edit interfaces *dln* unit *logical-unit-number* dialer-options],  
[edit logical-systems *logical-system-name* interfaces *dln* unit *logical-unit-number*  
dialer-options]

**Release Information** Statement introduced before JUNOS Release 7.4.

**Description** (J-series Services Routers) For ISDN logical interfaces, the interval used to calculate the average load on the network. By default, the average interface load is calculated every 60 seconds.

**Options** *seconds*—Number of seconds at which the average load calculation is triggered.

**Range:** 20 through 180, in 10-second intervals

**Default:** 60 seconds

**Usage Guidelines** See “Configuring ISDN Logical Interface Properties” on page 661.

**Required Privilege Level** interface—To view this statement in the configuration.  
interface-control—To add this statement to the configuration.

**Related Topics** *J-series Services Router Basic LAN and WAN Access Configuration Guide*



## load-threshold

---

|                                 |                                                                                                                                                                                                                                                                          |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>load-threshold percent;</code>                                                                                                                                                                                                                                     |
| <b>Hierarchy Level</b>          | [edit interfaces <i>dlm</i> unit <i>logical-unit-number</i> dialer-options],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>dlm</i> unit <i>logical-unit-number</i> dialer-options]                                                                   |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                           |
| <b>Description</b>              | (J-series Services Routers) For ISDN logical interfaces, specify the bandwidth threshold percentage used for adding interfaces. Another link is added to the multilink bundle when the load reaches the threshold value you set. Specify a percentage between 0 and 100. |
| <b>Options</b>                  | <i>percent</i> —Bandwidth threshold percentage used for adding interfaces. When set to 0, all available channels are dialed.<br><b>Range:</b> 0 through 100<br><b>Default:</b> 100 seconds                                                                               |
| <b>Usage Guidelines</b>         | See “Configuring Bandwidth on Demand” on page 667.                                                                                                                                                                                                                       |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                  |
| <b>Related Topics</b>           | <i>J-series Services Router Basic LAN and WAN Access Configuration Guide</i>                                                                                                                                                                                             |

## local-mac

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|                                 |                                                                                                                                                                                                                                                                                                          |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>local-mac mac-address remote-mac mac-address;</code>                                                                                                                                                                                                                                               |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family llc2 redundancy-group <i>group-number</i> map],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family llc2 redundancy-group <i>group-number</i> map] |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 7.5.                                                                                                                                                                                                                                                               |
| <b>Description</b>              | For J-series Services Routers only. On Ethernet interfaces configured for DLSw, specify the local MAC address to be mapped to a remote destination MAC address.                                                                                                                                          |
| <b>Options</b>                  | <i>mac-address</i> —MAC address. Specify the MAC address as six hexadecimal bytes in one of the following formats: <i>nnnn.nnnn.nnnn</i> or <i>nn:nn:nn:nn:nn:nn</i> . For example, 0011.2233.4455 or 00:11:22:33:44:55.                                                                                 |
| <b>Usage Guidelines</b>         | See “Configuring DLSw Ethernet Redundancy Using LLC2 Properties” on page 168.                                                                                                                                                                                                                            |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                  |
| <b>Related Topics</b>           | <i>JUNOS Services Interfaces Configuration Guide</i>                                                                                                                                                                                                                                                     |

## local-name

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | local-name <i>name</i> ;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> ppp-options chap],<br>[edit interfaces <i>interface-name</i> ppp-options pap],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ppp-options chap],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ppp-options pap],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ppp-options chap],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ppp-options pap] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.<br>Support for PAP added in JUNOS Release 8.3.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b>              | <p>For CHAP authentication, the value sent in CHAP challenge and response packets on a per interface basis. For PAP authentication, the local hostname for sending PAP authentication requests.</p> <p>For ATM2 IQ interfaces only, you can configure a CHAP local name on the logical interface unit if the logical interface is configured with one of the following PPP over ATM encapsulation types:</p> <ul style="list-style-type: none"> <li>■ atm-ppp-llc—PPP over AAL5 LLC encapsulation.</li> <li>■ atm-ppp-vc-mux—PPP over AAL5 multiplex encapsulation.</li> </ul>               |
| <b>Default</b>                  | For CHAP authentication, if you do not include the <b>local-name</b> statement in the configuration, the interface sends the routing platform's system hostname in CHAP challenge and response packets.                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Usage Guidelines</b>         | See “Configuring the PPP Challenge Handshake Authentication Protocol” on page 103 and “Configuring the PPP Password Authentication Protocol” on page 106.                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Related Topics</b>           | <i>JUNOS System Basics Configuration Guide</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

## local-password

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|                                 |                                                                                                                                                                                                                                                                                            |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>local-password password;</code>                                                                                                                                                                                                                                                      |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> ppp-options pap],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ppp-options pap],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ppp-options pap] |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.3.                                                                                                                                                                                                                                                 |
| <b>Description</b>              | Configure the host password for sending PAP requests.                                                                                                                                                                                                                                      |
| <b>Usage Guidelines</b>         | See “Configuring the Local Password” on page 154.                                                                                                                                                                                                                                          |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                    |
| <b>Related Topics</b>           | Configuring the PPP Password Authentication Protocol on page 106                                                                                                                                                                                                                           |

## local-window

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|                                 |                                                                                                                                                                                                                        |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>local-window count;</code>                                                                                                                                                                                       |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family llc2],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family llc2] |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 7.4.                                                                                                                                                                             |
| <b>Description</b>              | For J-series Services Routers only. On Ethernet interfaces configured for DLSw, configure the maximum number of Information-frames (I-frames) to send before waiting for acknowledgment.                               |
| <b>Options</b>                  | <i>count</i> —Number of I-frames.<br><b>Range:</b> 1 through 127 I-frames<br><b>Default:</b> 7 I-frames                                                                                                                |
| <b>Usage Guidelines</b>         | See “Configuring LLC2 Options” on page 167.                                                                                                                                                                            |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                |
| <b>Related Topics</b>           | <i>J-series Services Router Advanced WAN Access Configuration Guide</i>                                                                                                                                                |

## lockout

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|                                 |                                                                                                                                            |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | lockout;                                                                                                                                   |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> sonet-options aps]                                                                                  |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                             |
| <b>Description</b>              | Configure a lockout of protection, forcing the use of the working circuit and locking out the protect circuit regardless of anything else. |
| <b>Usage Guidelines</b>         | See “Configuring Switching Between the Working and Protect Circuits” on page 700.                                                          |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                    |

## logical-interface-policer

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|                                 |                                                                                                                                                                                   |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | logical-interface-policer;                                                                                                                                                        |
| <b>Hierarchy Level</b>          | [edit firewall policer <i>policer-template-name</i> ],<br>[edit firewall three-color-policer <i>policer-name</i> ],                                                               |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.2.                                                                                                                                        |
| <b>Description</b>              | Apply a policer to a logical interface in the ingress or egress direction as part of a configuration to discard high loss priority traffic, or configure an aggregate policer.    |
| <b>Usage Guidelines</b>         | See “Configuring Gigabit Ethernet Two-Color and Tricolor Policers” on page 614, See “Applying a Policer” on page 616, and the <i>JUNOS Class of Service Configuration Guide</i> . |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                           |
| <b>Related Topics</b>           | action (Policer)                                                                                                                                                                  |

## logical-systems

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|                                 |                                                                                                                     |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>logical-systems <i>logical-system-name</i>;</code>                                                            |
| <b>Hierarchy Level</b>          | [edit]                                                                                                              |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                      |
| <b>Description</b>              | Configure a logical system.                                                                                         |
| <b>Options</b>                  | <i>logical-system-name</i> —Name of the logical system.                                                             |
| <b>Usage Guidelines</b>         | See “Configuring Logical System Interface Properties” on page 145.                                                  |
| <b>Required Privilege Level</b> | routing—To view this statement in the configuration.<br>routing-control—To add this statement to the configuration. |

## log-prefix

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|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>log-prefix <i>prefix-number</i>;</code>                                                                           |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> services-options syslog host <i>hostname</i> ]                                   |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                          |
| <b>Description</b>              | Set the system logging prefix value.                                                                                    |
| <b>Options</b>                  | <i>prefix-number</i> —System logging prefix value.                                                                      |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                          |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |

## long-buildout

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | (long-buildout   no-long-buildout);                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> t3-options]                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Description</b>              | <p>Configure the T3 line buildout. A T3 interface has two settings for the T3 line buildout: a short setting, which is less than 255 feet (68 meters), and a long setting, which is greater than 255 feet and shorter than 450 feet (137 meters).</p> <p>This statement applies to copper-cable-based T3 interfaces only. You cannot configure a line buildout for a DS3 channel on a channelized OC12 interface, which runs over fiber-optic cable.</p> |
| <b>Default</b>                  | A T3 interface uses the short line buildout setting ( <b>no-long-buildout</b> ) for wires shorter than 255 feet (68 meters).                                                                                                                                                                                                                                                                                                                             |
| <b>Usage Guidelines</b>         | See “Configuring the T3 Line Buildout” on page 501.                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                                                                                                                       |

## loopback

See the following sections:

- loopback (ADSL, DS0, E1/E3, SONET/SDH, SHDSL, and T1/T3) on page 925
- loopback (Aggregated Ethernet, Fast Ethernet, and Gigabit Ethernet) on page 926
- loopback (Serial) on page 926

### **loopback (ADSL, DS0, E1/E3, SONET/SDH, SHDSL, and T1/T3)**

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | loopback (local   payload   remote);                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> ds0-options],<br>[edit interfaces <i>interface-name</i> dsl-options],<br>[edit interfaces <i>interface-name</i> e1-options],<br>[edit interfaces <i>interface-name</i> e3-options],<br>[edit interfaces <i>interface-name</i> shdsl-options],<br>[edit interfaces <i>interface-name</i> sonet-options],<br>[edit interfaces <i>interface-name</i> t1-options],<br>[edit interfaces <i>interface-name</i> t3-options]                                                                                                                                                                                                                                                                                                                         |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Description</b>              | Configure a loopback connection. To turn off the loopback capability, remove the loopback statement from the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Options</b>                  | <p><b>local</b>—Loop packets, including both data and timing information, back on the local routing platform's PIC. NxDS0 IQ interfaces do not support local loopback.</p> <p><b>payload</b>—For channelized T3, T1, and NxDS0 IQ interfaces only, loop back data only (without clocking information) on the remote routing platform's PIC. With payload loopback, overhead is recalculated. Neither ATM-over-asymmetrical digital subscriber line (ADSL) interfaces nor ATM-over-SHDSL interfaces support payload loopback.</p> <p><b>remote</b>—Loop packets, including both data and timing information, back on the remote routing platform's interface card. NxDS0 IQ interfaces do not support remote loopback. ATM-over-ADSL interfaces do not support payload loopback.</p> |
| <b>Usage Guidelines</b>         | See “Configuring E3 and T3 Parameters on ATM Interfaces” on page 313, “Configuring E1 Loopback Capability” on page 472, “Configuring E3 Loopback Capability” on page 481, “Configuring Channelized IQ and IQE SONET/SDH Loop Timing” on page 687, “Configuring SHDSL Operating Mode on an ATM Physical Interface” on page 340, “Configuring T1 Loopback Capability” on page 490, and “Configuring T3 Loopback Capability” on page 502.                                                                                                                                                                                                                                                                                                                                              |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Related Topics</b>           | feac-loop-respond                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

**loopback (Aggregated Ethernet, Fast Ethernet, and Gigabit Ethernet)**

**Syntax** (loopback | no-loopback);

**Hierarchy Level** [edit interfaces *interface-name* aggregated-ether-options],  
[edit interfaces *interface-name* fastether-options],  
[edit interfaces *interface-name* ggether-options]

**Release Information** Statement introduced before JUNOS Release 7.4.

**Description** For aggregated Ethernet, Fast Ethernet, Gigabit Ethernet, and 10-Gigabit Ethernet interfaces, enable or disable loopback mode.



**NOTE:** By default, local aggregated Ethernet, Fast Ethernet, Tri-Rate Ethernet copper, Gigabit Ethernet, and 10-Gigabit Ethernet interfaces connect to a remote system.

**Usage Guidelines** See “Configuring Ethernet Loopback Capability” on page 519.

**Required Privilege Level** interface—To view this statement in the configuration.  
interface-control—To add this statement to the configuration.

**loopback (Serial)**

**Syntax** loopback *mode*;

**Hierarchy Level** [edit interfaces *interface-name* serial-options]

**Release Information** Statement introduced before JUNOS Release 7.4.

**Description** Configure a loopback connection.

**Default** If you do not include this statement, there is no loopback connection.

**Options** *mode*—You can specify the one of the following loopback modes:

- dce-local—For EIA-530 interfaces only, loop packets back on the local DCE.
- dce-remote—For EIA-530 interfaces only, loop packets back on the remote DCE.
- local—Loop packets back on the local routing platform’s PIC.
- remote—Loop packets back on the line interface unit (LIU).

**Usage Guidelines** See “Configuring Serial Loopback Capability” on page 251.

**Required Privilege Level** interface—To view this statement in the configuration.  
interface-control—To add this statement to the configuration.



## loopback-clear-timer

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|                                 |                                                                                                                                                                                                                        |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | loopback-clear-timer <i>seconds</i> ;                                                                                                                                                                                  |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ppp-options],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ppp-options] |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.5.                                                                                                                                                                             |
| <b>Description</b>              | For interfaces with PPP, PPP TCC, PPP over Ethernet, PPP over ATM, and PPP over Frame Relay encapsulations, configure a loop detection clear timer for the Link Control Protocol (LCP) component of a PPP session.     |
| <b>Options</b>                  | <i>seconds</i> —The time in seconds to wait before the loop detection flag is cleared if it is not cleared by the protocol.<br><b>Range:</b> 1 through 60 seconds.<br><b>Default:</b> 9 seconds                        |
| <b>Usage Guidelines</b>         | See “Configuring the PPP Clear Loop Detected Timer” on page 152.                                                                                                                                                       |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                |

## loop-timing

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|                                 |                                                                                                                                                                                |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | (loop-timing   no-loop-timing);                                                                                                                                                |
| <b>Hierarchy Level</b>          | [edit interfaces <i>ct3-fpc/pic/port</i> t3-options],<br>[edit interfaces <i>e1-fpc/pic/port:0</i> sonet-options],<br>[edit interfaces <i>stm1-fpc/pic/port</i> sonet-options] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                 |
| <b>Description</b>              | For channelized IQ interfaces and non-IQ channelized STM1 interfaces only, configure the SONET/SDH or DS3-level clocking source.                                               |
| <b>Options</b>                  | loop-timing—Configure loop timing (external) clocking.<br><br>no-loop-timing—Configure line timing (internal) clocking.<br><b>Default:</b> no-loop-timing                      |
| <b>Usage Guidelines</b>         | See “Configuring Channelized IQ and IQE SONET/SDH Loop Timing” on page 687 and “Configuring the Channelized T3 Loop Timing” on page 502.                                       |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                        |
| <b>Related Topics</b>           | clocking                                                                                                                                                                       |

## loss-priority

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|                                 |                                                                                                                                                                                      |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | loss-priority (high   low);                                                                                                                                                          |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> gigether-options ethernet-switch-profile ethernet-policer-profile output-priority-map classifier premium forwarding-class <i>class-name</i> ] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                       |
| <b>Description</b>              | Specify the packet loss priority value.                                                                                                                                              |
| <b>Options</b>                  | high—Packet has high loss priority.<br><br>low—Packet has low loss priority.                                                                                                         |
| <b>Usage Guidelines</b>         | See “Specifying an Output Priority Map” on page 610.                                                                                                                                 |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                              |

## loss-threshold

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|                                 |                                                                                                                                                           |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | loss-threshold <i>number</i> ;                                                                                                                            |
| <b>Hierarchy Level</b>          | [edit protocols oam ethernet connectivity-fault-management maintenance-domain <i>domain-name</i> maintenance-association <i>ma-name</i> continuity-check] |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.4.                                                                                                                |
| <b>Description</b>              | The number of continuity check messages lost before marking the remote MEP as down.                                                                       |
| <b>Options</b>                  | <i>number</i> —Specify how many continuity check messages can be lost before the remote MEP is considered down.                                           |
| <b>Usage Guidelines</b>         | See “Configuring the Continuity Check Loss Threshold” on page 587.                                                                                        |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                   |

## low-plp-max-threshold

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|                                 |                                                                                                                                                                      |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>low-plp-max-threshold percent;</code>                                                                                                                          |
| <b>Hierarchy Level</b>          | <code>[edit interfaces at-fpc/pic/port atm-options linear-red-profiles profile-name]</code>                                                                          |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                       |
| <b>Description</b>              | For ATM2 IQ interfaces only, define the drop profile fill-level for the low PLP CoS VC. When the fill level exceeds the defined percentage, all packets are dropped. |
| <b>Options</b>                  | <i>percent</i> —Fill-level percentage when linear RED is applied to cells with PLP.                                                                                  |
| <b>Usage Guidelines</b>         | See “Configuring ATM2 IQ VC Tunnel CoS Components” on page 315.                                                                                                      |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                              |
| <b>Related Topics</b>           | high-plp-max-threshold, low-plp-threshold, queue-depth                                                                                                               |

## low-plp-threshold

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|                                 |                                                                                                                                                                                                                                                                        |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>low-plp-threshold percent;</code>                                                                                                                                                                                                                                |
| <b>Hierarchy Level</b>          | <code>[edit interfaces at-fpc/pic/port atm-options linear-red-profiles profile-name]</code>                                                                                                                                                                            |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                         |
| <b>Description</b>              | For ATM2 IQ interfaces only, define the CoS VC drop profile fill-level percentage when linear RED is applied to cells with low PLP. When the fill level exceeds the defined percentage, packets with low PLP are randomly dropped by RED. This statement is mandatory. |
| <b>Options</b>                  | <i>percent</i> —Fill-level percentage when linear RED is applied to cells with low PLP.                                                                                                                                                                                |
| <b>Usage Guidelines</b>         | See “Configuring ATM2 IQ VC Tunnel CoS Components” on page 315.                                                                                                                                                                                                        |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                |
| <b>Related Topics</b>           | high-plp-max-threshold, high-plp-threshold, low-plp-max-threshold, queue-depth                                                                                                                                                                                         |

## Isq-failure-options

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|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | Isq-failure-options {<br>no-termination-request;<br>[trigger-link-failure <i>interface-name</i> ];<br>}                 |
| <b>Hierarchy Level</b>          | [edit interfaces Isq- <i>fpc/pic/port</i> ]                                                                             |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 7.4.                                                                              |
| <b>Description</b>              | For AS PIC or MultiServices PIC link services IQ (Isq) interfaces only, define the failure recovery option settings.    |
| <b>Options</b>                  | The remaining statements are explained separately.                                                                      |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                          |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |

## mac

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|                                 |                                                                                                                                                                                                                          |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | mac <i>mac-address</i> ;                                                                                                                                                                                                 |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> ]                                                                                                                                                                                 |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                           |
| <b>Description</b>              | Set the MAC address of the interface. You can configure the MAC address on the management Ethernet interface (fxp0) only.                                                                                                |
| <b>Options</b>                  | <i>mac-address</i> —MAC address. Specify the MAC address as six hexadecimal bytes in one of the following formats: <i>nnnn.nnnn.nnnn</i> or <i>nn:nn:nn:nn:nn:nn</i> . For example, 0011.2233.4455 or 00:11:22:33:44:55. |
| <b>Usage Guidelines</b>         | See “Configuring the MAC Address on the Management Ethernet Interface” on page 628.                                                                                                                                      |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                  |

## mac-address

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|                                 |                                                                                                                                                                                                                                                 |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>mac-address mac-address;</code>                                                                                                                                                                                                           |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> accept-source-mac],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> accept-source-mac]              |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                  |
| <b>Description</b>              | For Gigabit Ethernet IQ and Gigabit Ethernet PICs with SFPs (except the 10-port Gigabit Ethernet PIC and the built-in Gigabit Ethernet port on the M7i platform), specify a remote MAC address on which to count incoming and outgoing packets. |
| <b>Options</b>                  | <i>mac-address</i> —MAC address. Specify the MAC address as six hexadecimal bytes in one of the following formats: <i>nnnn.nnnn.nnnn</i> or <i>nn:nn:nn:nn:nn:nn</i> . For example, 0011.2233.4455 or 00:11:22:33:44:55.                        |
| <b>Usage Guidelines</b>         | See “Configuring MAC Address Filtering” on page 613.                                                                                                                                                                                            |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                         |

## mac-learn-enable

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | (mac-learn-enable   no-mac-learn-enable);                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> gigether-options ethernet-switch-profile],<br>[edit interfaces <i>interface-name</i> aggregated-ether-options ethernet-switch-profile]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b>              | <p>For Gigabit Ethernet IQ and Gigabit Ethernet PICs with SFPs (except the 10-port Gigabit Ethernet PIC and the built-in Gigabit Ethernet port on the M7i platform), configure whether source and destination MAC addresses are dynamically learned:</p> <ul style="list-style-type: none"> <li>■ <b>mac-learn-enable</b>—Allow the interface to dynamically learn source and destination MAC addresses.</li> <li>■ <b>no-mac-learn-enable</b>—Prohibit the interface from dynamically learning source and destination MAC addresses.</li> </ul> <p>MAC address learning is based on source addresses. You can start accounting for traffic after there has been traffic sent from the MAC address. Once the MAC address is learned, the frames and bytes transmitted to or received from the MAC address can be tracked.</p> |
| <b>Usage Guidelines</b>         | See “Configuring MAC Address Filtering” on page 613.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

## mac-validate

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | mac-validate (loose   strict);                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family <i>family</i> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 9.3.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b>              | Enable IP and MAC address validation for static Ethernet and IP demux interfaces. Supported on MX-series routers only.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Options</b>                  | <p><b>loose</b>—Forwards incoming packets when both the IP source address and the MAC source address match one of the trusted address tuples. Drops packets when the IP source address matches one of the trusted tuples, but the MAC address does not match the MAC address of the tuple. Continues to forward incoming packets when the source address of the incoming packet does not match any of the trusted IP addresses.</p> <p><b>strict</b>—Forwards incoming packets when both the IP source address and the MAC source address match one of the trusted address tuples. Drops packets when the MAC address does not match the tuple's MAC source address, or when IP source address of the incoming packet does not match any of the trusted IP addresses.</p> |
| <b>Usage Guidelines</b>         | See “Configuring MAC Address Validation on Static Ethernet Interfaces” on page 579 and “Configuring MAC Address Validation on Static Demux Interfaces” on page 231.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

## **maintenance-association**

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**Syntax**    maintenance-association *ma-name* {  
               short-name-format (character-string | vlan | 2octet | rfc-2685-vpn-id);  
               continuity-check {  
                   hold-interval *minutes*;  
                   interval (10m | 10s | 1m | 1s| 100ms);  
                   loss-threshold *number*;  
               }  
               mep *mep-id* {  
                   auto-discovery;  
                   direction (up | down);  
                   interface *interface-name*;  
                   priority *number*;  
                   remote-mep *mep-id* {  
                       action-profile *profile-name*;  
                   }  
               }  
           }

**Hierarchy Level**    [edit protocols oam ethernet connectivity-fault-management maintenance-domain  
                           *domain-name*]

**Release Information**    Statement introduced in JUNOS Release 8.4.

**Description**    Configure the name of the maintenance association in IEEE-compliant format.

**Options**    ma-name—The name of the maintenance association within the maintenance domain.  
               The remaining statements are explained separately.

**Usage Guidelines**    See “Creating the Maintenance Association” on page 586.

**Required Privilege Level**    interface—To view this statement in the configuration.  
                                   interface-control—To add this statement to the configuration.



## maintenance-domain

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**Syntax**    `maintenance-domain domain-name {  
                   level number;  
                   name-format (character-string | none | dns | mac+2oct);  
                   maintenance-association ma-name {  
                       short-name-format (character-string | vlan | 2octet | rfc-2685-vpn-id);  
                       continuity-check {  
                           hold-interval minutes;  
                           interval (10m | 10s | 1m | 1s | 100ms);  
                           loss-threshold number  
                       }  
                       mep mep-id {  
                           action-profile profile-name;  
                           auto-discovery;  
                           direction (up | down);  
                           interface interface-name;  
                           priority number;  
                           remote-mep mep-id {  
                               action-profile profile-name;  
                           }  
                       }  
                   }  
                   }  
                   }`

**Hierarchy Level**    [edit protocols oam ethernet connectivity-fault-management]

**Release Information**    Statement introduced in JUNOS Release 8.4.

**Description**    Configure the name of the maintenance domain in IEEE-compliant format.

**Options**    domain-name—The name for the maintenance domain.

The remaining statements are explained separately.

**Usage Guidelines**    See “Creating the Maintenance Domain” on page 585.

**Required Privilege Level**    interface—To view this statement in the configuration.  
                   interface-control—To add this statement to the configuration.

**map**

---

**Syntax**    map {  
               local-mac *mac-address* remote-mac *mac-address*;  
               }

**Hierarchy Level**    [edit interfaces interface-name unit logical-unit-number family llc2 redundancy-group group-number],  
                           [edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number family llc2 redundancy-group group-number]

**Release Information**    Statement introduced in JUNOS Release 7.5.

**Description**    For J-series Services Routers only. On Ethernet interfaces configured for DLSw Ethernet redundancy, map a local peer MAC address to a remote peer MAC address.

The statements are explained separately



**NOTE:** For DLSw configurations, you must specify the **local-mac** statement and the **remote-mac** statement when you configure the **map** statement. If you do not include the MAC translation information with the **map** statement, the commit operation will fail.

---

**Usage Guidelines**    See “Configuring DLSw Ethernet Redundancy Using LLC2 Properties” on page 168.

**Required Privilege Level**    interface—To view this statement in the configuration.  
                                   interface-control—To add this statement to the configuration.

**Related Topics**    *JUNOS Services Interfaces Configuration Guide*

## master-only

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | master-only;                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Hierarchy Level</b>          | [edit groups rex interfaces fxp0 unit <i>logical-unit-number</i> family <i>family</i> address],<br>[edit groups rex logical-systems <i>logical-system-name</i> interfaces fxp0 unit<br><i>logical-unit-number</i> family <i>family</i> address]<br>[edit interfaces fxp0 unit <i>logical-unit-number</i> family <i>family</i> address],<br>[edit logical-systems <i>logical-system-name</i> interfaces fxp0 unit <i>logical-unit-number</i> family<br><i>family</i> address] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b>              | Configure the IP address to be used when the Routing Engine is the current master.                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Usage Guidelines</b>         | See “Configuring a Consistent Management IP Address” on page 627.                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                      |
| <b>Related Topics</b>           | For information about the <b>groups</b> statement, see the <i>JUNOS CLI User Guide</i> .                                                                                                                                                                                                                                                                                                                                                                                     |

## maximum-contexts

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|                                 |                                                                                                                                                                                                                                                                                                         |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | maximum-contexts <i>number</i> <force>;                                                                                                                                                                                                                                                                 |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> compression rtp],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i><br>compression rtp]                                                                       |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 7.5.                                                                                                                                                                                                                                                              |
| <b>Description</b>              | Specify the maximum number of RTP contexts to accept during negotiation.                                                                                                                                                                                                                                |
| <b>Options</b>                  | <i>number</i> —Maximum number of contexts.<br><br><i>force</i> —(Optional) Requires the PIC to use the value specified for maximum RTP contexts, regardless of the negotiated value. This option allows the software to interoperate with JUNOS releases that base the RTP context value on link speed. |
| <b>Usage Guidelines</b>         | See <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                                                                                                                              |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                 |

## maximum-vcs

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>maximum-vcs <i>maximum-vcs</i>;</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Hierarchy Level</b>          | <code>[edit interfaces <i>at-fpc/pic/port</i> atm-options vpi <i>vpi-identifier</i>]</code>                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b>              | <p>For ATM1 interfaces, configure the maximum number of virtual circuits (VCs) allowed on a virtual path (VP). When configuring ATM1 interfaces on the routing platform, you must include this statement.</p> <p>For a configured virtual path identifier (VPI), valid virtual channel identifier (VCI) numbers are from 0 through (<i>maximum-vcs</i> value – 1). VCI numbers 0 through 31 are reserved by the ATM Forum. It is recommended that you use a VCI number higher than 31 when connecting to an ATM switch.</p> |
| <b>Options</b>                  | <p><i>maximum-vcs</i>—Maximum number of VCs on the VP.</p> <p><b>Range:</b> 1 through 4090</p>                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Usage Guidelines</b>         | See “Configuring the Maximum Number of ATM1 VCs on a VP” on page 276.                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Related Topics</b>           | multipoint-destination, promiscuous-mode, vci                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

## maximum-requests

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|                                 |                                                                                                                                                |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>maximum-requests <i>times</i>;</code>                                                                                                    |
| <b>Hierarchy Level</b>          | <code>[edit protocols dot1x authenticator interface <i>interface-id</i>]</code>                                                                |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 9.3.                                                                                                     |
| <b>Description</b>              | Specify the maximum number of retransmission times of an EAPOL Request packet to the client before it times out the authentication session.    |
| <b>Options</b>                  | <p><i>times</i>—Specify the maximum number of retransmission times.</p> <p><b>Range:</b> 1 through 10 times</p> <p><b>Default:</b> 2 times</p> |
| <b>Usage Guidelines</b>         | See “Configuring IEEE 802.1x Port-Based Network Access Control” on page 591.                                                                   |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>             |
| <b>Related Topics</b>           | dot1x, authenticator, interface (IEEE 802.1x (dot1x)—Port-Based Network Access Control)                                                        |

## max-retry

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|                                 |                                                                                                                                                                                                                        |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>max-retry count;</code>                                                                                                                                                                                          |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family llc2],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family llc2] |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 7.4.                                                                                                                                                                             |
| <b>Description</b>              | For J-series Services Routers only. On Ethernet interfaces configured for DLSw, configure the number of retries the router should attempt when waiting for a response.                                                 |
| <b>Options</b>                  | <i>count</i> —Number of retries.<br><b>Range:</b> 1 through 127<br><b>Default:</b> 10                                                                                                                                  |
| <b>Usage Guidelines</b>         | See “Configuring LLC2 Options” on page 167.                                                                                                                                                                            |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                |
| <b>Related Topics</b>           | <i>J-series Services Router Advanced WAN Access Configuration Guide</i>                                                                                                                                                |

## member-interface-speed

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|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>member-interface-speed speed;</code>                                                                              |
| <b>Hierarchy Level</b>          | [edit interfaces container-options member-interface-type]                                                               |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 9.2.                                                                              |
| <b>Description</b>              | Specify container-interface member-interface speed options.                                                             |
| <b>Options</b>                  | <i>speed</i> —Set interface speed to OC3, OC12, OC48, OC192, OC768, or mixed.                                           |
| <b>Usage Guidelines</b>         | See “Configuring Container Interfaces” on page 697.                                                                     |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |
| <b>Related Topics</b>           | container-options                                                                                                       |

## member-interface-type

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|                                 |                                                                                                                                                    |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | member-interface-type sonet {<br>member-interface-speed [ <i>speed</i> ];<br>}                                                                     |
| <b>Hierarchy Level</b>          | [edit interfaces container-options]                                                                                                                |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 9.2.                                                                                                         |
| <b>Description</b>              | Specify container-interface member-interface type as sonet and speed options.                                                                      |
| <b>Options</b>                  | <p>sonet—Protocol type of the container interface, specify sonet.</p> <p>speed—Set interface speed to OC3, OC12, OC48, OC192, OC768, or mixed.</p> |
| <b>Usage Guidelines</b>         | See “Configuring Container Interfaces” on page 697.                                                                                                |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                            |
| <b>Related Topics</b>           | container-options                                                                                                                                  |

**mep**

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**Syntax**    mep *mep-id* {  
               auto-discovery;  
               direction (up | down);  
               interface *interface-name*;  
               priority *number*;  
               remote-mep *mep-id* {  
                   action-profile *profile-name*;  
               }  
           }

**Hierarchy Level**    [edit protocols oam ethernet connectivity-fault-management maintenance-domain  
                           *domain-name* maintenance-association *ma-name*]

**Release Information**    Statement introduced in JUNOS Release 8.4.

**Description**    The numeric identifier of the maintenance association end point (MEP) within the maintenance association.

**Options**    mep-id—Specify the numeric identifier of the MEP.  
               **Range:** 1 through 8191

The remaining statements are explained separately.

**Usage Guidelines**    See “Creating a Maintenance End Point” on page 587.

**Required Privilege Level**    interface—To view this statement in the configuration.  
                                   interface-control—To add this statement to the configuration.

## minimum-links

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>minimum-links <i>number</i>;</code>                                                                                                                                                                                                                                                                                                                                                    |
| <b>Hierarchy Level</b>          | [edit interfaces <i>aex</i> aggregated-ether-options],<br>[edit interfaces <i>asx</i> aggregated-sonet-options],<br>[edit interfaces <i>interface-name</i> mlfr-uni-nni-bundle-options],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b>              | For aggregated Ethernet, SONET/SDH, multilink, link services, and voice services interfaces only, set the minimum number of links that must be up for the bundle to be labeled up.                                                                                                                                                                                                           |
| <b>Options</b>                  | <i>number</i> —Number of links.<br><b>Range:</b> 1 through 8 (1 through 16 for Ethernet and SONET interfaces on the MX-series, M320, M120, T-series or TX matrix routers)<br><b>Default:</b> 1                                                                                                                                                                                               |
| <b>Usage Guidelines</b>         | See “Configuring Aggregated Ethernet Minimum Links” on page 546, “Configuring Aggregated SONET/SDH Minimum Links” on page 718, or the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                                                                                 |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                      |



## mlfr-uni-nni-bundle-options

---

**Syntax** mlfr-uni-nni-bundle-options {  
 acknowledge-retries *number*;  
 acknowledge-timer *milliseconds*;  
 action-red-differential-delay (disable-tx | remove-link);  
 drop-timeout *milliseconds*;  
 fragment-threshold *bytes*;  
 hello-timer *milliseconds*;  
 link-layer-overhead *percent*;  
 lmi-type (ansi | itu);  
 minimum-links *number*;  
 mrru *bytes*;  
 n391 *number*;  
 n392 *number*;  
 n393 *number*;  
 red-differential-delay *milliseconds*;  
 t391 *seconds*;  
 t392 *number*;  
 yellow-differential-delay *milliseconds*;  
 }

**Hierarchy Level** [edit interfaces *interface-name*]

**Release Information** Statement introduced before JUNOS Release 7.4.

**Description** Configure link services and voice services interface management properties.

The statements are explained separately.

**Usage Guidelines** See the *JUNOS Services Interfaces Configuration Guide*.

**Required Privilege Level** interface—To view this statement in the configuration.  
 interface-control—To add this statement to the configuration.

## mode

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|                                 |                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | mode loose;                                                                                                                                                                                                                                                                                                                                                 |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family (inet   inet6) rpf-check],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i><br>family (inet   inet6) rpf-check]                                                                                           |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                              |
| <b>Description</b>              | Check whether the packet has a source address with a corresponding prefix in the routing table. If a corresponding prefix is not found, unicast reverse path forwarding (RPF) loose mode does not accept the packet. Unlike strict mode, loose mode does not check whether the interface expects to receive a packet with a specific source address prefix. |
| <b>Default</b>                  | If you do not include this statement, unicast RPF is in strict mode.                                                                                                                                                                                                                                                                                        |
| <b>Usage Guidelines</b>         | See “Configuring Unicast RPF Strict Mode” on page 189 and “Configuring Unicast RPF Loose Mode” on page 190.                                                                                                                                                                                                                                                 |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                     |

## modem-options

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|                                 |                                                                                                                                    |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | modem-options {<br>dialin (console   routable);<br>init-command-string <i>initialization-command-string</i> ;<br>}                 |
| <b>Hierarchy Level</b>          | [edit interfaces umd0]                                                                                                             |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.2.                                                                                         |
| <b>Description</b>              | For J-series Services Routers, configure a USB port to act as a USB modem.<br><br>The remaining statement is explained separately. |
| <b>Usage Guidelines</b>         | See “Specifying a USB Modem Interface on J-series Routers” on page 85.                                                             |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.            |

## monitor-session

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|                                 |                                                                                                                                                            |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | monitor-session ( <i>interface-name</i>   all);                                                                                                            |
| <b>Hierarchy Level</b>          | [edit protocols ppp]                                                                                                                                       |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 7.5.                                                                                                                 |
| <b>Description</b>              | Monitor PPP packet exchanges. When monitoring is enabled, packets exchanged during a session are logged to the default log of <code>/var/log/pppd</code> . |
| <b>Default</b>                  | If you do not include this statement, no PPPD-specific monitoring operations are performed.                                                                |
| <b>Options</b>                  | all—Monitor PPP packet exchanges on all sessions.<br><br><i>interface-name</i> —Logical interface name on which to enable session monitoring.              |
| <b>Usage Guidelines</b>         | See “Monitoring a PPP Session” on page 110.                                                                                                                |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                    |

## mpls

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|                                 |                                                                                                                                                                                                                                          |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <pre> mpls {   pop-all-labels {     required-depth <i>number</i>;   } } </pre>                                                                                                                                                           |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> atm-options],<br>[edit interfaces <i>interface-name</i> sonet-options],<br>[edit interfaces <i>interface-name</i> fastether-options],<br>[edit interfaces <i>interface-name</i> gigether-options] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                           |
| <b>Description</b>              | For passive monitoring on ATM and SONET/SDH interfaces and 10-Gigabit Ethernet interfaces in WAN PHY mode, process incoming IP packets that have MPLS labels.<br><br>The remaining statements are explained separately.                  |
| <b>Usage Guidelines</b>         | See “Removing MPLS Labels from Incoming Packets” on page 270 and “Removing MPLS Labels from Incoming Packets” on page 709.                                                                                                               |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                  |
| <b>Related Topics</b>           | <i>JUNOS Services Interfaces Configuration Guide</i>                                                                                                                                                                                     |

**mrru**

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|                                 |                                                                                                                                                                                                                                                                          |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>mrru bytes;</code>                                                                                                                                                                                                                                                 |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> mlfr-uni-nni-bundle-options],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                           |
| <b>Description</b>              | For multilink, link services, voice services, and J-series Services Routers ISDN interfaces only, set the maximum received reconstructed unit (MRRU). The MRRU is similar to the MTU, but is specific to multilink interfaces.                                           |
| <b>Options</b>                  | <i>bytes</i> —MRRU size.<br><b>Range:</b> 1500 through 4500 bytes<br><b>Default:</b> 1500 bytes                                                                                                                                                                          |
| <b>Usage Guidelines</b>         | See “Configuring the Dialer Interface” on page 668 and the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                                        |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                  |
| <b>Related Topics</b>           | mtu                                                                                                                                                                                                                                                                      |

**mtu**

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|                                 |                                                                                                                                                                                                                                                                                                                                    |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>mtu bytes;</code>                                                                                                                                                                                                                                                                                                            |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> ],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family <i>family</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family <i>family</i> ]                                            |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                     |
| <b>Description</b>              | Maximum transmission unit (MTU) size for the media or protocol. The default MTU size depends on the device type. Not all devices allow you to set an MTU value, and some devices have restrictions on the range of allowable MTU values. Changing the media MTU or protocol MTU causes an interface to be deleted and added again. |
| <b>Options</b>                  | <i>bytes</i> —MTU size.<br><b>Range:</b> 0 through 9192 bytes<br><b>Default:</b> 1500 bytes (INET, INET6, and ISO families), 1448 bytes (MPLS)                                                                                                                                                                                     |
| <b>Usage Guidelines</b>         | See “Configuring the Media MTU” on page 89 and “Setting the Protocol MTU” on page 177.                                                                                                                                                                                                                                             |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                            |

## multicast-dlci

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|                                 |                                                                                                                                                                                                                                                   |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>multicast-dlci <i>dlci-identifier</i>;</code>                                                                                                                                                                                               |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ]                                                  |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                    |
| <b>Description</b>              | For point-to-multipoint Frame Relay, link services, and voice services interfaces only, enable multicast support on the interface. You can configure multicast support on the interface if the Frame Relay switch performs multicast replication. |
| <b>Options</b>                  | <i>dlci-identifier</i> —DLCI identifier, a number from 16 through 1022 that defines the Frame Relay DLCI over which the switch expects to receive multicast packets for replication.                                                              |
| <b>Usage Guidelines</b>         | See “Configuring a Multicast-Capable Frame Relay Connection” on page 357 and the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                           |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                           |
| <b>Related Topics</b>           | dlci, multipoint-destination                                                                                                                                                                                                                      |

## multicast-vci

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|                                 |                                                                                                                                                                                                                                               |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>multicast-vci vpi-identifier.vci-identifier;</code>                                                                                                                                                                                     |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ]                                              |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                |
| <b>Description</b>              | For ATM encapsulation only, and for point-to-multipoint ATM logical interfaces only, enable the support of multicast on the interface. You can configure multicast support on the interface if the ATM switch performs multicast replication. |
| <b>Options</b>                  | <i>vci-identifier</i> —ATM virtual circuit identifier.<br><b>Range:</b> 0 through 16384<br><br><i>vpi-identifier</i> —ATM virtual path identifier.<br><b>Range:</b> 0 through 255<br><b>Default:</b> 0                                        |
| <b>Usage Guidelines</b>         | See “Configuring a Multicast-Capable ATM1 or ATM2 IQ Connection” on page 294.                                                                                                                                                                 |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                       |
| <b>Related Topics</b>           | multipoint-destination, vci                                                                                                                                                                                                                   |

## multicast-only

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|                                 |                                                                                                                                                                                                                        |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>multicast-only;</code>                                                                                                                                                                                           |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                         |
| <b>Description</b>              | Configure the unit and family so that it can transmit and receive multicast traffic only. You can configure this property on the IP family only.                                                                       |
| <b>Usage Guidelines</b>         | See “Configuring the Protocol Family” on page 160.                                                                                                                                                                     |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                |
| <b>Related Topics</b>           | tunnel, <i>JUNOS Services Interfaces Configuration Guide</i>                                                                                                                                                           |

## multilink-max-classes

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|                                 |                                                                                                                                                                                                  |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | multilink-max-classes <i>number</i> ;                                                                                                                                                            |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                   |
| <b>Description</b>              | For Adaptive Services (AS) PIC link services IQ interfaces (lsq) only, configure the number of multilink classes to be negotiated when a link joins the bundle.                                  |
| <b>Options</b>                  | <i>number</i> —The number of multilink classes to be negotiated when a link joins the bundle.<br><b>Range:</b> 1 through 8<br><b>Default:</b> None                                               |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                   |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                          |
| <b>Related Topics</b>           | multipoint                                                                                                                                                                                       |

## multipoint

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|                                 |                                                                                                                                                                                                  |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | multipoint;                                                                                                                                                                                      |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                   |
| <b>Description</b>              | Configure the interface unit as a multipoint connection.                                                                                                                                         |
| <b>Default</b>                  | If you omit this statement, the interface unit is configured as a point-to-point connection.                                                                                                     |
| <b>Usage Guidelines</b>         | See “Configuring a Multipoint Connection” on page 147.                                                                                                                                           |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                          |
| <b>Related Topics</b>           | point-to-point                                                                                                                                                                                   |

## multipoint-destination

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <pre> multipoint-destination address dlcidlcid-identifier; multipoint-destination address {   epd-threshold cells;   inverse-arp;   oam-liveness {     up-count cells;     down-count cells;   }   oam-period (disable   seconds);   shaping {     (cbr rate   rtvbr peak rate sustained rate burst length   vbr peak rate sustained rate     burst length);     queue-length number;   }   vci vpi-identifier.vci-identifier; } </pre>                                                                                                                     |
| <b>Hierarchy Level</b>          | <pre> [edit interfaces interface-name unit logical-unit-number family family address address], [edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number family family address address] </pre>                                                                                                                                                                                                                                                                                                                           |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b>              | For point-to-multipoint Frame Relay or ATM interfaces only, enable the support of multicast on the interface. You can configure multicast support on the interface if the Frame Relay or ATM switch performs multicast replication.                                                                                                                                                                                                                                                                                                                         |
| <b>Options</b>                  | <p><b>address</b>—Address of the remote side of the point-to-multipoint connection.</p> <p><b>dlci-identifier</b>—For Frame Relay interfaces, the data-link connection identifier.<br/> <b>Range:</b> 0 through 0xFFFFFFF (24 bits)</p> <p><b>vci-identifier</b>—For ATM interfaces, the virtual circuit identifier.<br/> <b>Range:</b> 0 through 16384</p> <p><b>vpi-identifier</b>—For ATM interfaces, the virtual path identifier.<br/> <b>Range:</b> 0 through 255<br/> <b>Default:</b> 0</p> <p>The remaining statements are explained separately.</p> |
| <b>Usage Guidelines</b>         | See “Configuring a Point-to-Point ATM1 or ATM2 IQ Connection” on page 292, and “Configuring a Point-to-Multipoint Frame Relay Connection” on page 357.                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Related Topics</b>           | dlci, encapsulation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |



## multiservice-options

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|                                 |                                                                                                                                                |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | multiservice-options {<br>(syslog   no-syslog);<br>(core-dump   no-core-dump);<br>}                                                            |
| <b>Hierarchy Level</b>          | [edit interfaces <i>mo-fpc/pic/port</i> ]                                                                                                      |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                 |
| <b>Description</b>              | For monitoring services interfaces only, configure multiservice-specific interface properties.<br><br>The statements are explained separately. |
| <b>Usage Guidelines</b>         | See “Configuring Multiservice Physical Interface Properties” on page 129 and the <i>JUNOS Services Interfaces Configuration Guide</i> .        |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                        |
| <b>Related Topics</b>           | passive-monitor-mode                                                                                                                           |

## n391

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|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | n391 <i>number</i> ;                                                                                                    |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> mlfr-uni-nni-bundle-options]                                                     |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                          |
| <b>Description</b>              | For link services and voice services interfaces only, set the Frame Relay full status polling interval.                 |
| <b>Options</b>                  | number—Number of polling interval.<br><b>Range:</b> 1 through 255<br><b>Default:</b> 6                                  |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                          |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |
| <b>Related Topics</b>           | n392, n393, timeslots, and t392                                                                                         |

**n392**

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|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | n392 <i>number</i> ;                                                                                                    |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> mlfr-uni-nni-bundle-options]                                                     |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                          |
| <b>Description</b>              | For link services and voices interfaces only, set the Frame Relay error threshold, in number of errors.                 |
| <b>Options</b>                  | number—Error threshold.<br><b>Range:</b> 1 through 10<br><b>Default:</b> 3                                              |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                          |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |
| <b>Related Topics</b>           | n391, n393, timeslots, t392                                                                                             |

**n393**

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|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | n393 <i>number</i> ;                                                                                                    |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> mlfr-uni-nni-bundle-options]                                                     |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                          |
| <b>Description</b>              | For link services and voices interfaces only, set the Frame Relay monitored event count.                                |
| <b>Options</b>                  | <i>number</i> —Number of event count.<br><b>Range:</b> 1 through 255<br><b>Default:</b> 6                               |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                          |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |
| <b>Related Topics</b>           | n391, n392, timeslots, t392                                                                                             |

## name-format

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | name-format (character-string   none   dns   mac+2oct);                                                                                                                                                                                                                                                                                                                                                     |
| <b>Hierarchy Level</b>          | [edit protocols oam ethernet connectivity-fault-management maintenance-domain <i>domain-name</i> ]                                                                                                                                                                                                                                                                                                          |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.4.                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b>              | Specify the format of the maintenance domain name.                                                                                                                                                                                                                                                                                                                                                          |
| <b>Options</b>                  | <p>character-string—The name is an ASCII character string.</p> <p>none—Name format none means that maintenance domain name is not used.</p> <p>dns—Name is in domain name service (DNS) format. For example: www.juniper.net.</p> <p>mac+2octet—Name is the MAC address plus a two-octet maintenance association identifier. For example: 08:00:22:33:44:55.100</p> <p><b>Default:</b> character-string</p> |
| <b>Usage Guidelines</b>         | See “Configuring the Maintenance Association Short Name Format” on page 586.                                                                                                                                                                                                                                                                                                                                |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                                                                          |

## native-vlan-id

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>native-vlan-id <i>number</i>;</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Hierarchy Level</b>          | [edit interfaces <i>ge-fpc/pic/port</i> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.3.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Description</b>              | <p>For 1-, 4-, and 8-port Gigabit Ethernet IQ2 PICs, for 1-port 10-Gigabit Ethernet IQ2 PICs configured for 802.1Q flexible VLAN tagging, for all Ethernet interfaces on MX-series routers, and for aggregated Ethernet interfaces on IQ2 PICs or MX-series DPCs, configure mixed tagging support for untagged packets on a port. When the <b>native-vlan-id</b> statement is included with the <b>flexible-vlan-tagging</b> statement, untagged packets are accepted on the same mixed VLAN-tagged port.</p> <p>The logical interface on which untagged packets will be received must be configured with the same native VLAN ID as that configured on the physical interface. To configure the logical interface, include the <b>vlan-id</b> statement (matching the <b>native-vlan-id</b> statement on the physical interface) at the [edit interface <i>interface-name</i> unit <i>logical-unit-number</i>] hierarchy level.</p> <p>When the <b>native-vlan-id</b> statement is included with the <b>interface-mode</b> the statement, untagged packets are accepted and forwarded within the bridge domain that is configured with the matching VLAN ID.</p> |
| <b>Options</b>                  | <i>number</i> —VLAN ID number.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Usage Guidelines</b>         | See “Configuring Mixed Tagging Support for Untagged Packets” on page 527, <b>flexible-vlan-tagging</b> , and “Configuring a Logical Interface for Access Mode” on page 529.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

**ncp-restart-timer**

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|                                 |                                                                                                                                                                                                                        |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>ncp-restart-timer milliseconds;</code>                                                                                                                                                                           |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ppp-options],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ppp-options] |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.1.                                                                                                                                                                             |
| <b>Description</b>              | For interfaces with PPP and PPP TCC encapsulations and on multilink PPP bundle interfaces, configure a restart timer for the Network Control Protocol (NCP) component of a PPP session.                                |
| <b>Options</b>                  | <i>milliseconds</i> —The time in milliseconds between successive NCP configuration requests.<br><b>Range:</b> 500 through 10000 milliseconds.<br><b>Default:</b> 3 seconds                                             |
| <b>Usage Guidelines</b>         | See “Configuring the PPP Restart Timers” on page 151.                                                                                                                                                                  |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                |

**negotiate-address**

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|                                 |                                                                                                                                                                                                                        |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>negotiate-address;</code>                                                                                                                                                                                        |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                         |
| <b>Description</b>              | For interfaces with PPP encapsulation, enable the interface to be assigned an IP address by the remote end.                                                                                                            |
| <b>Usage Guidelines</b>         | See “Configuring IPCP Options” on page 164.                                                                                                                                                                            |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                |
| <b>Related Topics</b>           | address, unnumbered-address, <i>JUNOS System Basics Configuration Guide</i>                                                                                                                                            |

## negotiation-options

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|                                 |                                                                                                                                                                          |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | negotiation-options {<br>allow-remote-loopback;<br>no-allow-link-events;<br>}                                                                                            |
| <b>Hierarchy Level</b>          | [edit protocols oam link-fault-management interface <i>interface-name</i> ]                                                                                              |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.4.                                                                                                                               |
| <b>Description</b>              | <p>Enable and disable IEEE 802.3ah Operation, Administration, and Management (OAM) features for Ethernet interfaces.</p> <p>The statements are explained separately.</p> |
| <b>Usage Guidelines</b>         | See “Configuring IEEE 802.3ah OAM Link-Fault Management” on page 595.                                                                                                    |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                       |

## neighbor

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | neighbor <i>address</i> ;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> sonet-options aps]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b>              | <p>If you are configuring one router to be the working router and a second to be the protect router, configure the address of the remote interface. You configure this on one or both of the interfaces.</p> <p>The address you specify for the neighbor must never be routed through the interface on which APS is configured, or instability will result. We strongly recommend that you directly connect the working and protect routers and that you configure the interface address of this shared network as the neighbor address.</p> |
| <b>Options</b>                  | <i>address</i> —Neighbor’s address.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Usage Guidelines</b>         | See “Configuring Basic APS Support” on page 696.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                                                                                                                                                                                                           |

## no-allow-link-events

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|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | no-allow-link-events;                                                                                                   |
| <b>Hierarchy Level</b>          | [edit protocols oam ethernet link-fault-management interface <i>interface-name</i> negotiation-options]                 |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.4.                                                                              |
| <b>Description</b>              | Disable the sending of link event TLVs.                                                                                 |
| <b>Usage Guidelines</b>         | See “Disabling the Sending of Link Event TLVs” on page 598.                                                             |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |

## no-asynchronous-notification

---

**See** asynchronous-notification

## no-auto-negotiation

---

**See** auto-negotiation

## no-cbit-parity

---

**See** cbit-parity

## no-core-dump

---

**See** core-dump

## no-feac-loop-respond

---

**See** feac-loop-respond

## no-flow-control

---

**See** flow-control

## no-gratuitous-arp-reply

---

**See** gratuitous-arp-reply

## no-gratuitous-arp-request

---

**Syntax** no-gratuitous-arp-request;

**Hierarchy Level** [edit interfaces *interface-name*]

**Release Information** Statement introduced before JUNOS Release 7.4.

**Description** For Ethernet interfaces, do not respond to gratuitous ARP requests.

**Default** Gratuitous ARP responses are enabled on all Ethernet interfaces.

**Usage Guidelines** See “Configuring Gratuitous ARP” on page 521.

**Required Privilege Level** interface—To view this statement in the configuration.  
interface-control—To add this statement to the configuration.

**Related Topics** gratuitous-arp-reply



## no-keepalives

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | no-keepalives;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> ],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ]                                                                                                                                                                                                                                                                                                 |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b>              | <p>Disable the sending of keepalives on a physical interface configured with PPP, Frame Relay, or Cisco HDLC encapsulation. The default keepalive interval is 10 seconds.</p> <p>For ATM2 IQ interfaces only, you can disable keepalives on a logical interface unit if the logical interface is configured with one of the following PPP over ATM encapsulation types:</p> <ul style="list-style-type: none"> <li>■ atm-ppp-llc—PPP over AAL5 LLC encapsulation.</li> <li>■ atm-ppp-vc-mux—PPP over AAL5 multiplex encapsulation.</li> </ul> |
| <b>Usage Guidelines</b>         | See “Configuring Keepalives” on page 118 “Disabling the Sending of PPPoE Keepalive Messages” on page 640, and “Configuring Frame Relay Keepalives” on page 353.                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                       |

## no-long-buildout

---

**See** long-buildout

## no-loopback

---

**See** loopback

## no-mac-learn-enable

---

**See** mac-learn-enable

## non-revertive

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|                                 |                                                                                                                                                           |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | non-revertive;                                                                                                                                            |
| <b>Hierarchy Level</b>          | [edit interfaces aeX aggregated-ether-options lacp link-protection]                                                                                       |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 9.3.                                                                                                                |
| <b>Description</b>              | Disable the ability to switch to a better priority link (if one is available) once a link is established as active and collectiondistribution is enabled. |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                   |

## no-partition

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See the following sections:

- no-partition (Channelized E1 IQ Interfaces) on page 961
- no-partition (Channelized OC1 IQ Interfaces) on page 962
- no-partition (Channelized OC12 IQ Interfaces) on page 962
- no-partition (Channelized STM1 IQ Interfaces) on page 963
- no-partition (Channelized T3 IQ Interfaces) on page 963

### ***no-partition (Channelized E1 IQ Interfaces)***

|                                 |                                                                                                                                                                |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | no-partition interface-type e1;                                                                                                                                |
| <b>Hierarchy Level</b>          | [edit interfaces ce1-fpc/pic/port]                                                                                                                             |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                 |
| <b>Description</b>              | For Channelized E1 IQ PICs only, configure the channelized E1 interface as an unpartitioned, clear channel.                                                    |
| <b>Default</b>                  | If you do not include either this statement or the <b>partition</b> statement, the Channelized IQ PIC is not partitioned, and no data channels are configured. |
| <b>Usage Guidelines</b>         | See “Configuring Channelized E1 Interfaces” on page 377.                                                                                                       |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                        |
| <b>Related Topics</b>           | partition                                                                                                                                                      |

***no-partition (Channelized OC1 IQ Interfaces)***

|                                 |                                                                                                                                                                                                                    |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | no-partition interface-type (ct3   t3);                                                                                                                                                                            |
| <b>Hierarchy Level</b>          | [edit interfaces coc1-fpc/pic/port:channel]                                                                                                                                                                        |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                     |
| <b>Description</b>              | For the Channelized OC12 PIC only, convert the channelized OC1 IQ interface into a channelized T3 interface or a T3 interface. You perform this configuration task for C-bit parity and M13-mapped configurations. |
| <b>Default</b>                  | If you do not include either this statement or the <b>partition</b> statement, the Channelized IQ PICs not partitioned, and no data channels are configured.                                                       |
| <b>Options</b>                  | ct3—Channelized T3 interface type.<br><br>t3—T3 interface type.                                                                                                                                                    |
| <b>Usage Guidelines</b>         | See “Configuring Channelized OC12 Interfaces” on page 401.                                                                                                                                                         |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                            |
| <b>Related Topics</b>           | partition                                                                                                                                                                                                          |

***no-partition (Channelized OC12 IQ Interfaces)***

|                                 |                                                                                                                                                              |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | no-partition interface-type so;                                                                                                                              |
| <b>Hierarchy Level</b>          | [edit interfaces coc12-fpc/pic/port]                                                                                                                         |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                               |
| <b>Description</b>              | For Channelized OC12 IQ PICs only, configure the channelized OC12 interface as an unpartitioned, clear channel.                                              |
| <b>Default</b>                  | If you do not include either this statement or the <b>partition</b> statement, the Channelized IQ PICs not partitioned, and no data channels are configured. |
| <b>Usage Guidelines</b>         | See “Configuring an OC12 IQ and IQE Interface” on page 403.                                                                                                  |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                      |
| <b>Related Topics</b>           | partition                                                                                                                                                    |

***no-partition (Channelized STM1 IQ Interfaces)***

|                                 |                                                                                                                                                                       |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | no-partition interface-type (cau4   so);                                                                                                                              |
| <b>Hierarchy Level</b>          | [edit interfaces cstm1- <i>fpc/pic/port</i> ]                                                                                                                         |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                        |
| <b>Description</b>              | For the Channelized STM1 PIC only, convert the channelized STM1 IQ interface into a channelized Administrative Unit 4 (AU-4) interface or a SONET/SDH STM1 interface. |
| <b>Default</b>                  | If you do not include either this statement or the <b>partition</b> statement, the Channelized IQ PICs not partitioned, and no data channels are configured.          |
| <b>Options</b>                  | cau4—Channelized AU-4 interface type.<br><br>so—SONET/SDH STM1 interface type.                                                                                        |
| <b>Usage Guidelines</b>         | See “Configuring Channelized STM1 IQ and IQE Interfaces” on page 423.                                                                                                 |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                               |
| <b>Related Topics</b>           | partition                                                                                                                                                             |

***no-partition (Channelized T3 IQ Interfaces)***

|                                 |                                                                                                                                                                |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | no-partition interface-type t3;                                                                                                                                |
| <b>Hierarchy Level</b>          | [edit interfaces ct3- <i>fpc/pic/port</i> ]                                                                                                                    |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                 |
| <b>Description</b>              | For the Channelized DS3 PIC only, configure the channelized T3 interface as an unpartitioned, clear channel.                                                   |
| <b>Default</b>                  | If you do not include either this statement or the <b>partition</b> statement, the Channelized IQ PIC is not partitioned, and no data channels are configured. |
| <b>Usage Guidelines</b>         | See “Configuring T3 IQ Interfaces” on page 443.                                                                                                                |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                        |
| <b>Related Topics</b>           | partition                                                                                                                                                      |

***no-payload-scrambler***


---

**See** payload-scrambler

## no-preempt

---

**See** preempt

## no-redirects

---

**Syntax** no-redirects;

**Hierarchy Level** [edit interfaces *interface-name* unit *number* family *family*]

**Release Information** Statement introduced before JUNOS Release 7.4.

**Description** Do not send protocol redirect messages on the interface.

To disable the sending of protocol redirect messages for the entire routing platform, include the **no-redirects** statement at the [edit system] hierarchy level.

**Default** Interfaces send protocol redirect messages.

**Usage Guidelines** See “Disabling the Transmission of Redirect Messages on an Interface” on page 178.

**Required Privilege Level** interface—To view this statement in the configuration.  
interface-control—To add this statement to the configuration.

**Related Topics** *JUNOS System Basics Configuration Guide*

## no-source-filtering

---

**See** source-filtering

## no-syslog

---

**See** syslog

## no-termination-request

---

|                                 |                                                                                                                                                                                                                                                                                     |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | no-termination-request;                                                                                                                                                                                                                                                             |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> ppp-options],<br>[edit interfaces <i>lsq-fpc/pic/port</i> lsq-failure-options]                                                                                                                                                               |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 7.4.<br>Support at the [edit interfaces <i>interface-name</i> ppp-options] hierarchy level added in JUNOS Release 8.3.                                                                                                                        |
| <b>Description</b>              | For LSQ PICs or link PICs in redundant LSQ configurations, you can inhibit the router from sending PPP termination-request messages to the remote host if the PIC fails.                                                                                                            |
| <b>Usage Guidelines</b>         | See “Configuring Link PIC Failover” on page 400 for Channelized OC3 IQ PICs, “Configuring Link PIC Failover” on page 416 for OC12 IQ PICs, “Configuring Link PIC Failover” on page 433 for Channelized STM1 IQ PICs, and the <i>JUNOS Services Interfaces Configuration Guide</i> . |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                             |

## no-translate-discard-eligible

---

**See** translate-discard-eligible

## no-translate-fecn-and-becn

---

**See** translate-fecn-and-becn

## no-unframed

---

**See** unframed

## no-z0-increment

---

**See** z0-increment

**oam**

```

Syntax oam {
 ethernet {
 connectivity-fault-management {
 action-profile profile-name {
 default-action {
 interface-down;
 }
 }
 }
 linktrace {
 age (30m | 10m | 1m | 30s | 10s);
 path-database-size path-database-size;
 }
 maintenance-domain domain-name {
 level number;
 name-format (character-string | none | dns | mac+2octet);
 maintenance-association ma-name {
 short-name-format (character-string | vlan | 2octet | rfc-2685-vpn-id);
 continuity-check {
 hold-interval minutes;
 interval (10m | 10s | 1m | 1s| 100ms);
 loss-threshold number;
 }
 mep mep-id {
 action-profile profile-name;
 auto-discovery;
 direction (up | down);
 interface interface-name;
 priority number;
 remote-mep mep-id {
 action-profile profile-name;
 }
 }
 }
 }
 }
 }
 link-fault-management {
 action-profile profile-name {
 action {
 syslog;
 link-down;
 send-critical-event;
 }
 event {
 link-adjacency-loss;
 link-event-rate {
 frame-error count;
 frame-period count;
 frame-period-summary count;
 symbol-period count;
 }
 }
 protocol-down;
 }
 }

```



```

 }
 }
 interface interface-name {
 apply-action-profile
 link-discovery (active | passive);
 pdu-interval interval;
 pdu-threshold threshold-value;
 remote-loopback;
 event-thresholds {
 frame-error count;
 frame-period count;
 frame-period-summary count;
 symbol-period count;
 }
 negotiation-options {
 allow-remote-loopback;
 no-allow-link-events;
 }
 }
}
}
}

```

|                                 |                                                                                                                                                                                                                                  |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Hierarchy Level</b>          | [edit protocols]                                                                                                                                                                                                                 |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.2.                                                                                                                                                                                       |
| <b>Description</b>              | <p>For Ethernet interfaces on M320, M120, MX-series, and T-series routing platforms, provide IEEE 802.3ah Operation, Administration, and Management (OAM) support.</p> <p>The remaining statements are explained separately.</p> |
| <b>Usage Guidelines</b>         | See “Configuring IEEE 802.3ah OAM Link-Fault Management” on page 595.                                                                                                                                                            |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                               |

## oam-liveness

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | oam-liveness {<br>down-count <i>cells</i> ;<br>up-count <i>cells</i> ;<br>}                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> atm-options vpi <i>vpi-identifier</i> ],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family <i>family</i> address <i>address</i> multipoint-destination <i>address</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family <i>family</i> address <i>address</i> multipoint-destination <i>address</i> ] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b>              | For ATM encapsulation only, configure Operation, Administration, and Maintenance (OAM) F5 loopback cell count thresholds. Not supported on ATM-over-SHDSL interfaces.<br><br>For ATM2 IQ PICs only, configure OAM F4 loopback cell count thresholds at the [edit interfaces <i>interface-name</i> atm-options vpi <i>vpi-identifier</i> ] hierarchy level.                                                                                                                                                                                                                                                                                                   |
| <b>Options</b>                  | down-count <i>cells</i> —Minimum number of consecutive OAM F4 or F5 loopback cells lost before a VC is declared down.<br><b>Range:</b> 1 through 255<br><b>Default:</b> 5 cells<br><br>up-count <i>cells</i> —Minimum number of consecutive OAM F4 or F5 loopback cells received before a VC is declared up.<br><b>Range:</b> 1 through 255<br><b>Default:</b> 5 cells                                                                                                                                                                                                                                                                                       |
| <b>Usage Guidelines</b>         | See “Configuring the ATM OAM F5 Loopback Cell Threshold” on page 305.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

## oam-period

---

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | oam-period (disable   seconds);                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> atm-options vpi <i>vpi-identifier</i> ],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family <i>family</i> address <i>address</i> multipoint-destination <i>address</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family <i>family</i> address <i>address</i> multipoint-destination <i>address</i> ] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b>              | For ATM encapsulation only, configure the OAM F5 loopback cell period. Not supported on ATM-over-SHDSL interfaces.<br><br>For ATM2 IQ PICs only, configure OAM F4 loopback cell period at the [edit interfaces <i>interface-name</i> atm-options vpi <i>vpi-identifier</i> ] hierarchy level.                                                                                                                                                                                                                                                                                                                                                                |
| <b>Default</b>                  | If you omit this statement, OAM F5 loopback cells are not originated, but the interface still responds if it receives OAM F5 loopback cells.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Options</b>                  | disable—Disable OAM loopback cell transmit feature.<br><br>seconds—OAM loopback cell period.<br><b>Range:</b> 1 through 900 seconds                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Usage Guidelines</b>         | See “Defining the ATM OAM F5 Loopback Cell Period” on page 305.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

## oc-slice

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>oc-slice <i>oc-slice-range</i>;</code>                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> partition <i>partition-number</i> ]                                                                                                                                                                                                                                                                                                                                      |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b>              | For channelized OC12 IQ interfaces only, configure the range of SONET/SDH slices.                                                                                                                                                                                                                                                                                                                               |
| <b>Default</b>                  | If you do not include either this statement or the <code>no-partition</code> statement, the Channelized OC12 IQ PICs not partitioned, and no data channels are configured.                                                                                                                                                                                                                                      |
| <b>Options</b>                  | <p><i>oc-slice-range</i>—Range of SONET/SDH slices. OC3 interfaces must occupy three consecutive OC slices per interface, in the form 1–3, 4–6, 7–9, or 10–12. The T3, T1, and DS0 interface types each occupy one OC slice per interface.</p> <p><b>Range:</b> For OC3 interfaces, 1–3, 4–6, 7–9, or 10–12; for SONET/SDH and T3 interfaces, 1–12.</p> <p>The remaining statement is explained separately.</p> |
| <b>Usage Guidelines</b>         | See “Configuring Channelized OC12 Interfaces” on page 401.                                                                                                                                                                                                                                                                                                                                                      |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                                                                              |

## open-timeout

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|                                 |                                                                                                                                    |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>open-timeout <i>seconds</i>;</code>                                                                                          |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> services-options]                                                                           |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                     |
| <b>Description</b>              | Configure timeout period for Transmission Control Protocol (TCP) session establishment.                                            |
| <b>Options</b>                  | <p><i>seconds</i>—Timeout period in seconds.</p> <p><b>Range:</b> 4 through 86,400 seconds</p> <p><b>Default:</b> 30 seconds</p>   |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                     |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p> |

## operating-mode

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>operating-mode mode;</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Hierarchy Level</b>          | [edit interfaces <i>at-fpc/pic/port</i> dsl-options]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b>              | For J-series Services Routers only, modify the operating mode of the digital subscriber line for an ATM interface.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Options</b>                  | <p><i>mode</i>—Operating mode for ATM-over-ADSL interfaces. The mode can be one of the following:</p> <ul style="list-style-type: none"> <li>■ <i>adsl2plus</i>—Set the ADSL line to train in the ITU G.992.5 mode.</li> <li>■ <i>ansi-dmt</i>—Set the ADSL line to train in the ANSI T1.413 Issue 2 mode.</li> <li>■ <i>auto</i>—Set the ADSL line to autonegotiate the setting to match the setting of the DSL access multiplexer (DSLAM) located at the central office. The ADSL line trains in the ANSI T1.413 Issue 2 (<i>ansi-dmt</i>) or ITU G.992.1 (<i>itu-dmt</i>) mode.</li> <li>■ <i>etsi</i>—Set the ADSL line to train in the ETSI TS 101 388 V1.3.1 mode.</li> <li>■ <i>itu-annexb-ur2</i>—Set the ADSL line to train in the ITU G.992.1 UR-2 mode.</li> <li>■ <i>itu-annexb-non-ur2</i>—Set the ADSL line to train in the ITU G.992.1 non-UR-2 mode.</li> <li>■ <i>itu-dmt</i>—Set the ADSL line to train in the ITU G.992.1 mode.</li> <li>■ <i>itu-dmt-bis</i>—Set the ADSL line to train in the ITU G.992.3 mode.</li> </ul> <p><b>Default:</b> <i>auto</i></p> |
| <b>Usage Guidelines</b>         | See “Configuring ATM-over-ADSL Interfaces” on page 331.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Related Topics</b>           | <i>J-series Services Router Basic LAN and WAN Access Configuration Guide</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

## optics-options

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|                                 |                                                                                                                                                                               |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | optics-options {<br>wavelength <i>nm</i> ;<br>}                                                                                                                               |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> ]                                                                                                                                      |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                |
| <b>Description</b>              | For 10-Gigabit Ethernet dense wavelength-division multiplexing (DWDM) interfaces only, configure full C-band International Telecommunication Union (ITU)-Grid tunable optics. |
| <b>Options</b>                  | The <i>wavelength</i> statement is explained separately.                                                                                                                      |
| <b>Usage Guidelines</b>         | See “Configuring the 10-Gigabit Ethernet DWDM Interface Wavelength” on page 631.                                                                                              |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                       |

## output

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|                                 |                                                                                                                                                                                                                                        |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | output {<br>service-set <i>service-set-name</i> <service-filter <i>filter-name</i> >;<br>}                                                                                                                                             |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet service],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet service] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                         |
| <b>Description</b>              | Define one or more output service sets and filters to be applied to traffic.                                                                                                                                                           |
| <b>Options</b>                  | The remaining statements are explained separately.                                                                                                                                                                                     |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                                                         |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                |

## output-list

---

|                                 |                                                                                                                                                                                                                                                        |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | output-list {<br>[ <i>filter-names</i> ];<br>}                                                                                                                                                                                                         |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family <i>family</i> filter],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family <i>family</i> filter] |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 7.6.                                                                                                                                                                                                             |
| <b>Description</b>              | Apply a group of filters to evaluate when packets are transmitted on an interface.                                                                                                                                                                     |
| <b>Options</b>                  | [ <i>filter-names</i> ]—Name of a filter to evaluate when packets are transmitted on the interface. Up to 16 filters can be included in a filter input list.                                                                                           |
| <b>Usage Guidelines</b>         | See “Applying a Filter to an Interface” on page 184 and the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                     |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                |
| <b>Related Topics</b>           | input-list, <i>JUNOS Policy Framework Configuration Guide</i> , <i>JUNOS System Basics Configuration Guide</i>                                                                                                                                         |

## output-policer

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|                                 |                                                                                                                                    |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | output-policer <i>policer-name</i> ;                                                                                               |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> layer2-policer]                                             |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.2.                                                                                         |
| <b>Description</b>              | Associate a Layer 2 policer with a logical interface. The output-policer and output-three-color statements are mutually exclusive. |
| <b>Options</b>                  | <i>policer-name</i> —Name of the policer that you define at the [edit firewall] hierarchy level.                                   |
| <b>Usage Guidelines</b>         | See “Applying a Policer” on page 611.                                                                                              |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.            |
| <b>Related Topics</b>           | input-policer                                                                                                                      |

## output-priority-map

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|                                 |                                                                                                                                                                                                                    |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <pre>output-priority-map {   classifier {     premium {       forwarding-class <i>class-name</i> {         loss-priority (high   low);       }     }   } }</pre>                                                   |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> gigether-options ethernet-switch-profile ethernet-policer-profile]                                                                                                          |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                     |
| <b>Description</b>              | <p>For Gigabit Ethernet IQ and 10-Gigabit Ethernet interfaces only, define the output policer priority map to be applied to outgoing frames on this interface.</p> <p>The statements are explained separately.</p> |
| <b>Usage Guidelines</b>         | See “Specifying an Output Priority Map” on page 610.                                                                                                                                                               |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                            |
| <b>Related Topics</b>           | input-priority-map                                                                                                                                                                                                 |

## output-three-color

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|                                 |                                                                                                                                                 |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | output-three-color <i>policer-name</i> ;                                                                                                        |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> layer2-policer]                                                          |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.2.                                                                                                      |
| <b>Description</b>              | Associate a Layer 2, three-color policer with a logical interface. The output-three-color and output-policer statements are mutually exclusive. |
| <b>Options</b>                  | <i>policer-name</i> —Name of the three-color policer that you define at the [edit firewall] hierarchy level.                                    |
| <b>Usage Guidelines</b>         | See “Applying a Policer” on page 611.                                                                                                           |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                         |
| <b>Related Topics</b>           | input-three-color                                                                                                                               |



## output-vlan-map

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See the following sections:

- output-vlan-map (Gigabit Ethernet IQ) on page 975
- output-vlan-map (Aggregated Ethernet) on page 976

### **output-vlan-map (Gigabit Ethernet IQ)**

**Syntax**    output-vlan-map {  
                   (pop | pop-pop | pop-swap | push | push-push | swap | swap-push | swap-swap);  
                   inner-tag-protocol-id *tpid*;  
                   inner-vlan-id *number*;  
                   tag-protocol-id *tpid*;  
                   vlan-id *number*;  
                   }

**Hierarchy Level**    [edit interfaces *interface-name* unit *logical-unit-number*],  
                           [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

**Release Information**    Statement introduced before JUNOS Release 7.4.  
                               pop-pop, pop-swap, push-push, swap-push, and swap-swap statements added in JUNOS Release 8.1.

**Description**            For Gigabit Ethernet IQ interfaces only, define the rewrite operation to be applied to outgoing frames on this logical interface.

The statements are explained separately.

**Usage Guidelines**       See “Stacking and Rewriting Gigabit Ethernet IQ VLAN Tags” on page 547.

**Required Privilege Level**    interface—To view this statement in the configuration.  
                                   interface-control—To add this statement to the configuration.

**Related Topics**            input-vlan-map

**output-vlan-map (Aggregated Ethernet)**

|                                 |                                                                                                                                                                                                                                                  |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | output-vlan-map {<br>(pop   push   swap);<br>tag-protocol-id <i>tpid</i> ;<br>vlan-id <i>number</i> ;<br>}                                                                                                                                       |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ]                                                 |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.2.                                                                                                                                                                                                       |
| <b>Description</b>              | For aggregated Ethernet interfaces using Gigabit Ethernet IQ and 10-Gigabit Ethernet IQ2 interfaces only, define the rewrite profile to be applied to outgoing frames on this logical interface.<br><br>The statements are explained separately. |
| <b>Usage Guidelines</b>         | See “Stacking and Rewriting Gigabit Ethernet IQ VLAN Tags” on page 547.                                                                                                                                                                          |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                          |
| <b>Related Topics</b>           | input-vlan-map                                                                                                                                                                                                                                   |

## overflow

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See the following sections:

- overflow (Receive Bucket) on page 977
- overflow (Transmit Bucket) on page 977

### overflow (Receive Bucket)

|                                 |                                                                                                                                                                        |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | overflow (discard   tag);                                                                                                                                              |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> receive-bucket]                                                                                                                 |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                         |
| <b>Description</b>              | Specify how to handle packets that exceed the threshold for the receive leaky bucket.                                                                                  |
| <b>Options</b>                  | <p>tag—Tag, count, and process received packets that exceed the threshold.</p> <p>discard—Discard received packets that exceed the threshold. No counting is done.</p> |
| <b>Usage Guidelines</b>         | See “Configuring Receive and Transmit Leaky Bucket Properties” on page 120 and “Configuring Receive and Transmit Leaky Bucket Properties” on page 711.                 |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                     |

### overflow (Transmit Bucket)

|                                 |                                                                                                                                                        |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | overflow discard;                                                                                                                                      |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> transmit-bucket]                                                                                                |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                         |
| <b>Description</b>              | Discard packets that exceed the threshold for the transmit leaky bucket.                                                                               |
| <b>Usage Guidelines</b>         | See “Configuring Receive and Transmit Leaky Bucket Properties” on page 120 and “Configuring Receive and Transmit Leaky Bucket Properties” on page 711. |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                     |

## paired-group

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|                                 |                                                                                                                                         |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>paired-group <i>group-name</i>;</code>                                                                                            |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> sonet-options aps]                                                                               |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                          |
| <b>Description</b>              | Configure load sharing between two working-protect circuit pairs.                                                                       |
| <b>Options</b>                  | <i>group-name</i> —Circuit's group name, as configured with the <code>protect-circuit</code> or <code>working-circuit</code> statement. |
| <b>Usage Guidelines</b>         | See “Configuring APS Load Sharing Between Circuit Pairs” on page 705.                                                                   |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                 |
| <b>Related Topics</b>           | <code>working-circuit</code>                                                                                                            |

**pap**

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**Syntax**    pap {  
               access-profile *name*;  
               default-pap-password *password*;  
               local-name *name*;  
               local-password *password*;  
               passive;  
               }

**Hierarchy Level**    [edit interfaces *interface-name* ppp-options],  
                           [edit interfaces *interface-name* unit *logical-unit-number* ppp-options],  
                           [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*  
                           ppp-options]

**Release Information**    Statement introduced in JUNOS Release 8.3.

**Description**    Configure the Password Authentication Protocol (PAP). Use PAP authentication as a means to provide a simple method for the peer to establish its identity using a two-way handshake. This is done only upon initial link establishment.

After the link is established, an ID and password pair is repeatedly sent by the peer to the authenticator until authentication is acknowledged or the connection is terminated.

The statements are explained separately.

**Usage Guidelines**    See “Configuring the PPP Challenge Handshake Authentication Protocol” on page 103, “Configuring PPP PAP Authentication” on page 152, and “Tracing Operations of the pppd Process” on page 110.

**Required Privilege Level**    interface—To view this statement in the configuration.  
                                   interface-control—To add this statement to the configuration.

**Related Topics**    traceoptions, *JUNOS System Basics Configuration Guide*

## **pap-password**

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|                                 |                                                                                                                 |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>pap-password password;</code>                                                                             |
| <b>Hierarchy Level</b>          | [edit access profile <i>profile-name</i> client <i>client-name</i> ]                                            |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                  |
| <b>Description</b>              | Configure the Password Authentication Protocol (PAP) password.                                                  |
| <b>Options</b>                  | <i>password</i> —PAP password.                                                                                  |
| <b>Usage Guidelines</b>         | See “Configuring PPP PAP Authentication” on page 152.                                                           |
| <b>Required Privilege Level</b> | admin—To view this statement in the configuration.<br>admin-control—To add this statement to the configuration. |
| <b>Related Topics</b>           | chap-secret and <i>JUNOS System Basics Configuration Guide</i>                                                  |

## partition

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>partition <i>partition-number</i> oc-slice <i>oc-slice-range</i> interface-type <i>type</i> timeslots <i>time-slot-range</i>;</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b>              | For IQ interfaces and J-series interfaces on the Dual-Port Channelized E1 and T1 PIM, configure the channelized interface partition. The partition number is correlated with the channel number. Partition and channel numbering on IQ interfaces begins with :1, not :0.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Default</b>                  | If you omit this statement, the channelized PIC or PIM is not partitioned, and no data channels are configured.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Options</b>                  | <p><i>partition-number</i>—Sublevel interface partition index.</p> <p>Ranges:</p> <ul style="list-style-type: none"> <li>■ 1 through 4 for an OC3 interface on a channelized OC12 IQ interface.</li> <li>■ 1 through 12 for a T3 interface on a channelized OC12 IQ interface.</li> <li>■ 1 through 4 for a T3 interface on a channelized T3 IQ interface.</li> <li>■ 1 through 28 for a T1 IQ interface on a channelized OC12 IQ or channelized T3 IQ interface.</li> <li>■ 1 through 10 for an E1 interface on a channelized E1 IQ interface.</li> <li>■ 1 through 30 on a channelized E1 interface.</li> <li>■ 1 through 23 on a channelized T1 interface.</li> <li>■ 1 through 24 for NxDS0 interfaces on either channelized OC12 IQ or channelized DS3 IQ interfaces.</li> <li>■ 0 through 31 (with 0 reserved for framing) for NxDS0 interfaces on channelized E1 IQ interfaces.</li> </ul> <p>The remaining statements are explained separately.</p> |
| <b>Usage Guidelines</b>         | See “Configuring Channelized E1 Interfaces” on page 377, “Configuring Channelized OC12 Interfaces” on page 401, and “Configuring Channelized T3 Interfaces” on page 443.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Related Topics</b>           | no-partition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

## passive

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See the following sections:

- **passive (CHAP)** on page 982
- **passive (PAP)** on page 983

### **passive (CHAP)**

**Syntax**    passive;

**Hierarchy Level**    [edit interfaces *interface-name* ppp-options chap],  
                               [edit interfaces *interface-name* unit *logical-unit-number* ppp-options chap],  
                               [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*  
                               ppp-options chap]

**Release Information**    Statement introduced before JUNOS Release 7.4.

**Description**    Do not challenge the peer, but respond if challenged. If you omit this statement from the configuration, the interface always challenges its peer.

For ATM2 IQ interfaces only, you can configure CHAP on the logical interface unit if the logical interface is configured with one of the following PPP over ATM encapsulation types:

- **atm-ppp-llc**—PPP over AAL5 LLC encapsulation.
- **atm-ppp-vc-mux**—PPP over AAL5 multiplex encapsulation.

**Usage Guidelines**    See “Configuring Passive Mode” on page 105.

**Required Privilege Level**    interface—To view this statement in the configuration.  
                                       interface-control—To add this statement to the configuration.

**Related Topics**    *JUNOS System Basics Configuration Guide*



**passive (PAP)**

|                                 |                                                                                                                                                                                                                                                                                            |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | passive;                                                                                                                                                                                                                                                                                   |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> ppp-options pap],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ppp-options pap],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ppp-options pap] |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.3.                                                                                                                                                                                                                                                 |
| <b>Description</b>              | Do not challenge the peer, but respond if challenged. If you omit this statement from the configuration, the interface always challenges its peer.                                                                                                                                         |
| <b>Usage Guidelines</b>         | See “Configuring Passive Mode” on page 108.                                                                                                                                                                                                                                                |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                    |
| <b>Related Topics</b>           | <i>JUNOS System Basics Configuration Guide</i>                                                                                                                                                                                                                                             |

**passive-monitor-mode**

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | passive-monitor-mode;                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> ],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ]                                                                                                                                                                                                                       |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Description</b>              | For ATM, Ethernet, and SONET/SDH interfaces only, monitor packet flows from another routing platform. If you include this statement in the configuration, the interface does not send keepalives or alarms, and does not participate actively on the network.<br><br>For ATM and Ethernet interfaces, you can include this statement on the physical interface only.<br><br>For SONET/SDH interfaces, you can include this statement on the logical interface only. |
| <b>Usage Guidelines</b>         | See “Enabling Passive Monitoring on ATM Interfaces” on page 269, “Enabling Passive Monitoring on Ethernet Interfaces” on page 581, and “Enabling Passive Monitoring on SONET/SDH Interfaces” on page 709.                                                                                                                                                                                                                                                           |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                             |
| <b>Related Topics</b>           | multiservice-options, <i>JUNOS Services Interfaces Configuration Guide</i>                                                                                                                                                                                                                                                                                                                                                                                          |

## path-database-size

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|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | path-database-size <i>path-database-size</i> ;                                                                          |
| <b>Hierarchy Level</b>          | [edit protocols oam ethernet connectivity-fault-management linktrace]                                                   |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.5.                                                                              |
| <b>Description</b>              | Number of linktrace reply entries to be stored per linktrace request.                                                   |
| <b>Options</b>                  | path-database-size—Database size.<br><b>Range:</b> 1 through 500<br><b>Default:</b> 100                                 |
| <b>Usage Guidelines</b>         | See “Configuring the Linktrace Database Size” on page 590.                                                              |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |

## path-trace

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>path-trace <i>trace-string</i>;</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> sonet-options]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b>              | <p>For SONET/SDH interfaces and 10-Gigabit Ethernet interfaces in WAN PHY mode, configure a path trace identifier, which is a text string that identifies the circuit.</p> <p>On SONET/SDH OC48 interfaces that are configured for channelized (multiplexed) mode (by including the <code>no-concatenate</code> statement at the [edit chassis fpc slot-number pic <i>pic-number</i>] hierarchy level), the <code>bytes e1-quiet</code> and <code>bytes f1</code> options have no effect. The <code>bytes f2</code>, <code>bytes z3</code>, <code>bytes z4</code>, and <code>path-trace</code> options work correctly on channel 0 and work in the transmit direction only on channels 1, 2, and 3.</p> <p>For DS3 channels on a channelized OC12 interface, you can configure a unique path trace for each of the 12 channels. Each path trace can be up to 16 bytes. For channels on a channelized OC12 IQ interface, each path trace can be up to 64 bytes.</p> |
| <b>Options</b>                  | <p><i>trace-string</i>—Text string that identifies the circuit. If the string contains spaces, enclose it in quotation marks. A common convention is to use the circuit identifier as the path trace identifier. If you do not configure an identifier, the JUNOS software uses the system and interface names to construct the default <i>trace-string</i>. For all nonchannelized SONET/SDH interfaces, the default <i>trace-string</i> is <code>&lt;system-name &lt;interface-name&gt;</code>. For channelized SONET/SDH interfaces and 10-Gigabit Ethernet WAN-PHY interfaces, the default <i>trace-string</i> is <code>&lt;interface-name&gt;</code>.</p>                                                                                                                                                                                                                                                                                                     |
| <b>Usage Guidelines</b>         | See “Configuring the SONET/SDH Path Trace Identifier” on page 689.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Related Topics</b>           | sonet-options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

## payload-scrambler

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | (payload-scrambler   no-payload-scrambler);                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> e3-options],<br>[edit interfaces <i>interface-name</i> sonet-options],<br>[edit interfaces <i>interface-name</i> t3-options]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b>              | <p>Enable or disable HDLC scrambling on an E3, a SONET/SDH, or a T3 interface. This type of scrambling provides better link stability. Both sides of a connection must either use or not use scrambling.</p> <p>If you commit a T3 interface configuration that has HDLC payload scrambling enabled, the interface must also be configured to be compatible with the channel service unit (CSU) at the remote end of the line.</p> <p>Disable payload scrambling on an E3 interface if Digital Link compatibility mode is used.</p> <p>On a channelized OC12 interface, the <b>sonet payload-scrambler</b> statement is ignored. To configure scrambling on the DS3 channels on the interface, you can include the <b>t3-options payload-scrambler</b> statement in the configuration for each DS3 channel.</p> |
| <b>Default</b>                  | Payload scrambling is disabled on all E3 and T3 interfaces; it is enabled by default on E3/T3 over ATM interfaces and on SONET/SDH interfaces.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Usage Guidelines</b>         | See “Configuring E3 and T3 Parameters on ATM Interfaces” on page 313, “Configuring E3 HDLC Payload Scrambling” on page 483, “Configuring SONET/SDH HDLC Payload Scrambling” on page 689, “Configuring T3 HDLC Payload Scrambling” on page 504, and “Examples: Configuring T3 Interfaces” on page 505.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Related Topics</b>           | compatibility-mode                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

## p-bit-timeout

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|                                 |                                                                                                                                                                                                                        |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | p-bit-timeout <i>time</i> ;                                                                                                                                                                                            |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family llc2],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family llc2] |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 7.4.                                                                                                                                                                             |
| <b>Description</b>              | For J-series Services Routers only. On Ethernet interfaces configured for DLSw, configure the length of time the router waits for a response to a poll bit.                                                            |
| <b>Options</b>                  | <i>time</i> —Number of milliseconds.<br><b>Range:</b> 1 through 60000<br><b>Default:</b> 3000 milliseconds                                                                                                             |
| <b>Usage Guidelines</b>         | See “Configuring LLC2 Options” on page 167.                                                                                                                                                                            |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                |
| <b>Related Topics</b>           | <i>J-series Services Router Advanced WAN Access Configuration Guide</i>                                                                                                                                                |

## pdu-interval

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|                                 |                                                                                                                                                                                                                                     |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | pdu-interval <i>interval</i> ;                                                                                                                                                                                                      |
| <b>Hierarchy Level</b>          | [edit protocols oam ethernet link-fault-management interface <i>interface-name</i> ]                                                                                                                                                |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.2.                                                                                                                                                                                          |
| <b>Description</b>              | For Ethernet interfaces on M320, M120, MX-series, and T-series routing platforms, specify the periodic OAM PDU sending interval for fault detection. Used for IEEE 802.3ah Operation, Administration, and Management (OAM) support. |
| <b>Options</b>                  | <i>interval</i> —Periodic OAM PDU sending interval.<br><b>Range:</b> 100 through 1000 milliseconds<br><b>Default:</b> 1000 milliseconds                                                                                             |
| <b>Usage Guidelines</b>         | See “Configuring the OAM PDU Interval” on page 597.                                                                                                                                                                                 |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                             |

## pdu-threshold

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|                                 |                                                                                                                                                                                                                                    |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>pdu-threshold <i>threshold-value</i>;</code>                                                                                                                                                                                 |
| <b>Hierarchy Level</b>          | [edit protocols oam ethernet link-fault-management interface <i>interface-name</i> ]                                                                                                                                               |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.2.                                                                                                                                                                                         |
| <b>Description</b>              | For Ethernet interfaces on M320, M120, MX-series, and T-series routing platforms, specify the number of OAM PDUs to miss before an error is logged. Used for IEEE 802.3ah Operation, Administration, and Management (OAM) support. |
| <b>Options</b>                  | <i>threshold-value</i> —The number of PDUs missed before declaring the peer lost.<br><b>Range:</b> 3 through 10 PDUs<br><b>Default:</b> 3 PDUs                                                                                     |
| <b>Usage Guidelines</b>         | See “Configuring the OAM PDU Threshold” on page 597.                                                                                                                                                                               |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                            |

## peer

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|                                 |                                                                                                                                                                                                                                                                                                                        |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>peer <i>ip-address</i> priority-cost <i>priority</i>;</code>                                                                                                                                                                                                                                                     |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family llc2 redundancy-group <i>group-number</i> track dlsw],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family llc2 redundancy-group <i>group-number</i> track dlsw] |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 7.5.                                                                                                                                                                                                                                                                             |
| <b>Description</b>              | For J-series Services Routers only, Ethernet interfaces configured for DLSw, enable tracking options for a remote peer.                                                                                                                                                                                                |
| <b>Options</b>                  | <i>ip-address</i> —IP address of the remote peer.<br><br><i>priority-cost priority</i> —Cost value that is subtracted from the priority value when remote peer connectivity is lost. Specify a value from 1 through 254.                                                                                               |
| <b>Usage Guidelines</b>         | See “Configuring DLSw Ethernet Redundancy Using LLC2 Properties” on page 168.                                                                                                                                                                                                                                          |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                |
| <b>Related Topics</b>           | <i>JUNOS Services Interfaces Configuration Guide</i>                                                                                                                                                                                                                                                                   |

## peer-unit

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|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>peer-unit <i>unit-number</i>;</code>                                                                                                                                                       |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                   |
| <b>Description</b>              | Configure a peer relationship between two logical systems.                                                                                                                                       |
| <b>Options</b>                  | <i>unit-number</i> —Peering logical system unit number.                                                                                                                                          |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                   |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                          |


## periodic

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|                                 |                                                                                                                                                                                                                                                           |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>periodic <i>interval</i>;</code>                                                                                                                                                                                                                    |
| <b>Hierarchy Level</b>          | [edit interfaces aex aggregated-ether-options lacp]                                                                                                                                                                                                       |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                            |
| <b>Description</b>              | For aggregated Ethernet interfaces only, configure the interval for periodic transmission of LACP packets.                                                                                                                                                |
| <b>Options</b>                  | <i>interval</i> —Interval for periodic transmission of LACP packets. <ul style="list-style-type: none"> <li>■ <b>fast</b>—Transmit packets every second.</li> <li>■ <b>slow</b>—Transmit packets every 30 seconds.</li> </ul> <p><b>Default:</b> fast</p> |
| <b>Usage Guidelines</b>         | See “Configuring Aggregated Ethernet LACP” on page 539.                                                                                                                                                                                                   |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                   |

## per-unit-scheduler

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|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                                                                     | per-unit-scheduler;                                                                                                                                                                                                                                                                                                                                  |
| <b>Hierarchy Level</b>                                                            | [edit interfaces <i>interface-name</i> ]                                                                                                                                                                                                                                                                                                             |
| <b>Release Information</b>                                                        | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                       |
| <b>Description</b>                                                                | For channelized OC3 IQ, channelized OC12 IQ, channelized STM1 IQ, channelized T3 IQ, channelized E1 IQ, E3 IQ, link services IQ interfaces (lsq-), link services (ls-) on J-series platforms, Gigabit Ethernet IQ, Gigabit Ethernet IQ2, and 10-Gigabit Ethernet interfaces only, enable association of scheduler map names with logical interfaces. |
|  | <b>NOTE:</b> Per-unit scheduling is not supported on T1 interfaces configured on the Channelized OC12 IQ PIC.                                                                                                                                                                                                                                        |
| <b>Usage Guidelines</b>                                                           | When configuring the <code>per-unit-scheduler</code> statement on interfaces on the IQ2 PIC, you must also include the <code>vlan-tagging</code> statement. See the <i>JUNOS Class of Service Configuration Guide</i> .                                                                                                                              |
| <b>Required Privilege Level</b>                                                   | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                              |

## pfc

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|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | pfc;                                                                                                                                                                                                                                                                                                               |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> ppp-options compression],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ppp-options compression],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ppp-options compression] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                     |
| <b>Description</b>              | For interfaces with PPP encapsulation, configure the router to compress the protocol field to one byte.                                                                                                                                                                                                            |
| <b>Usage Guidelines</b>         | See “Configuring the PPP Protocol Field Compression” on page 113.                                                                                                                                                                                                                                                  |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                            |



**pic-type**

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|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | pic-type (atm1   atm2);                                                                                                 |
| <b>Hierarchy Level</b>          | [edit interfaces <i>at-fpc/pic/port</i> atm-options]                                                                    |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                          |
| <b>Description</b>              | For ATM interfaces, configure the type of ATM PIC installed in your routing platform.                                   |
| <b>Options</b>                  | atm1—ATM1 PIC<br>atm2—ATM2 IQ PIC                                                                                       |
| <b>Usage Guidelines</b>         | See “Configuring the ATM PIC Type” on page 271.                                                                         |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |

**plp1**

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>plp1 cells;</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> address <i>address</i> family <i>family</i> multipoint-destination <i>address</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> address <i>address</i> family <i>family</i> multipoint-destination <i>address</i> ] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Description</b>              | For ATM2 IQ interfaces only, define the EPD threshold on a VC. The EPD threshold is a limit on the number of transmit packets that can be queued. Packets that exceed the limit are discarded. This threshold applies to packets that have a PLP of 1.                                                                                                                                                                                                                                                                                                                    |
| <b>Default</b>                  | EPD threshold is unregulated.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Options</b>                  | <i>cells</i> —Maximum number of cells.<br><b>Range:</b> For 1-port and 2-port OC12 interfaces, 1 through 425,984 cells.<br><br>For 1-port OC48 interfaces, 1 through 425,984 cells.<br><br>For 2-port OC3, DS3, and E3 interfaces, 1 through 212,992 cells.<br><br>For 4-port DS3 and E3 interfaces, 1 through 106,496 cells.                                                                                                                                                                                                                                             |
| <b>Usage Guidelines</b>         | See “Configuring Two EPD Thresholds per Queue” on page 304 and “Configuring an ATM Scheduler Map” on page 317.                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Related Topics</b>           | epd-threshold, linear-red-profile                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

**plp-to-clp**

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|                                 |                                                                                                                                                                                                                                                                |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | plp-to-clp;                                                                                                                                                                                                                                                    |
| <b>Hierarchy Level</b>          | [edit interfaces <i>at-fpc/pic/port</i> atm-options],<br>[edit interfaces <i>at-fpc/pic/port</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>at-fpc/pic/port</i> unit<br><i>logical-unit-number</i> ] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                 |
| <b>Description</b>              | For ATM2 IQ interfaces only, enable the PLP setting to be copied to the cell-loss priority (CLP) bit.                                                                                                                                                          |
| <b>Default</b>                  | If you omit this statement, the JUNOS software does not copy the PLP setting to the CLP bit.                                                                                                                                                                   |
| <b>Usage Guidelines</b>         | See “Enabling the PLP Setting to Be Copied to the CLP Bit” on page 324.                                                                                                                                                                                        |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                        |

**point-to-point**

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|                                 |                                                                                                                                                                                                  |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | point-to-point;                                                                                                                                                                                  |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                   |
| <b>Description</b>              | For all interfaces except aggregated Ethernet, Fast Ethernet, and Gigabit Ethernet, configure the interface unit as a point-to-point connection. This is the default connection type.            |
| <b>Default</b>                  | If you omit this statement, the interface unit is configured as a point-to-point connection.                                                                                                     |
| <b>Usage Guidelines</b>         | See “Configuring a Point-to-Point Connection” on page 146.                                                                                                                                       |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                          |
| <b>Related Topics</b>           | multipoint                                                                                                                                                                                       |

## policer

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See the following sections:

- **policer (CoS)** on page 994
- **policer (Interface)** on page 995
- **policer (MAC)** on page 996

### **policer (CoS)**

**Syntax** `policer cos-policer-name {  
     aggregate {  
         bandwidth-limit bps;  
         burst-size-limit bytes;  
     }  
     premium {  
         bandwidth-limit bps;  
         burst-size-limit bytes;  
     }  
}`

**Hierarchy Level** [edit interfaces *interface-name* gigether-options ethernet-switch-profile  
                           ethernet-policer-profile]

**Release Information** Statement introduced before JUNOS Release 7.4.

**Description** For Gigabit Ethernet IQ and Gigabit Ethernet PICs with SFPs (except the 10-port Gigabit Ethernet PIC and the built-in Gigabit Ethernet port on the M7i platform), define a CoS policer template to specify the premium bandwidth and burst-size limits, and the aggregate bandwidth and burst-size limits. For Gigabit Ethernet interfaces with SFPs (except the 10-port Gigabit Ethernet PIC and the built-in Gigabit Ethernet port on the M7i platform), the premium policer is not supported.

**Options** *cos-policer-name*—Name of one policer to specify the premium bandwidth and burst-size limits, and the aggregate bandwidth and burst-size limits.

The remaining statements are explained separately.

**Usage Guidelines** See “Configuring Gigabit Ethernet Policers” on page 609.

**Required Privilege Level** interface—To view this statement in the configuration.  
                           interface-control—To add this statement to the configuration.

***policer (Interface)***

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                    |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <pre>policer {     arp <i>policer-template-name</i>;     input <i>policer-template-name</i>;     output <i>policer-template-name</i>; }</pre>                                                                                                                                                                                                                                                                      |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family <i>family</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family <i>family</i> ]                                                                                                                                                                         |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b>              | Apply a policer to an interface.                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Options</b>                  | <p><b>arp <i>policer-template-name</i></b>—For inet family only, name of one policer to evaluate when ARP packets are received on the interface.</p> <p><b>input <i>policer-template-name</i></b>—Name of one policer to evaluate when packets are received on the interface.</p> <p><b>output <i>policer-template-name</i></b>—Name of one policer to evaluate when packets are transmitted on the interface.</p> |
| <b>Usage Guidelines</b>         | See “Applying Policers” on page 181 and the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                                                                                                                                                                                                 |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                            |
| <b>Related Topics</b>           | <i>JUNOS Policy Framework Configuration Guide</i>                                                                                                                                                                                                                                                                                                                                                                  |

***policer (MAC)***

|                                 |                                                                                                                                                                                                                                                                                                          |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <pre> policer {     input <i>cos-policer-name</i>;     output <i>cos-policer-name</i>; } </pre>                                                                                                                                                                                                          |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> accept-source-mac<br>mac-address <i>mac-address</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i><br>accept-source-mac mac-address <i>mac-address</i> ] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                           |
| <b>Description</b>              | For Gigabit Ethernet IQ and Gigabit Ethernet PICs with SFPs (except the 10-port Gigabit Ethernet PIC and the built-in Gigabit Ethernet port on the M7i platform), configure MAC policing.                                                                                                                |
| <b>Options</b>                  | <p><b>input <i>cos-policer-name</i></b>—Name of one policer to specify the premium bandwidth and aggregate bandwidth.</p> <p><b>output <i>cos-policer-name</i></b>—Name of one policer to specify the premium bandwidth and aggregate bandwidth.</p>                                                     |
| <b>Usage Guidelines</b>         | See “Configuring MAC Address Filtering” on page 613.                                                                                                                                                                                                                                                     |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                  |

**pool**

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>pool <i>pool-name</i> &lt;priority <i>priority</i>&gt;;</code>                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Hierarchy Level</b>          | [edit interfaces <i>br-pim</i> / <i>0</i> / <i>port</i> dialer-options],<br>[edit interfaces <i>umd</i> <i>0</i> dialer-options],<br>[edit interfaces <i>dl</i> <i>n</i> unit <i>logical-unit-number</i> dialer-options],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>dl</i> <i>n</i> unit <i>logical-unit-number</i> dialer-options]                                                                                                                 |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b>              | (J-series Services Routers) for logical and physical ISDN interfaces, specify the dial pool. The dial pool allows logical (dialer) and physical ( <b><i>br-pim</i>/<i>0</i>/<i>port</i></b> ) interfaces to be bound together dynamically on a per-call basis. On a dialer interface, <b>pool</b> directs the dialer interface which dial pool to use. On <b><i>br-pim</i>/<i>0</i>/<i>port</i></b> interface, <b>pool</b> defines the pool to which the interface belongs. |
| <b>Options</b>                  | <i>pool-name</i> —Pool identifier.<br><br><i>priority priority</i> —(physical <b><i>br-pim</i>/<i>0</i>/<i>port</i></b> interfaces only) Specify a priority value of 0 (lowest) to 255 (highest) for the interface within the pool.                                                                                                                                                                                                                                         |
| <b>Usage Guidelines</b>         | See “Configuring ISDN Physical Interface Properties” on page 659 and “Specifying a USB Modem Interface on J-series Routers” on page 85.                                                                                                                                                                                                                                                                                                                                     |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                     |
| <b>Related Topics</b>           | <i>J-series Services Router Basic LAN and WAN Access Configuration Guide</i>                                                                                                                                                                                                                                                                                                                                                                                                |

**pop**

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | pop;                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> input-vlan-map],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> output-vlan-map],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> input-vlan-map],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> output-vlan-map] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b>              | For Gigabit Ethernet IQ and 10-Gigabit Ethernet IQ2 interfaces and aggregated Ethernet interfaces using Gigabit Ethernet IQ interfaces, specify the VLAN rewrite operation to remove a VLAN tag from the top of the VLAN tag stack. The outer VLAN tag of the frame is removed.                                                                                                                                                                                 |
| <b>Usage Guidelines</b>         | See “Removing a VLAN Tag” on page 555.                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                         |



## pop-all-labels

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | pop-all-labels {<br>required-depth <i>number</i> ;<br>}                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> atm-options mpls],<br>[edit interfaces <i>interface-name</i> sonet-options mpls],<br>[edit interfaces <i>interface-name</i> fastether-options mpls],<br>[edit interfaces <i>interface-name</i> gigeether-options mpls]                                                                                                                                                                                    |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Description</b>              | <p>For passive monitoring on ATM and SONET/SDH interfaces only, removes up to two MPLS labels from incoming IP packets.</p> <p>This statement has no effect on IP packets with more than two MPLS labels. Packets with MPLS labels cannot be processed by the Monitoring Services PIC; if packets with MPLS labels are forwarded to the Monitoring Services PIC, they are discarded.</p> <p>The remaining statement is explained separately.</p> |
| <b>Default</b>                  | If you omit this statement, the MPLS labels are not removed, and the packet is not processed by the Monitoring Services PIC.                                                                                                                                                                                                                                                                                                                     |
| <b>Usage Guidelines</b>         | See “Removing MPLS Labels from Incoming Packets” on page 270 and “Removing MPLS Labels from Incoming Packets” on page 709.                                                                                                                                                                                                                                                                                                                       |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                          |
| <b>Related Topics</b>           | <i>JUNOS Services Interfaces Configuration Guide</i>                                                                                                                                                                                                                                                                                                                                                                                             |

**pop-pop**

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|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | pop-pop;                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> input-vlan-map],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> output-vlan-map],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> input-vlan-map],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> output-vlan-map] |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.1.                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Description</b>              | For Gigabit Ethernet IQ and IQ2 interfaces, and for aggregated Ethernet interfaces using Gigabit Ethernet IQ2 or 10-Gigabit Ethernet PICs on MX-series routing platforms, specify the VLAN rewrite operation to remove both the outer and inner VLAN tags of the frame.                                                                                                                                                                                         |
| <b>Usage Guidelines</b>         | See “Removing the Outer and Inner VLAN Tags” on page 555.                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                         |

**pop-swap**

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | pop-swap;                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> input-vlan-map],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> output-vlan-map],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> input-vlan-map],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> output-vlan-map] |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.1.                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Description</b>              | For Gigabit Ethernet IQ and IQ2 interfaces, and for aggregated Ethernet interfaces using Gigabit Ethernet IQ2 or 10-Gigabit Ethernet PICs on MX-series routing platforms, specify the VLAN rewrite operation to remove the outer VLAN tag of the frame, and replace the inner VLAN tag of the frame with a user-specified VLAN tag value. The inner tag becomes the outer tag in the final frame.                                                               |
| <b>Usage Guidelines</b>         | See “Removing the Outer VLAN Tag and Rewriting the Inner VLAN Tag” on page 556.                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                         |

## port

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|                                 |                                                                                                                                                                                                       |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | port {<br>minimum <i>port-number</i> ;<br>maximum <i>port-number</i> ;<br>}                                                                                                                           |
| <b>Hierarchy Level</b>          | [edit interfaces <i>vsp-fpc/pic/port</i> unit <i>logical-unit-number</i> compression rtp]                                                                                                             |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                        |
| <b>Description</b>              | For voice services interfaces only, assign User Datagram Protocol (UDP) destination port numbers reserved for Real-Time Transport Protocol (RTP) traffic.                                             |
| <b>Options</b>                  | <p>minimum <i>port-number</i>—Specify minimum port number.<br/> <b>Range:</b> 0 through 65,535</p> <p>maximum <i>port-number</i>—Specify maximum port number.<br/> <b>Range:</b> 0 through 65,535</p> |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                        |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                               |

## port-priority

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|                                 |                                                                                                                                                                                                                                           |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | port-priority <i>priority</i> ;                                                                                                                                                                                                           |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> together-options 802.3ad lacp]                                                                                                                                                                     |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 9.3.                                                                                                                                                                                                |
| <b>Description</b>              | Define LACP port priority at the interface level.                                                                                                                                                                                         |
| <b>Options</b>                  | <p><i>priority</i>—Priority for being elected to be the active port and both collect and distribute traffic. A smaller value indicates a higher priority for being elected.<br/> <b>Range:</b> 1 through 255<br/> <b>Default:</b> 127</p> |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                   |

## post-service-filter

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|                                 |                                                                                                                                                                                                                                                    |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>post-service-filter <i>filter-name</i>;</code>                                                                                                                                                                                               |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet service input],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet service input] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                     |
| <b>Description</b>              | Define the filter to be applied to traffic after service processing. The filter is applied only if a service set is configured and selected.                                                                                                       |
| <b>Options</b>                  | <i>filter-name</i> —Identifier for postservice filter.                                                                                                                                                                                             |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                                                                     |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                            |

## pppoe-options

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|                                 |                                                                                                                                                                                                                                     |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>pppoe-options {<br/>    access-concentrator <i>name</i>;<br/>    auto-reconnect <i>seconds</i>;<br/>    (client   server);<br/>    service-name <i>name</i>;<br/>    underlying-interface <i>interface-name</i>;<br/>}</code> |
| <b>Hierarchy Level</b>          | [edit interfaces pp0 unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces pp0 unit <i>logical-unit-number</i> ]                                                                        |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.<br>client Statement introduced in JUNOS Release 8.5.<br>server Statement introduced in JUNOS Release 8.5.                                                                            |
| <b>Description</b>              | For J-series Services Routers and M120 Multiservice Edge Routers with PPP over Ethernet interfaces, configure PPP over Ethernet-specific interface properties.<br><br>The remaining statements are explained separately.            |
| <b>Usage Guidelines</b>         | See “Configuring a PPPoE Interface” on page 643.                                                                                                                                                                                    |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                             |
| <b>Related Topics</b>           | <i>J-series Services Router Basic LAN and WAN Access Configuration Guide</i>                                                                                                                                                        |

## ppp-options

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**Syntax**

```
ppp-options {
 chap {
 access-profile name;
 default-chap-secret name;
 local-name name;
 passive;
 }
 compression {
 acfc;
 pfc;
 }
 lcp-restart-timer milliseconds;
 loopback-clear-timer seconds;
 ncp-restart-timer milliseconds;
 pap {
 access-profile name;
 default-pap-password password;
 local-name name;
 local-password password;
 passive;
 }
}
```

**Hierarchy Level** [edit interfaces *interface-name*],  
[edit interfaces *interface-name* unit *logical-unit-number*],  
[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

**Release Information** Statement introduced before JUNOS Release 7.4.  
lcp-restart-timer Statement introduced in JUNOS Release 8.1.  
ncp-restart-timer Statement introduced in JUNOS Release 8.1.  
loopback-clear-timer Statement introduced in JUNOS Release 8.5.

**Description** On interfaces with PPP encapsulation, configure PPP-specific interface properties.

For ATM2 IQ interfaces only, you can configure CHAP on the logical interface unit if the logical interface is configured with one of the following PPP over ATM encapsulation types:

- atm-ppp-llc—PPP over AAL5 LLC encapsulation.
- atm-ppp-vc-mux—PPP over AAL5 multiplex encapsulation.

The remaining statements are explained separately.

**Usage Guidelines** See “Configuring the PPP Challenge Handshake Authentication Protocol” on page 103.

**Required Privilege Level** interface—To view this statement in the configuration.  
interface-control—To add this statement to the configuration.

## preempt

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | (preempt   no-preempt) {<br>hold-time <i>seconds</i> ;<br>}                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family llc2 redundancy-group <i>group-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family llc2 redundancy-group <i>group-number</i> ]                                                                                                                                                                                                              |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b>              | Configure whether a DLSw backup router can preempt a master router: <ul style="list-style-type: none"> <li>■ <b>preempt</b>—Allow the master router to be preempted.</li> <li>■ <b>no-preempt</b>—Prohibit the preemption of the master router.</li> </ul> <p>The remaining statement is explained separately.</p>                                                                                                                                                                                              |
| <b>Default</b>                  | If you omit this statement, the backup router cannot preempt a master router.                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Usage Guidelines</b>         | See “Configuring DLSw Ethernet Redundancy Using LLC2 Properties” on page 168.                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Related Topics</b>           | For information about the <b>preempt</b> statement at the [edit interfaces <i>interface-name</i> unit <i>unit-number</i> family inet address <i>address</i> (vrrp-group   vrrp-inet6-group) <i>group-number</i> ] or [edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>unit-number</i> family (inet   inet6) address <i>address</i> (vrrp-group   vrrp-inet6-group) <i>group-number</i> ] hierarchy level, see the <i>JUNOS High Availability Configuration Guide</i> . |

## preferred

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|                                 |                                                                                                                                                                                                                                                                                             |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | preferred;                                                                                                                                                                                                                                                                                  |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family <i>family</i> address <i>address</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i><br>family <i>family</i> address <i>address</i> ] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                              |
| <b>Description</b>              | Configure this address to be the preferred address on the interface. If you configure more than one address on the same subnet, the preferred source address is chosen by default as the source address when you originate packets to destinations on the subnet.                           |
| <b>Default</b>                  | The lowest numbered address on the subnet is the preferred address.                                                                                                                                                                                                                         |
| <b>Usage Guidelines</b>         | See “Configuring the Interface Address” on page 162.                                                                                                                                                                                                                                        |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                     |

## preferred-source-address

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>preferred-source-address address;</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet unnumbered-address <i>interface-name</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet unnumbered-address <i>interface-name</i> ]                                                                                                                                                                                                                                                           |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 9.0.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Description</b>              | <p>For unnumbered Ethernet interfaces configured with a loopback interface as the donor interface, specify one of the loopback interface's secondary addresses as the preferred source address for the unnumbered Ethernet interface. Configuring the preferred source address enables you to use an IP address other than the primary IP address on some of the unnumbered Ethernet interfaces in your network.</p> <p>Currently, configuration of a preferred source address for unnumbered Ethernet interfaces is supported only for the IPv4 address family.</p> |
| <b>Options</b>                  | <i>address</i> —Secondary IP address of the donor loopback interface.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Usage Guidelines</b>         | See “Configuring a Preferred Source Address for Unnumbered Ethernet or Demux Interfaces” on page 174.                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Related Topics</b>           | address, <i>JUNOS System Basics Configuration Guide</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |



## premium

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See the following sections:

- premium (Output Priority Map) on page 1007
- premium (Policer) on page 1008

### ***premium (Output Priority Map)***

**Syntax**    premium {  
               forwarding-class *class-name* {  
                   loss-priority (high | low);  
               }  
           }

**Hierarchy Level**    [edit interfaces *interface-name* *gigether-options* ethernet-switch-profile  
                           ethernet-policer-profile output-priority-map classifier]

**Release Information**    Statement introduced before JUNOS Release 7.4.

**Description**    For Gigabit Ethernet IQ interfaces only, define the classifier for egress premium traffic.

The statements are explained separately.

**Usage Guidelines**    See “Specifying an Output Priority Map” on page 610.

**Required Privilege Level**    interface—To view this statement in the configuration.  
                                   interface-control—To add this statement to the configuration.

**Related Topics**    input-priority-map

**premium (Policer)**

|                                 |                                                                                                                                            |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | premium {<br>bandwidth-limit <i>bps</i> ;<br>burst-size-limit <i>bytes</i> ;<br>}                                                          |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> together-options ethernet-switch-profile ethernet-policer-profile policer <i>cos-policer-name</i> ] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                             |
| <b>Description</b>              | Define a policer to apply to nonpremium traffic.<br><br>The statements are explained separately.                                           |
| <b>Usage Guidelines</b>         | See “Configuring Gigabit Ethernet Policers” on page 609.                                                                                   |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                    |
| <b>Related Topics</b>           | aggregate, ieee802.1p                                                                                                                      |

**preserve-interface**

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | preserve-interface;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> sonet-options aps]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 7.6.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b>              | Provide link PIC replication, providing MLPPP link redundancy at the port level. This feature is supported with SONET APS and the following link PICs: <ul style="list-style-type: none"> <li>■ Channelized OC3 IQ PIC</li> <li>■ Channelized OC12 IQ PIC</li> <li>■ Channelized STM1 IQ PIC</li> </ul> <p>Link PIC replication provides the ability to add two sets of links, one from the active SONET PIC and the other from the standby SONET PIC, to the same bundle. If the active SONET PIC fails, links from the standby PIC are used without triggering link renegotiation. All the negotiated state is replicated from the active links to the standby links to prevent link renegotiation.</p> |
| <b>Usage Guidelines</b>         | See “Configuring Link PIC Redundancy” on page 704.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Related Topics</b>           | <i>JUNOS Services Interfaces Configuration Guide</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

## primary

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See the following sections:

- primary (Address on Interface) on page 1009
- primary (AS PIC or MultiServices PIC Interfaces) on page 1009

### **primary (Address on Interface)**

|                                 |                                                                                                                                                                                                                                                                                             |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | primary;                                                                                                                                                                                                                                                                                    |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family <i>family</i> address <i>address</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i><br>family <i>family</i> address <i>address</i> ] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                              |
| <b>Description</b>              | Configure this address to be the primary address of the protocol on the interface. If the logical unit has more than one address, the primary address is used by default as the source address when packets originate from the interface and the destination does not indicate the subnet.  |
| <b>Default</b>                  | For unicast traffic, the primary address is the lowest non-127 preferred address on the unit.                                                                                                                                                                                               |
| <b>Usage Guidelines</b>         | See “Configuring the Interface Address” on page 162.                                                                                                                                                                                                                                        |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                     |

### **primary (AS PIC or MultiServices PIC Interfaces)**

|                                 |                                                                                                                                                   |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | primary <i>interface-name</i> ;                                                                                                                   |
| <b>Hierarchy Level</b>          | [edit interfaces (rsp0   rsp1) redundancy-options]                                                                                                |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                    |
| <b>Description</b>              | Specify the primary AS PIC or MultiServices PIC interface.                                                                                        |
| <b>Options</b>                  | <i>interface-name</i> —The identifier for the AS PIC interface or MultiServices PIC interface, which must be of the form <i>sp-fpc/pic/port</i> . |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                    |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                           |

## priority

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See the following sections:

- [priority \(DLSw\)](#) on page 1010
- [priority \(IEEE 802.1ag OAM Connectivity-Fault Management\)](#) on page 1011
- [priority \(Schedulers\)](#) on page 1011



**NOTE:** For information about the `priority` statement at the [edit interfaces *interface-name* unit *unit-number* family inet address *address* (vrrp-group | vrrp-inet6-group) *group-number*] or [edit logical-systems *logical-system-name* interfaces *interface-name* unit *unit-number* family (inet | inet6) address *address* (vrrp-group | vrrp-inet6-group) *group-number*] hierarchy level, see the *JUNOS High Availability Configuration Guide*.

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### priority (DLSw)

|                                 |                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>priority priority;</code>                                                                                                                                                                                                                                                                                                                  |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet address <i>address</i> redundancy-group <i>group-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet address <i>address</i> redundancy-group <i>group-number</i> ] |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 7.5.                                                                                                                                                                                                                                                                                                       |
| <b>Description</b>              | When configuring DLSw Ethernet redundancy on Fast Ethernet and Gigabit Ethernet interfaces, configure a DLSw router's priority for becoming the master default router. The router with the highest priority within the group becomes the master.                                                                                                 |
| <b>Options</b>                  | <p><i>priority</i>—Router's priority for being elected to be the master router in the VRRP group. A larger value indicates a higher priority for being elected.</p> <p><b>Range:</b> 1 through 255</p> <p><b>Default:</b> 100 (for backup routers)</p>                                                                                           |
| <b>Usage Guidelines</b>         | See “Configuring DLSw Ethernet Redundancy Using LLC2 Properties” on page 168.                                                                                                                                                                                                                                                                    |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                               |

**priority (IEEE 802.1ag OAM Connectivity-Fault Management)**

|                                 |                                                                                                                                                             |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>priority number;</code>                                                                                                                               |
| <b>Hierarchy Level</b>          | [edit protocols oam ethernet connectivity-fault-management maintenance-domain <i>domain-name</i> maintenance-association <i>ma-name</i> mep <i>mep-id</i> ] |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.4.                                                                                                                  |
| <b>Description</b>              | IEEE 802.1p priority bits used by the continuity check messages.                                                                                            |
| <b>Options</b>                  | <i>number</i> —Configure the IEEE 802.1p priority bits to be used in the VLAN header of the CFM packets.<br><b>Range:</b> 0 through 7                       |
| <b>Usage Guidelines</b>         | See “Configuring the Maintenance End Point Priority” on page 588                                                                                            |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                     |

**priority (Schedulers)**

|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>priority (high   low);</code>                                                                                     |
| <b>Hierarchy Level</b>          | [edit interfaces <i>at-fpc/pic/port</i> atm-options scheduler-maps <i>map-name</i> forwarding-class <i>class-name</i> ] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                          |
| <b>Description</b>              | For ATM2 IQ interfaces only, assign queuing priority to a forwarding class.                                             |
| <b>Options</b>                  | low—Forwarding class has low priority.<br><br>high—Forwarding class has high priority.                                  |
| <b>Usage Guidelines</b>         | See “Configuring ATM2 IQ VC Tunnel CoS Components” on page 315.                                                         |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |

## priority-cost

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|                                 |                                                                                                                                                                                                                                                                                                                                                                       |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>priority-cost <i>priority</i>;</code>                                                                                                                                                                                                                                                                                                                           |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>unit-number</i> family llc2 redundancy-group <i>group-number</i> priority <i>priority</i> track interface <i>interface-name</i> ]                                                                                                                                                                                      |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.1.                                                                                                                                                                                                                                                                                                                            |
| <b>Description</b>              | When configuring DLSw Ethernet redundancy, configure a DLSw router's priority cost for becoming the master default router. The router with the highest priority within the group becomes the master.                                                                                                                                                                  |
| <b>Options</b>                  | <p><code>priority-cost <i>priority</i></code>—The value subtracted from the configured DLSw priority when the tracked interface is down, forcing a new master router election. The sum of all the costs for all interfaces or routes that are tracked must be less than or equal to the configured priority of the DLSw group.</p> <p><b>Range:</b> 1 through 254</p> |
| <b>Usage Guidelines</b>         | See “Configuring DLSw Ethernet Redundancy Using LLC2 Properties” on page 168.                                                                                                                                                                                                                                                                                         |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                                    |

## promiscuous-mode

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|                                 |                                                                                                                                                                                                                                                                                                                                      |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>promiscuous-mode {<br/>    vpi <i>vpi-identifier</i>;<br/>}</code>                                                                                                                                                                                                                                                             |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> atm-options]                                                                                                                                                                                                                                                                                  |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                       |
| <b>Description</b>              | For ATM interfaces with <code>atm-ccc-cell-relay</code> encapsulation, map all incoming cells from either an interface port or a VP to a single label-switched path (LSP) without restricting the VCI number. Promiscuous mode allows you to map traffic from all 65,535 VCIs to a single LSP, or from all 256 VPIs to a single LSP. |
| <b>Options</b>                  | <p><code>vpi-identifier</code>—Open this VPI in promiscuous mode.</p> <p><b>Range:</b> 0 through 255</p>                                                                                                                                                                                                                             |
| <b>Usage Guidelines</b>         | See “Configuring ATM Cell-Relay Promiscuous Mode” on page 272.                                                                                                                                                                                                                                                                       |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                   |
| <b>Related Topics</b>           | vpi                                                                                                                                                                                                                                                                                                                                  |

## protect-circuit

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|                                 |                                                                                                                                                                                 |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | protect-circuit <i>group-name</i> ;                                                                                                                                             |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> sonet-options aps]                                                                                                                       |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                  |
| <b>Description</b>              | Configure the protect router in an APS circuit pair. When the working interface fails, APS brings up the protection circuit and the traffic is moved to the protection circuit. |
| <b>Options</b>                  | <i>group-name</i> —Circuit's group name.                                                                                                                                        |
| <b>Usage Guidelines</b>         | See “Configuring Basic APS Support” on page 696.                                                                                                                                |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                         |
| <b>Related Topics</b>           | working-circuit                                                                                                                                                                 |

## protocol-down

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|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | protocol-down;                                                                                                                                                                               |
| <b>Hierarchy Level</b>          | [edit protocols oam ethernet link-fault-management action-profile event]                                                                                                                     |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.5.                                                                                                                                                   |
| <b>Description</b>              | Upper layer indication of protocol down event. When the <b>protocol-down</b> statement is included, the protocol down event triggers the action specified under the <b>action</b> statement. |
| <b>Usage Guidelines</b>         | See “Configuring an OAM Action Profile” on page 598.                                                                                                                                         |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                      |

## protocols

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|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>protocols [inet iso mpls];</code>                                                                                                                                                                                                                                                                                  |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit logical-unit-number family tcc]                                                                                                                                                                                                                                              |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.3.                                                                                                                                                                                                                                                                               |
| <b>Description</b>              | For Layer 2.5 VPNs on T-series, M120, and M320 routers support, configure IS-IS (ISO traffic) or MPLS traffic to traverse a TCC interface. By default, IPv4 (inet) traffic runs on T-series, M120, and M320 routers and over TCC interfaces. You must configure the same traffic type on both ends of the Layer 2.5 VPN. |
| <b>Usage Guidelines</b>         | See “Configuring IS-IS or MPLS Traffic for TCC Interfaces” on page 209.                                                                                                                                                                                                                                                  |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                  |

## proxy

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>proxy inet-address <i>address</i>;</code>                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family tcc],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family tcc]                                                                                                                                                                                                                         |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b>              | For Layer 2.5 VPNs using an Ethernet interface as the TCC routing platform, configure the IP address for which the TCC routing platform is proxying. Ethernet TCC is supported on interfaces that carry IPv4 traffic only. Ethernet TCC encapsulation is supported on 1-port Gigabit Ethernet, 2-port Gigabit Ethernet, 4-port Gigabit Ethernet, and 4-port Fast Ethernet PICs only. Ethernet TCC is not supported on the T640 routing node. |
| <b>Options</b>                  | <code>inet-address</code> —Configure the IP address of the neighbor to the TCC routing platform.                                                                                                                                                                                                                                                                                                                                             |
| <b>Usage Guidelines</b>         | See “Configuring Ethernet TCC” on page 570 and “Example: Configuring an Ethernet TCC or Extended VLAN TCC” on page 571.                                                                                                                                                                                                                                                                                                                      |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                      |
| <b>Related Topics</b>           | <i>remote, JUNOS VPNs Configuration Guide</i>                                                                                                                                                                                                                                                                                                                                                                                                |



## proxy-arp

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|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | proxy-arp;                                                                                                                                                                                       |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                   |
| <b>Description</b>              | For Ethernet interfaces only, configure the router to respond to any ARP request, as long as the router has an active route to the ARP request's target address.                                 |
| <b>Usage Guidelines</b>         | See “Configuring Unrestricted Proxy ARP” on page 575.                                                                                                                                            |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                          |

## push

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | push;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> input-vlan-map],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> output-vlan-map],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> input-vlan-map],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> output-vlan-map]                                                             |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Description</b>              | For Gigabit Ethernet IQ and 10-Gigabit Ethernet IQ2 interfaces and aggregated Ethernet interfaces using Gigabit Ethernet IQ interfaces, specify the VLAN rewrite operation to add a new VLAN tag to the top of the VLAN stack. An outer VLAN tag is pushed in front of the existing VLAN tag. If you include the <b>push</b> statement in the configuration, you must also include the <b>pop</b> statement at the [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> output-vlan-map] hierarchy level. |
| <b>Usage Guidelines</b>         | See “Stacking a VLAN Tag” on page 554.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                     |

## push-push

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|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | push-push;                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> input-vlan-map],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> output-vlan-map],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> input-vlan-map],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> output-vlan-map] |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.1.                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Description</b>              | For Gigabit Ethernet IQ and IQ2 interfaces, and for aggregated Ethernet interfaces using Gigabit Ethernet IQ2 or 10-Gigabit Ethernet PICs on MX-series routing platforms, specifies the VLAN rewrite operation to push two VLAN tags in front of the frame.                                                                                                                                                                                                     |
| <b>Usage Guidelines</b>         | See “Stacking Two VLAN Tags” on page 557.                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                         |

## queue-depth

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|                                 |                                                                                                                                                                                                            |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | queue-depth <i>cells</i> ;                                                                                                                                                                                 |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> atm-options linear-red-profiles <i>profile-name</i> ]                                                                                                               |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                             |
| <b>Description</b>              | For ATM2 IQ interfaces only, define maximum queue depth in the CoS VC drop profile. Packets are always dropped beyond the defined maximum. This statement is mandatory; there is no default configuration. |
| <b>Default</b>                  | Buffer usage is unregulated.                                                                                                                                                                               |
| <b>Options</b>                  | <i>cells</i> —Maximum number of cells the queue can contain.<br><b>Range:</b> 1 through 64,000 cells                                                                                                       |
| <b>Usage Guidelines</b>         | See “Configuring ATM2 IQ VC Tunnel CoS Components” on page 315.                                                                                                                                            |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                    |
| <b>Related Topics</b>           | high-plp-threshold, low-plp-threshold                                                                                                                                                                      |

## queue-length

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | queue-length <i>number</i> ;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> address <i>address</i> family <i>family</i> multipoint-destination <i>address</i> shaping],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> shaping],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> address <i>address</i> family <i>family</i> multipoint-destination <i>address</i> shaping],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> shaping] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Description</b>              | For ATM1 interfaces only, define the maximum queue length in the traffic-shaping profile. For ATM1 PICs, each VC has its own independent shaping parameters.                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Default</b>                  | Buffer usage is unregulated.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Options</b>                  | <i>number</i> —Maximum number of packets the queue can contain.<br><b>Range:</b> 1 through 16383 packets<br><b>Default:</b> 16383 packets                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Usage Guidelines</b>         | See “Configuring the ATM1 Queue Length” on page 301.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

## queues

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|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | queues [ <i>queue-numbers</i> ];                                                                                        |
| <b>Hierarchy Level</b>          | [edit interfaces <i>vsp-fpc/pic/port</i> unit <i>logical-unit-number</i> compression rtp]                               |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                          |
| <b>Description</b>              | For voice services interfaces only, assign queue numbers for RTP traffic.                                               |
| <b>Options</b>                  | queues <i>queue-numbers</i> —Assign one or more of the following queues: q0, q1, q2, q3.                                |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> . For VRRP services, specify the q3 option instead of q0.  |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |

## quiet-period

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|                                 |                                                                                                                                                                                                                                                          |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | quiet-period <i>seconds</i> ;                                                                                                                                                                                                                            |
| <b>Hierarchy Level</b>          | [edit protocols dot1x authenticator interface <i>interface-id</i> ]                                                                                                                                                                                      |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 9.3.                                                                                                                                                                                                               |
| <b>Description</b>              | Specify the number of seconds the port remains in the wait state following a failed authentication exchange with the client, before reattempting authentication.                                                                                         |
| <b>Options</b>                  | <i>seconds</i> —Specify the number of seconds the port remains in the wait state following a failed authentication exchange with the client, before reattempting authentication.<br><b>Range:</b> 0 through 65,535 seconds<br><b>Default:</b> 60 seconds |
| <b>Usage Guidelines</b>         | See “Configuring IEEE 802.1x Port-Based Network Access Control” on page 591.                                                                                                                                                                             |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                  |
| <b>Related Topics</b>           | dot1x, authenticator, interface (IEEE 802.1x (dot1x)—Port-Based Network Access Control)                                                                                                                                                                  |

## rate

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|                                 |                                                                                                                                                        |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | rate <i>percentage</i> ;                                                                                                                               |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> receive-bucket],<br>[edit interfaces <i>interface-name</i> transmit-bucket]                                     |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                         |
| <b>Description</b>              | Specify percentage of the interface line rate that is available to receive or transmit packets.                                                        |
| <b>Options</b>                  | <i>percentage</i> —Percentage of the interface line rate that is available to receive or transmit packets.<br><b>Range:</b> 0 through 100              |
| <b>Usage Guidelines</b>         | See “Configuring Receive and Transmit Leaky Bucket Properties” on page 120 and “Configuring Receive and Transmit Leaky Bucket Properties” on page 711. |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                |

## reassemble-packets

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|                                 |                                                                                                                                                                                                    |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | reassemble-packets;                                                                                                                                                                                |
| <b>Hierarchy Level</b>          | [edit interfaces <i>gr-fpc/pic/port</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>gr-fpc/pic/port</i> unit <i>logical-unit-number</i> ] |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 9.2.                                                                                                                                                         |
| <b>Description</b>              | Enable reassembly of fragmented tunnel packets on generic routing encapsulation (GRE) tunnel interfaces.                                                                                           |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                     |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                            |

## reauthentication

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|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | reauthentication (disable   interval <i>seconds</i> );                                                                                                                                                                                                                                 |
| <b>Hierarchy Level</b>          | [edit protocols dot1x authenticator interface <i>interface-id</i> ]                                                                                                                                                                                                                    |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 9.3.                                                                                                                                                                                                                                             |
| <b>Description</b>              | Set or disable the periodic reauthentication of the client.                                                                                                                                                                                                                            |
| <b>Options</b>                  | <ul style="list-style-type: none"> <li>■ disable—Disable the periodic reauthentication of the client.</li> <li>■ interval <i>seconds</i>—Specify the periodic reauthentication time interval.<br/> <b>Range:</b> 1 through 65,535 seconds<br/> <b>Default:</b> 3600 seconds</li> </ul> |
| <b>Usage Guidelines</b>         | See “Configuring IEEE 802.1x Port-Based Network Access Control” on page 591                                                                                                                                                                                                            |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                |
| <b>Related Topics</b>           | dot1x, interface (IEEE 802.1x (dot1x)—Port-Based Network Access Control),<br>quiet-period                                                                                                                                                                                              |

## receive-bucket

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|                                 |                                                                                                                                                                                                                                                                                                               |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | receive-bucket {<br>overflow (discard   tag);<br>rate <i>percentage</i> ;<br>threshold <i>bytes</i> ;<br>}                                                                                                                                                                                                    |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> ]                                                                                                                                                                                                                                                                      |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                |
| <b>Description</b>              | <p>Set parameters for the receive leaky bucket, which specifies what percentage of the interface's total capacity can be used to receive packets.</p> <p>For each DS3 channel on a channelized OC12 interface, you can configure a unique receive bucket.</p> <p>The statements are explained separately.</p> |
| <b>Usage Guidelines</b>         | See “Configuring Receive and Transmit Leaky Bucket Properties” on page 711.                                                                                                                                                                                                                                   |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                            |
| <b>Related Topics</b>           | transmit-bucket                                                                                                                                                                                                                                                                                               |

## receive-options-packets

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|                                 |                                                                                                                                                                                                                                        |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | receive-options-packets;                                                                                                                                                                                                               |
| <b>Hierarchy Level</b>          | <p>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet],</p> <p>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet]</p>      |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                         |
| <b>Description</b>              | For a Monitoring Services PIC and an ATM or SONET/SDH PIC installed in an M160, M40e, or T-series routing platform, guarantee conformity with cflowd records structure. This statement is required when you enable passive monitoring. |
| <b>Usage Guidelines</b>         | See “Enabling Passive Monitoring on ATM Interfaces” on page 269 and “Enabling Passive Monitoring on SONET/SDH Interfaces” on page 709.                                                                                                 |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                     |

**receive-ttl-exceeded**

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|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | receive-ttl-exceeded;                                                                                                                                                                                                                |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet]               |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                       |
| <b>Description</b>              | For Monitoring Services PIC and an ATM or SONET/SDH PIC installed in an M160, M40e, or T-series routing platform, guarantee conformity with cflowd records structure. This statement is required when you enable passive monitoring. |
| <b>Usage Guidelines</b>         | See “Enabling Passive Monitoring on ATM Interfaces” on page 269 and “Enabling Passive Monitoring on SONET/SDH Interfaces” on page 709.                                                                                               |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                              |

**red-differential-delay**

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|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | red-differential-delay <i>milliseconds</i> ;                                                                                                                                                              |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> mlfr-uni-nni-bundle-options]                                                                                                                                       |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                            |
| <b>Description</b>              | For link services and voice services interfaces only, configure the red differential delay among bundle links to give warning when a link has a differential delay that exceeds the configured threshold. |
| <b>Options</b>                  | <i>milliseconds</i> —Red differential delay threshold.<br><b>Range:</b> 1 through 2000 milliseconds<br><b>Default:</b> 10 milliseconds                                                                    |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                            |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                   |
| <b>Related Topics</b>           | action-red-differential-delay, yellow-differential-delay                                                                                                                                                  |

## redial-delay

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>redial-delay time;</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Hierarchy Level</b>          | [edit interfaces <i>dl</i> <i>n</i> unit <i>logical-unit-number</i> dialer-options],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>dl</i> <i>n</i> unit <i>logical-unit-number</i> dialer-options]                                                                                                                                                                                                                                                                                                                                                         |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 7.5.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b>              | (J-series Services Routers) For interfaces configured for ISDN with dialout, specify the delay (in seconds) between two successive calls made by the dialer. To configure callback mode, include the <code>callback</code> statement at the [edit interfaces <i>dl</i> <i>n</i> unit <i>logical-unit-number</i> dialer-options] hierarchy level.<br><br>If the <code>callback</code> statement is configured, you cannot use the caller <i>caller-id</i> statement at the [edit interfaces <i>dl</i> <i>n</i> unit <i>logical-unit-number</i> dialer-options] hierarchy level. |
| <b>Options</b>                  | <i>time</i> —Delay (in seconds) between two successive calls.<br><b>Range:</b> 2 through 255 seconds<br><b>Default:</b> 3 seconds                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Usage Guidelines</b>         | See “Configuring ISDN Interfaces” on page 657.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Related Topics</b>           | <i>J-series Services Router Basic LAN and WAN Access Configuration Guide</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |



## redundancy-group

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <pre> redundancy-group <i>group-number</i> {   advertise-interval <i>seconds</i>;   map {     local-mac <i>mac-address</i> request <i>mac-address</i>;   }   preempt hold-time <i>seconds</i>;   no-preempt;   priority <i>priority</i>;   track {     dls {       peer <i>ip-address</i> priority-cost <i>priority</i>;       destination <i>mac-address</i> priority-cost <i>priority</i>;     }     interface <i>interface-name</i> priority-cost <i>priority</i>;   } } </pre> |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family llc2],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family llc2]                                                                                                                                                                                                                                                             |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 7.5.                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b>              | <p>For J-series Services Routers only. On Ethernet interfaces configured for DLSw, configure the router for DLSw redundancy.</p> <p>The statements are explained separately.</p>                                                                                                                                                                                                                                                                                                   |
| <b>Usage Guidelines</b>         | See “Configuring DLSw Ethernet Redundancy Using LLC2 Properties” on page 168.                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                            |
| <b>Related Topics</b>           | <i>J-series Services Router Advanced WAN Access Configuration Guide</i>                                                                                                                                                                                                                                                                                                                                                                                                            |

## redundancy-options

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|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | redundancy-options {<br>primary <i>interface-name</i> ;<br>secondary <i>interface-name</i> ;<br>hot-standby;<br>}       |
| <b>Hierarchy Level</b>          | [edit interfaces (rsp0   rsp1)],<br>[edit interfaces rlsqnumber]                                                        |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                          |
| <b>Description</b>              | Specify the primary and secondary (backup) AS PIC interfaces or MultiServices PIC interfaces.                           |
| <b>Options</b>                  | The remaining statements are explained separately.                                                                      |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                          |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |

**remote**

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|                                 |                                                                                                                                                                                                                                                                                                                                                                    |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | remote {<br>(inet-address <i>address</i>   mac-address <i>address</i> );<br>}                                                                                                                                                                                                                                                                                      |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family tcc],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family tcc]                                                                                                                                               |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b>              | For Layer 2.5 VPNs using an Ethernet interface as the TCC routing platform, configure the location of the remote routing platform. Ethernet TCC is supported on interfaces that carry IPv4 traffic only. Ethernet TCC encapsulation is supported on 1-port Gigabit Ethernet, 2-port Gigabit Ethernet, 4-port Gigabit Ethernet, and 4-port Fast Ethernet PICs only. |
| <b>Options</b>                  | mac-address—Configure the MAC address of the remote site.<br><br>inet-address—Configure the IP address of the remote site.                                                                                                                                                                                                                                         |
| <b>Usage Guidelines</b>         | See “Configuring Ethernet TCC” on page 570 and “Example: Configuring an Ethernet TCC or Extended VLAN TCC” on page 571.                                                                                                                                                                                                                                            |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                            |
| <b>Related Topics</b>           | proxy, <i>JUNOS VPNs Configuration Guide</i>                                                                                                                                                                                                                                                                                                                       |

**remote-loopback**

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|                                 |                                                                                                                                                                                                                                                                                                  |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | remote-loopback;                                                                                                                                                                                                                                                                                 |
| <b>Hierarchy Level</b>          | [edit protocols oam link-fault-management interface <i>interface-name</i> ]                                                                                                                                                                                                                      |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.2.                                                                                                                                                                                                                                                       |
| <b>Description</b>              | For Ethernet interfaces on M320, M120, MX-series, and T-series routing platforms, set the remote DTE into loopback mode. Remove the statement from the configuration to take the remote DTE out of loopback mode. Used for IEEE 802.3ah Operation, Administration, and Management (OAM) support. |
| <b>Usage Guidelines</b>         | See “Setting a Remote Interface into Loopback Mode” on page 601.                                                                                                                                                                                                                                 |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                          |

## remote-loopback-respond

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|                                 |                                                                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | remote-loopback-respond;                                                                                                                                                |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> t1-options]                                                                                                                      |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                          |
| <b>Description</b>              | For T1 interfaces only, configure the routing platform to respond to remote loopback requests. Remote loopback requests can be from the facilities data link or inband. |
| <b>Default</b>                  | The routing platform does not respond to remote loop requests.                                                                                                          |
| <b>Usage Guidelines</b>         | See “Configuring the T1 Remote Loopback Response” on page 489.                                                                                                          |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                 |
| <b>Related Topics</b>           | feac-loop-respond, loopback                                                                                                                                             |

## remote-mep

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|                                 |                                                                                                                                                                |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | remote-mep <i>mep-id</i> {<br>action-profile <i>profile-name</i> ;<br>}                                                                                        |
| <b>Hierarchy Level</b>          | [edit protocols oam ethernet connectivity-fault-management maintenance-domain<br><i>domain-name</i> maintenance-association <i>ma-name</i> mep <i>mep-id</i> ] |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.4.                                                                                                                     |
| <b>Description</b>              | The numeric identifier of the remote maintenance association end point (MEP) within the maintenance association.                                               |
| <b>Options</b>                  | mep-id—Specify the numeric identifier of the MEP.<br><b>Range:</b> 1 through 8191<br><br>The remaining statements are explained separately.                    |
| <b>Usage Guidelines</b>         | See “Creating a Remote Maintenance End Point” on page 589.                                                                                                     |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                        |

## request

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|                                 |                                                                                                                                                     |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | request (protect   working);                                                                                                                        |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> sonet-options aps]                                                                                           |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                      |
| <b>Description</b>              | Perform a manual switch between the protect and working circuits. This statement is honored only if there are no higher-priority reasons to switch. |
| <b>Options</b>                  | protect—Request that the circuit become the protect circuit.<br><br>working—Request that the circuit become the working circuit.                    |
| <b>Usage Guidelines</b>         | See “Configuring Switching Between the Working and Protect Circuits” on page 700.                                                                   |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                             |
| <b>Related Topics</b>           | force                                                                                                                                               |

## required-depth

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>required-depth <i>number</i>;</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> atm-options mpls pop-all-labels],<br>[edit interfaces <i>interface-name</i> sonet-options mpls pop-all-labels],<br>[edit interfaces <i>interface-name</i> fastether-options mpls pop-all-labels],<br>[edit interfaces <i>interface-name</i> gigether-options mpls pop-all-labels]                                                                                                                                                                             |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Description</b>              | <p>For passive monitoring on ATM and SONET/SDH interfaces only, specify the number of MPLS labels an incoming packet must have for the <b>pop-all-labels</b> statement to take effect.</p> <p>If you include the <b>required-depth 1</b> statement, the <b>pop-all-labels</b> statement takes effect for incoming packets with one label only. If you include the <b>required-depth 2</b> statement, the <b>pop-all-labels</b> statement takes effect for incoming packets with two labels only.</p> |
| <b>Options</b>                  | <p><i>number</i>—Number of MPLS labels on incoming IP packets.</p> <p><b>Range:</b> 1 through 2 labels.</p> <p><b>Default:</b> If you omit this statement, the <b>pop-all-labels</b> statement takes effect for incoming packets with one or two labels. The default is equivalent to including the <b>required-depth [ 1 2 ]</b> statement.</p>                                                                                                                                                     |
| <b>Usage Guidelines</b>         | See “Removing MPLS Labels from Incoming Packets” on page 270 and “Removing MPLS Labels from Incoming Packets” on page 709.                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Related Topics</b>           | <i>JUNOS Services Interfaces Configuration Guide</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                 |


## retries

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|                                 |                                                                                                                                     |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>retries integer;</code>                                                                                                       |
| <b>Hierarchy Level</b>          | [edit protocols dot1x authenticator interface <i>interface-id</i> ]                                                                 |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 9.3.                                                                                          |
| <b>Description</b>              | Set the number of tries after which the port remains in the wait state for quiet-period seconds before reattempting authentication. |
| <b>Options</b>                  | <i>integer</i> —Specify the number of retries.<br><b>Range:</b> 1 through 10<br><b>Default:</b> 3 retries                           |
| <b>Usage Guidelines</b>         | See “Configuring IEEE 802.1x Port-Based Network Access Control” on page 591                                                         |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.             |
| <b>Related Topics</b>           | dot1x, interface (IEEE 802.1x (dot1x)—Port-Based Network Access Control), quiet-period                                              |

## revertive

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|                                                                                     |                                                                                                                                                                                                                                                         |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                                                                       | <code>revertive;</code>                                                                                                                                                                                                                                 |
| <b>Hierarchy Level</b>                                                              | [edit interfaces aeX aggregated-ether-options lacp link-protection]                                                                                                                                                                                     |
| <b>Release Information</b>                                                          | Statement introduced in JUNOS Release 9.3.                                                                                                                                                                                                              |
| <b>Description</b>                                                                  | Enable the ability to switch to a better priority link (if one is available).                                                                                                                                                                           |
|  | <b>NOTE:</b> By default, LACP link protection is revertive. However, you can use this statement to define a specific aggregated Ethernet interface as revertive to override a global non-revertive statement specified at the [edit chassis] hierarchy. |
| <b>Required Privilege Level</b>                                                     | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                 |

**revert-time**

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|                                 |                                                                                                                                                                                                                                                                  |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>revert-time seconds;</code>                                                                                                                                                                                                                                |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> sonet-options aps]                                                                                                                                                                                                        |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                   |
| <b>Description</b>              | Configure APS revertive mode.                                                                                                                                                                                                                                    |
| <b>Default</b>                  | APS operates in nonrevertive mode.                                                                                                                                                                                                                               |
| <b>Options</b>                  | <p><i>seconds</i>—Amount of time to wait after the working circuit has again become functional before making the working circuit active again.</p> <p><b>Range:</b> 1 through 65,535 seconds</p> <p><b>Default:</b> none (APS operates in nonrevertive mode)</p> |
| <b>Usage Guidelines</b>         | See “Configuring Revertive Mode” on page 702.                                                                                                                                                                                                                    |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                               |

**rfc-2615**

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|                                 |                                                                                                                                    |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>rfc-2615;</code>                                                                                                             |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> sonet-options]                                                                              |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                     |
| <b>Description</b>              | Include this statement to enable features described in RFC 2615, <i>PPP over SONET/SDH</i> .                                       |
| <b>Default</b>                  | Settings required by RFC 1619, <i>PPP over SONET/SDH</i> .                                                                         |
| <b>Usage Guidelines</b>         | See “Configuring SONET/SDH RFC 2615 Support” on page 690.                                                                          |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p> |



## routing-instance

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|                                 |                                                                                                                                                                                                              |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | routing-instance {<br>destination <i>routing-instance-name</i> ;<br>}                                                                                                                                        |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> tunnel],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> tunnel] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                               |
| <b>Description</b>              | Specify the destination routing instance that points to the routing table containing the tunnel destination address.                                                                                         |
| <b>Default</b>                  | The default Internet routing table <i>inet.0</i> .                                                                                                                                                           |
| <b>Usage Guidelines</b>         | See <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                                   |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                      |

## rpf-check

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|                                 |                                                                                                                                                                                                                                             |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | rpf-check {<br>fail-filter <i>filter-name</i> ;<br>mode loose;<br>}                                                                                                                                                                         |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family <i>family</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family <i>family</i> ]  |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                              |
| <b>Description</b>              | Check whether traffic is arriving on an expected path. You can include this statement with the <i>inet</i> or <i>inet6</i> protocol family only.<br><br>The <i>mode</i> statement is explained separately.                                  |
| <b>Options</b>                  | <i>fail-filter</i> —A filter to evaluate when packets are received on the interface. If the RPF check fails, this optional filter is evaluated. If the fail filter is not configured, the default action is to silently discard the packet. |
| <b>Usage Guidelines</b>         | See “Configuring Unicast RPF Strict Mode” on page 189 and “Configuring Unicast RPF Loose Mode” on page 190.                                                                                                                                 |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                     |

**rtp**

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**Syntax**    rtp {  
               f-max-period *number*;  
               queues [ *queue-numbers* ];  
               port {  
                   minimum *port-number*;  
                   maximum *port-number*;  
               }  
           }

**Hierarchy Level**    [edit interfaces *interface-name* unit *logical-unit-number* compression]

**Release Information**    Statement introduced before JUNOS Release 7.4.

**Description**    Configure the real-time transport protocol (RTP) properties for voice services traffic.  
                   The remaining statements are described separately.

**Usage Guidelines**    See the *JUNOS Services Interfaces Configuration Guide*.

**Required Privilege Level**    interface—To view this statement in the configuration.  
                   interface-control—To add this statement to the configuration.

**rts**

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**Syntax**    rts (assert | de-assert | normal);

**Hierarchy Level**    [edit interfaces *interface-name* serial-options dce-options],  
                   [edit interfaces *interface-name* serial-options dte-options]

**Release Information**    Statement introduced before JUNOS Release 7.4.

**Description**    For EIA-530 and V.35 interfaces only, configure the to-DCE signal, request to send (RTS).

**Options**    assert—The to-DCE signal must be asserted.  
               de-assert—The to-DCE signal must be deasserted.  
               normal—Normal RTS signal handling, as defined by the TIA/EIA Standard 530.  
               **Default:** normal

**Usage Guidelines**    See “Configuring the Serial Signal Handling” on page 247.

**Required Privilege Level**    interface—To view this statement in the configuration.  
                   interface-control—To add this statement to the configuration.

## rts-polarity

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|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | rts-polarity (negative   positive);                                                                                     |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> serial-options]                                                                  |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                          |
| <b>Description</b>              | Configure RTS signal polarity.                                                                                          |
| <b>Options</b>                  | negative—Negative signal polarity.<br>positive—Positive signal polarity.<br><b>Default:</b> positive                    |
| <b>Usage Guidelines</b>         | See “Configuring Serial Signal Polarities” on page 250.                                                                 |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |

**rtvbr**

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>rtvbr peak <i>rate</i> sustained <i>rate</i> burst <i>length</i>;</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Hierarchy Level</b>          | <p>[edit interfaces <i>interface-name</i> atm-options vpi <i>vpi-identifier</i> shaping],</p> <p>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> address <i>address</i> family <i>family</i> multipoint-destination <i>address</i> shaping],</p> <p>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> shaping],</p> <p>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> shaping],</p> <p>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> address <i>address</i> family <i>family</i> multipoint-destination <i>address</i> shaping]</p>                                                                                                                                                                                                                                                                                                       |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b>              | <p>For ATM2 IQ PICs only, define the real-time variable bandwidth utilization in the traffic-shaping profile.</p> <p>When you configure the real-time bandwidth utilization, you must specify all three options (<b>burst</b>, <b>peak</b>, and <b>sustained</b>). You can specify <i>rate</i> in bits per second either as a complete decimal number or as a decimal number followed by the abbreviation k (1000), m (1,000,000), or g (1,000,000,000). You can also specify <i>rate</i> in cells per second by entering a decimal number followed by the abbreviation c; values expressed in cells per second are converted to bits per second using the formula 1 cps = 384 bps.</p>                                                                                                                                                                                                                                                                                                                                      |
| <b>Default</b>                  | If the <b>rtvbr</b> statement is not included, bandwidth utilization is unlimited.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Options</b>                  | <p><b>burst <i>length</i></b>—Burst length, in cells. If you set the length to 1, the peak traffic rate is used.</p> <p><b>Range:</b> 1 through 4000 cells</p> <p><b>peak <i>rate</i></b>—Peak rate, in bits per second or cells per second.</p> <p><b>Range:</b> For ATM2 IQ OC3 and OC12 interfaces, 33 Kbps through 542,526,792 bps. For ATM2 IQ OC48 interfaces, 33 Kbps through 2,170,107,168 bps. For ATM2 IQ DS3 and E3 interfaces, 33 Kbps through the maximum rate, which depends on the ATM encapsulation and framing you configure. For more information, see Table 29 on page 296.</p> <p><b>sustained <i>rate</i></b>—Sustained rate, in bps or cps.</p> <p><b>Range:</b> For ATM2 IQ OC3 and OC12 interfaces, 33 Kbps through 542,526,792 bps. For ATM2 IQ OC48 interfaces, 33 Kbps through 2,170,107,168 bps. For ATM2 IQ DS3 and E3 interfaces, from 33 Kbps through the maximum rate, which depends on the ATM encapsulation and framing you configure. For more information, see Table 29 on page 296.</p> |
| <b>Usage Guidelines</b>         | See “Configuring ATM2 IQ Real-Time VBR” on page 296.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Related Topics</b>           | cbr, vbr                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

## sampling

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|                                 |                                                                                                                                                                                                                                                                                             |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | sampling <i>direction</i> ;                                                                                                                                                                                                                                                                 |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet]                                                                      |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                              |
| <b>Description</b>              | Configure the direction of traffic to be sampled.                                                                                                                                                                                                                                           |
| <b>Options</b>                  | <i>direction</i> can be one of the following:<br><br>input—Configure at least one expected ingress point.<br><br>output—Configure at least one expected egress point.<br><br>input output—On a single interface, configure at least one expected ingress point and one expect egress point. |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                                                                                                              |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                     |

## scheduler-maps

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|                                 |                                                                                                                                                                                                     |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | scheduler-maps <i>map-name</i> {<br>forwarding-class ( <i>class-name</i>   assured-forwarding   best-effort   expedited-forwarding<br>  network-control);<br>vc-cos-mode (alternate   strict);<br>} |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> atm-options]                                                                                                                                                 |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                      |
| <b>Description</b>              | For ATM2 IQ interfaces only, define CoS parameters assigned to forwarding classes.                                                                                                                  |
| <b>Options</b>                  | <i>map-name</i> —Name of the scheduler map.<br><br>The remaining statements are explained separately.                                                                                               |
| <b>Usage Guidelines</b>         | See “Configuring ATM2 IQ VC Tunnel CoS Components” on page 315.                                                                                                                                     |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                             |
| <b>Related Topics</b>           | atm-scheduler-map, <i>JUNOS Class of Service Configuration Guide</i>                                                                                                                                |

## schedulers

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|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>schedulers <i>number</i>;</code>                                                                                  |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> ]                                                                                |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.2.                                                                              |
| <b>Description</b>              | Specify the number of schedulers for Ethernet IQ2 PIC port interfaces.                                                  |
| <b>Default</b>                  | If you omit this statement, the 1024 schedulers are distributed equally over all ports in multiples of 4.               |
| <b>Options</b>                  | <i>number</i> —Number of schedulers to configure on the port.<br><b>Range:</b> 1 through 1024                           |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Class of Service Configuration Guide</i> .                                                             |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |

## secondary

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|                                 |                                                                                                                                                         |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>secondary <i>interface-name</i>;</code>                                                                                                           |
| <b>Hierarchy Level</b>          | [edit interfaces (rsp0   rsp1) redundancy-options]                                                                                                      |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                          |
| <b>Description</b>              | Specify the secondary (backup) AS PIC interface or MultiServices PIC interface.                                                                         |
| <b>Options</b>                  | <i>interface-name</i> —The identifier for the AS PIC interface or MultiServices PIC interface, which must be of the form <code>sp-fpc/pic/port</code> . |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                          |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                 |

## **send-critical-event**

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|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | send-critical-event;                                                                                                    |
| <b>Hierarchy Level</b>          | [edit protocols oam ethernet link-fault-management action-profile action]                                               |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.5.                                                                              |
| <b>Description</b>              | Send OAM PDUs with the critical event bit set.                                                                          |
| <b>Usage Guidelines</b>         | See “Specifying the Actions to Be Taken for Link-Fault Management Events” on page 599.                                  |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |

## serial-options

---

**Syntax**

```
serial-options {
 clock-rate rate;
 clocking-mode (dce | loop);
 control-polarity (negative | positive);
 cts-polarity (negative | positive);
 dcd-polarity (negative | positive);
 dce-options {
 control-signal (assert | de-assert | normal);
 cts (ignore | normal | require);
 dcd (ignore | normal | require);
 dsr (ignore | normal | require);
 dtr signal-handling-option;
 ignore-all;
 indication (ignore | normal | require);
 rts (assert | de-assert | normal);
 tm (ignore | normal | require);
 }
 dsr-polarity (negative | positive);
 dte-options {
 control-signal (assert | de-assert | normal);
 cts (ignore | normal | require);
 dcd (ignore | normal | require);
 dsr (ignore | normal | require);
 dtr signal-handling-option;
 ignore-all;
 indication (ignore | normal | require);
 rts (assert | de-assert | normal);
 tm (ignore | normal | require);
 }
 dtr-circuit (balanced | unbalanced);
 dtr-polarity (negative | positive);
 encoding (nrz | nrzi);
 indication-polarity (negative | positive);
 line-protocol protocol;
 loopback (dce-local | dce-remote | local | remote);
 rts-polarity (negative | positive);
 tm-polarity (negative | positive);
 transmit-clock invert;
}
```

**Hierarchy Level** [edit interfaces *se-pim*/0/*port*]

**Release Information** Statement introduced prior to JUNOS Release 7.4.

**Description** Configure serial-specific interface properties.

The statements are explained separately.

**Usage Guidelines** See “Configuring Serial Interfaces” on page 239.

**Required Privilege Level** interface—To view this statement in the configuration.



interface-control—To add this statement to the configuration.

**Related Topics** no-concatenate in the *JUNOS System Basics Configuration Guide*

## server

---

**Syntax** server;

**Hierarchy Level** [edit interfaces pp0 unit *logical-unit-number* pppoe-options],  
[edit logical-systems *logical-system-name* interfaces pp0 unit *logical-unit-number*  
pppoe-options]

**Release Information** Statement introduced in JUNOS Release 8.5.

**Description** Configure the router to operate in the PPPoE server mode. Supported on M120 Multiservice Edge Routers operating as access concentrators.

**Usage Guidelines** See “Configuring the PPPoE Server Mode” on page 645.

**Required Privilege Level** interface—To view this statement in the configuration.  
interface-control—To add this statement to the configuration.

## server-timeout

---

**Syntax** server-timeout *seconds*;

**Hierarchy Level** [edit protocols dot1x authenticator interface *interface-id*]

**Release Information** Statement introduced in JUNOS Release 9.3.

**Description** Specify the number of seconds the port waits for a response when relaying a request from the authentication server to the client before resending the request.

**Options** *seconds*—The number of seconds the port waits for a response when relaying a request from the authentication server to the client before resending the request.  
**Range:** 1 through 60 seconds  
**Default:** 30 seconds

**Usage Guidelines** See “Configuring IEEE 802.1x Port-Based Network Access Control” on page 591.

**Required Privilege Level** interface—To view this statement in the configuration.  
interface-control—To add this statement to the configuration.

**Related Topics** dot1x, authenticator, interface (IEEE 802.1x (dot1x)—Port-Based Network Access Control)

## service

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|                                 |                                                                                                                                                                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <pre> service {   input {     service-set <i>service-set-name</i> &lt;service-filter <i>filter-name</i>&gt;;     post-service-filter <i>filter-name</i>;   }   output {     service-set <i>service-set-name</i> &lt;service-filter <i>filter-name</i>&gt;;   } } </pre> |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet]                                                  |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                          |
| <b>Description</b>              | Define one or more service sets and filters, and one postservice filter to be applied to an interface.                                                                                                                                                                  |
| <b>Options</b>                  | The remaining statements are explained separately.                                                                                                                                                                                                                      |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                                                                                          |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                 |

## service-domain

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | service-domain (inside   outside);                                                                                                                                                                                                                                                                                                                                                              |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ]                                                                                                                                                                                                |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b>              | For adaptive services interfaces, specify a service interface domain. If you specify this interface using the <code>next-hop-service</code> statement at the [edit services <code>service-set</code> <i>service-set-name</i> ] hierarchy level, the interface domain must match that used with the <code>inside-service-interface</code> and <code>outside-service-interface</code> statements. |
| <b>Options</b>                  | inside—Interface used within the network.<br><br>outside—Interface used outside the network.                                                                                                                                                                                                                                                                                                    |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                                                                                                                                                                                                                  |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                         |

## service-filter

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|                                 |                                                                                                                                                                                                                                                                                                                                                      |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>service-filter <i>filter-name</i>;</code>                                                                                                                                                                                                                                                                                                      |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet service (input   output)],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet service (input   output)]                                                                             |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                       |
| <b>Description</b>              | Define the filter to be applied to traffic before it is accepted for service processing. Configuration of a service filter is optional; if you include the <b>service-set</b> statement without a <b>service-filter</b> definition, the JUNOS software assumes the match condition is true and selects the service set for processing automatically. |
| <b>Options</b>                  | <i>filter-name</i> —Identifies the filter to be applied in service processing.                                                                                                                                                                                                                                                                       |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                                                                                                                                                                       |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                              |

## service-name

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|                                 |                                                                                                                                                                                                                                                                                                |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>service-name <i>name</i>;</code>                                                                                                                                                                                                                                                         |
| <b>Hierarchy Level</b>          | [edit interfaces pp0 unit <i>logical-unit-number</i> pppoe-options],<br>[edit logical-systems <i>logical-system-name</i> interfaces pp0 unit <i>logical-unit-number</i> pppoe-options]                                                                                                         |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                 |
| <b>Description</b>              | For J-series Services Routers with PPP over Ethernet interfaces, configure the service to be requested from the PPP over Ethernet server; that is, the access concentrator. For example, you can use this statement to indicate an Internet service provider (ISP) name or a class of service. |
| <b>Options</b>                  | <i>name</i> —Service to be requested from the PPP over Ethernet server.                                                                                                                                                                                                                        |
| <b>Usage Guidelines</b>         | See “Configuring the PPPoE Service Name” on page 645.                                                                                                                                                                                                                                          |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                        |
| <b>Related Topics</b>           | <i>J-series Services Router Basic LAN and WAN Access Configuration Guide</i>                                                                                                                                                                                                                   |

## service-set

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|                                 |                                                                                                                                                                                                                                                                          |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>service-set <i>service-set-name</i>;</code>                                                                                                                                                                                                                        |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet service (input   output)],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet service (input   output)] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                           |
| <b>Description</b>              | Define one or more service sets to be applied to an interface. If you define multiple service sets, the JUNOS software evaluates the filters in the order in which they appear in the configuration.                                                                     |
| <b>Options</b>                  | <i>service-set-name</i> —Identifies the service set.                                                                                                                                                                                                                     |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                                                                                           |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                  |

## services

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>services <i>priority-level</i>;</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> services-options syslog host <i>hostname</i> ]                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b>              | Specify system logging priority level.                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Options</b>                  | <i>priority-level</i> —Assigns a priority level to the facility. Valid entries are as follows: <ul style="list-style-type: none"> <li>■ alert—Conditions that should be corrected immediately</li> <li>■ any—Matches any level.</li> <li>■ emergency—Panic conditions.</li> <li>■ critical—Critical conditions.</li> <li>■ error—Error conditions.</li> <li>■ info—Informational messages.</li> <li>■ notice—Conditions that require special handling.</li> <li>■ warning—Warning messages.</li> </ul> |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                |

## services-options

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**Syntax**

```
services-options {
 inactivity-timeout seconds;
 open-timeout seconds;
 syslog {
 host hostname {
 facility-override facility-name;
 log-prefix prefix-number;
 services priority-level;
 }
 }
}
```

**Hierarchy Level** [edit interfaces *interface-name*]

**Release Information** Statement introduced before JUNOS Release 7.4.

**Description** Define the service options to be applied on an interface.

**Options** The remaining statements are explained separately.

**Usage Guidelines** See the *JUNOS Services Interfaces Configuration Guide*.

**Required Privilege Level** interface—To view this statement in the configuration.  
interface-control—To add this statement to the configuration.

## shaping

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <pre>shaping {   (cbr <i>rate</i>   rtvbr peak <i>rate</i> sustained <i>rate</i> burst <i>length</i>   vbr peak <i>rate</i> sustained <i>rate</i>     burst <i>length</i>);   queue-length <i>number</i>; }</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Hierarchy Level</b>          | <pre>[edit interfaces <i>interface-name</i> atm-options vpi <i>vpi-identifier</i>], [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i>], [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> address <i>address</i> family <i>family</i>   multipoint-destination <i>address</i>], [edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit   <i>logical-unit-number</i>], [edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i>   address <i>address</i> family <i>family</i> multipoint-destination <i>address</i>]</pre> |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Description</b>              | <p>For ATM encapsulation only, define the traffic-shaping profile.</p> <p>For ATM2 IQ interfaces, changing or deleting VP tunnel traffic shaping causes all logical interfaces on a VP to be deleted and then re-added.</p> <p>VP tunnels are not supported on multipoint interfaces.</p> <p>The statements are explained separately.</p>                                                                                                                                                                                                                                                                                                                    |
| <b>Usage Guidelines</b>         | See “Defining Virtual Path Tunnels” on page 292 and “Defining the ATM Traffic-Shaping Profile” on page 295.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

## shdsl-options

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|                                 |                                                                                                                                                                                                     |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | shdsl-options {<br>annex (annex-a   annex-b);<br>line-rate <i>line-rate</i> ;<br>loopback (local   remote   payload);<br>snr-margin {<br>current <i>margin</i> ;<br>snext <i>margin</i> ;<br>}<br>} |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> ]                                                                    |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 7.4.                                                                                                                                                          |
| <b>Description</b>              | For J-series Services Routers only, configure symmetric DSL (SHDSL) options.<br><br>The statements are explained separately.                                                                        |
| <b>Usage Guidelines</b>         | See “Configuring ATM-over-SHDSL Interfaces” on page 337.                                                                                                                                            |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                             |

## short-name-format

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|                                 |                                                                                                                                                                                                                                                                |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | short-name-format (character-string   vlan   2octet   rfc-2685-vpn-id);                                                                                                                                                                                        |
| <b>Hierarchy Level</b>          | [edit protocols oam ethernet connectivity-fault-management maintenance-domain<br><i>domain-name</i> maintenance-association <i>ma-name</i> ]                                                                                                                   |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.4.                                                                                                                                                                                                                     |
| <b>Description</b>              | Specify the name format of the maintenance association name.                                                                                                                                                                                                   |
| <b>Options</b>                  | character-string—The name is an ASCII character string.<br><br>vlan—The primary VLAN identifier.<br><br>2octet—A number in the range 0 through 65535.<br><br>rfc-2685-vpn-id—A VPN identifier that complies with RFC 2685.<br><b>Default:</b> character-string |
| <b>Usage Guidelines</b>         | See “Configuring the Maintenance Association Short Name Format” on page 586.                                                                                                                                                                                   |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                        |

## short-sequence

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|                                 |                                                                                                                                                                                                  |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | short-sequence;                                                                                                                                                                                  |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                   |
| <b>Description</b>              | For multilink interfaces only, set the length of the packet sequence identification number to 12 bits.                                                                                           |
| <b>Default</b>                  | If you omit this statement from the configuration, the length is set to 24 bits.                                                                                                                 |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                   |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                          |

## snext

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|                                 |                                                                                                                                                                                                                                                                                  |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | snext <i>margin</i> ;                                                                                                                                                                                                                                                            |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> shdsl-options snr-margin],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> shdsl-options snr-margin]                                                                                                 |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 7.4.                                                                                                                                                                                                                                       |
| <b>Description</b>              | For J-series Services Routers only, configure self-near-end crosstalk (SNEXT) signal-to-noise ratio (SNR) margin for a SHDSL line. When configured, the line trains at higher than SNEXT threshold. The SNR margin is the difference between the desired SNR and the actual SNR. |
| <b>Options</b>                  | <i>margin</i> —Desired SNEXT margin. Possible values are disabled or a margin between -10dB and 10 dB.<br><b>Default:</b> disabled                                                                                                                                               |
| <b>Usage Guidelines</b>         | See “Configuring ATM-over-SHDSL Interfaces” on page 337.                                                                                                                                                                                                                         |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                          |
| <b>Related Topics</b>           | <i>J-series Services Router Basic LAN and WAN Access Configuration Guide</i>                                                                                                                                                                                                     |



## snr-margin

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | snr-margin {<br>current <i>margin</i> ;<br>snext <i>margin</i> ;<br>}                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> shdsl-options],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> shdsl-options]                                                                                                                                                                                                                                                                                         |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b>              | For J-series Services Routers only, configure the SHDSL signal-to-noise ratio (SNR) margin. The SNR margin is the difference between the desired SNR and the actual SNR. Configuring the SNR creates a more stable SHDSL connection by making the line train at a SNR margin higher than the threshold. If any external noise below the threshold is applied to the line, the line remains stable.<br><br>The statements are explained separately. |
| <b>Usage Guidelines</b>         | See “Configuring ATM-over-SHDSL Interfaces” on page 337.                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                            |
| <b>Related Topics</b>           | <i>J-series Services Router Basic LAN and WAN Access Configuration Guide</i>                                                                                                                                                                                                                                                                                                                                                                       |

## sonet-options

---

**Syntax** sonet-options {  
     aps {  
         advertise-interval *milliseconds*;  
         authentication-key *key*;  
         force;  
         hold-time *milliseconds*;  
         lockout;  
         neighbor *address*;  
         paired-group *group-name*;  
         protect-circuit *group-name*;  
         request;  
         revert-time *seconds*;  
         switching-mode (bidirectional | unidirectional);  
         working-circuit *group-name*;  
     }  
     bytes {  
         c2 *value*;  
         e1-quiet *value*;  
         f1 *value*;  
         f2 *value*;  
         s1 *value*;  
         z3 *value*;  
         z4 *value*;  
     }  
     fcs (16 | 32);  
     loopback (local | remote);  
     mpls {  
         pop-all-labels {  
             required-depth *number*;  
         }  
     }  
     path-trace *trace-string*;  
     (payload-scrambler | no-payload-scrambler);  
     rfc-2615;  
     trigger {  
         defect ignore;  
         defect hold-time up *milliseconds* down *milliseconds*;  
     }  
 }  
 vtmapping (itu-t | klm);  
 (z0-increment | no-z0-increment);

**Hierarchy Level** [edit interfaces *interface-name*]

**Release Information** Statement introduced before JUNOS Release 7.4.

**Description** Configure SONET/SDH-specific interface properties.

On SONET/SDH OC48 interfaces that you configure for channelized (multiplexed) mode (by including the `no-concatenate` statement at the [edit chassis fpc *slot-number*

`pic` *pic-number*] hierarchy level), the `bytes e1-quiet` and `bytes f1` options have no effect. The `bytes f2`, `bytes z3`, `bytes z4`, and `path-trace` options work correctly on channel 0 and work in the transmit direction only on channels 1, 2, and 3.

On a channelized OC12 interface, the `bytes e1-quiet`, `bytes f1`, `bytes f2`, `bytes z3`, and `bytes z4` options are not supported. The `fcs` and `payload-scrambler` statements are also not supported; you must configure these for each DS3 channel using the `t3-options fcs` and `t3-options payload-scrambler` statements. The `aps` and `loopback` statements are supported only on channel 0 and are ignored if included in the configurations for channels 1 through 11. You can configure loopbacks for each DS3 channel with the `t3-options loopback` statement. The `path-trace` statement can be included in the configuration for each DS3 channel, thereby configuring a unique path trace for each channel.

If you are running Intermediate System-to-Intermediate System (IS-IS) over SONET/SDH interfaces, use PPP if you are running Cisco IOS Release 12.0 or later. If you need to run HDLC, configure an ISO family MTU of 4469 on the routing platform.

The statements are explained separately.

|                                 |                                                                                                                                                                                                                                                            |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Usage Guidelines</b>         | See “Configuring SONET/SDH Parameters on ATM Interfaces” on page 314, “Configuring Channelized OC12 Interfaces” on page 401, “Configuring Channelized STM1 Interfaces” on page 423, and “Configuring SONET/SDH Physical Interface Properties” on page 680. |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                    |
| <b>Related Topics</b>           | <code>no-concatenate</code> in the <i>JUNOS System Basics Configuration Guide</i>                                                                                                                                                                          |

**source**

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|                                 |                                                                                                                                                                                                                                              |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>source source-address;</code>                                                                                                                                                                                                          |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> tunnel <i>address</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> tunnel <i>address</i> ] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                               |
| <b>Description</b>              | Specify the source address of the tunnel.                                                                                                                                                                                                    |
| <b>Default</b>                  | If you do not specify a source address, the tunnel uses the unit's primary address as the source address of the tunnel.                                                                                                                      |
| <b>Options</b>                  | <i>source-address</i> —Address of the local side of the tunnel. This is the address that is placed in the outer IP header's source field.                                                                                                    |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                                                               |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                      |
| <b>Related Topics</b>           | multicast-only, primary                                                                                                                                                                                                                      |

## source-address-filter

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | source-address-filter {<br><code>mac-address</code> ;<br>}                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> aggregated-ether-options],<br>[edit interfaces <i>interface-name</i> fastether-options],<br>[edit interfaces <i>interface-name</i> ggether-options]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b>              | For aggregated Ethernet, Fast Ethernet, Gigabit Ethernet, Gigabit Ethernet IQ interfaces, and Gigabit Ethernet PICs with SFPs (except the 10-port Gigabit Ethernet PIC and the built-in Gigabit Ethernet port on the M7i platform), specify the MAC addresses from which the interface can receive packets. For this statement to have any effect, you must include the <b>source-filtering</b> statement in the configuration to enable source address filtering. This statement is not supported on the J-series Services Routers.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Options</b>                  | <p><b>mac-address</b>—MAC address filter. You can specify the MAC address as <code>nn:nn:nn:nn:nn:nn</code> or <code>nnnn.nnnn.nnnn</code>, where <i>n</i> is a decimal digit. To specify more than one address, include multiple <b>mac-address</b> options in the <b>source-address-filter</b> statement.</p> <p>If you enable the VRRP on a Fast Ethernet or Gigabit Ethernet interface, as described in “Configuring VRRP and VRRP for IPv6” on page 603, and if you enable MAC source address filtering on the interface, you must include the virtual MAC address in the list of source MAC addresses that you specify in the <b>source-address-filter</b> statement. MAC addresses ranging from <code>00:00:5e:00:01:00</code> through <code>00:00:5e:00:01:ff</code> are reserved for VRRP, as defined in RFC 3768, <i>Virtual Router Redundancy Protocol</i>. When you configure the VRRP group, the group number must be the decimal equivalent of the last hexadecimal byte of the virtual MAC address.</p> <p>On untagged Gigabit Ethernet interfaces you should not configure the <b>source-address-filter</b> statement and the <b>accept-source-mac</b> statement simultaneously. On tagged Gigabit Ethernet interfaces you should not configure the <b>source-address-filter</b> statement and the <b>accept-source-mac</b> statement with an identical MAC address specified in both filters.</p> |
| <b>Usage Guidelines</b>         | See “Enabling Ethernet MAC Address Filtering” on page 517.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Related Topics</b>           | source-filtering                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

## source-class-usage

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|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | source-class-usage {<br><i>direction</i> ;<br>}                                                                                                                                                                                                                                                    |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet accounting],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet accounting]                                                       |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                     |
| <b>Description</b>              | Enable packet counters on an interface that count packets that arrive from specific prefixes on the provider core router and are destined for specific prefixes on the customer edge router.                                                                                                       |
| <b>Options</b>                  | <p><i>direction</i> can be one of the following:</p> <p>input—Configure at least one expected ingress point.</p> <p>output—Configure at least one expected egress point.</p> <p>input output—On a single interface, configure at least one expected ingress point and one expect egress point.</p> |
| <b>Usage Guidelines</b>         | See “Enabling Source Class and Destination Class Usage” on page 194 or the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                                                  |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                 |
| <b>Related Topics</b>           | accounting, destination-class-usage                                                                                                                                                                                                                                                                |

## source-filtering

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | (source-filtering   no-source-filtering);                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> aggregated-ether-options],<br>[edit interfaces <i>interface-name</i> fastether-options],<br>[edit interfaces <i>interface-name</i> gigether-options]                                                                                                                                                                                                                                                                                                                    |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b>              | <p>For aggregated Ethernet, Fast Ethernet, Gigabit Ethernet, and Gigabit Ethernet IQ interfaces only, enable the filtering of MAC source addresses, which blocks all incoming packets to that interface. To allow the interface to receive packets from specific MAC addresses, include the <b>source-address-filter</b> statement.</p> <p>If the remote Ethernet card is changed, the interface will no longer be able to receive packets from the new card because it will have a different MAC address.</p> |
| <b>Default</b>                  | Source address filtering is disabled.                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Usage Guidelines</b>         | See “Enabling Ethernet MAC Address Filtering” on page 517.                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Related Topics</b>           | accept-source-mac, source-address-filter                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

## speed

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See the following sections:

- speed (Ethernet) on page 1054
- speed (SONET/SDH) on page 1055

### speed (Ethernet)

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | speed (10m   100m   1g);                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> ],<br>[edit interfaces <i>ge-pim/0/0</i> switch-options switch-port <i>port-number</i> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b>              | Configure the interface speed. This statement applies to the management Ethernet interface (fxp0), Fast Ethernet 12-port and 48-port PICs, the built-in Fast Ethernet port on the FIC (M7i routing platform), the built-in Ethernet interfaces on J-series Services Routers, MX-series Tri-Rate Ethernet copper interface, and the Gigabit Ethernet ports on J-series Services Routers with uPIMs installed and configured for access switching mode. When you configure the Tri-Rate Ethernet copper interface to operate at 1 Gbps, autonegotiation must be enabled. When you configure 100BASE-FX SFP, you must set the port speed at 100 Mbps. |
| <b>Options</b>                  | You can specify the speed as either <b>10m</b> (10 Mbps), <b>100m</b> (100 Mbps), or on J-series Services Routers with uPIMs installed, <b>1g</b> (1 Gbps).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Usage Guidelines</b>         | See “Configuring the Interface Speed” on page 114, “Configuring the Interface Speed” on page 522, and “Configuring J-series Services Router Switching Interfaces” on page 515.                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |



**speed (SONET/SDH)**

|                                 |                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>speed (oc3   oc12   oc48);</code>                                                                                                                                                                                                                                                                                                                      |
| <b>Hierarchy Level</b>          | [edit interfaces <i>so-fpc/pic/port</i> ],<br>[edit interfaces <i>so-fpc/pic/port:channel</i> ]                                                                                                                                                                                                                                                              |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.3.                                                                                                                                                                                                                                                                                                                   |
| <b>Description</b>              | Configure the interface speed. This statement applies to SONET/SDH interfaces on next-generation SONET/SDH Type 1 and Type 2 PICs with SFP. Available speeds depend on whether the PIC is in concatenated mode or nonconcatenated mode. Include the channel in the interface name when configuring nonconcatenated interfaces.                               |
| <b>Options</b>                  | <code>oc3   oc12   oc48</code> —Speed when the PIC is in concatenated mode. For example, you can configure each port of an 4-port OC12 PIC to have a speed of <code>oc3</code> .<br><br>You can configure port 0 of an 4-port OC12 PIC to have a speed of <code>oc12</code> .<br><br><code>oc3   oc12</code> —Speed when the PIC is in nonconcatenated mode. |
| <b>Usage Guidelines</b>         | See “Configuring SONET/SDH Interface Speed” on page 683.                                                                                                                                                                                                                                                                                                     |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                      |

**spid1**


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|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>spid1 <i>spid1-string</i>;</code>                                                                                 |
| <b>Hierarchy Level</b>          | [edit interfaces <i>br-pim/0/port</i> isdn-options]                                                                     |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                          |
| <b>Description</b>              | Configure the Service Profile Identifier (SPID).                                                                        |
| <b>Options</b>                  | <i>spid1-string</i> —Numeric SPID.                                                                                      |
| <b>Usage Guidelines</b>         | See “Configuring ISDN Physical Interface Properties” on page 659.                                                       |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |
| <b>Related Topics</b>           | <i>J-series Services Router Basic LAN and WAN Access Configuration Guide</i>                                            |

## spid2

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|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>spid2 spid2-string;</code>                                                                                        |
| <b>Hierarchy Level</b>          | [edit interfaces <i>br-pim</i> /0/ <i>port</i> isdn-options]                                                            |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                          |
| <b>Description</b>              | Configure an additional SPID.                                                                                           |
| <b>Options</b>                  | <i>spid2-string</i> —Numeric SPID.                                                                                      |
| <b>Usage Guidelines</b>         | See “Configuring ISDN Physical Interface Properties” on page 659.                                                       |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |
| <b>Related Topics</b>           | <i>J-series Services Router Configuration Guide</i>                                                                     |

## stacked-vlan-tagging

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|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>stacked-vlan-tagging;</code>                                                                                      |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> ]                                                                                |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                          |
| <b>Description</b>              | For Gigabit Ethernet IQ interfaces, enable stacked VLAN tagging for all logical interfaces on the physical interface.   |
| <b>Usage Guidelines</b>         | See “Configuring the Management Ethernet Interface” on page 627.                                                        |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |
| <b>Related Topics</b>           | vlan-tags                                                                                                               |

## start-end-flag

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|                                 |                                                                                                                                                                                                                                                                                 |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | start-end-flag (filler   shared);                                                                                                                                                                                                                                               |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> ds0-options],<br>[edit interfaces <i>interface-name</i> e1-options],<br>[edit interfaces <i>interface-name</i> e3-options],<br>[edit interfaces <i>interface-name</i> t1-options],<br>[edit interfaces <i>interface-name</i> t3-options] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                  |
| <b>Description</b>              | For DS0, E1, E3, T1, and T3 interfaces, configure the interface to share the transmission of start and end flags.                                                                                                                                                               |
| <b>Default</b>                  | shared                                                                                                                                                                                                                                                                          |
| <b>Options</b>                  | filler—Wait two idle cycles between the start and end flags.<br><br>shared—Share the transmission of the start and end flags.                                                                                                                                                   |
| <b>Usage Guidelines</b>         | See “Configuring E1 Start and End Flags” on page 474, “Configuring the E3 Start and End Flags” on page 483, “Configuring T1 Start and End Flags” on page 492, and “Configuring T3 Start and End Flags” on page 505.                                                             |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                         |

## static-tei-val

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|                                 |                                                                                                                                                                                                                                                                                                              |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | static-tei-val <i>value</i> ;                                                                                                                                                                                                                                                                                |
| <b>Hierarchy Level</b>          | [edit interfaces <i>br-pim</i> /0/ <i>port</i> isdn-options]                                                                                                                                                                                                                                                 |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                               |
| <b>Description</b>              | For J-series Services Routers only. Statically configure the Terminal Endpoint Identifier (TEI) value. The TEI value represents any ISDN-capable device attached to an ISDN network that is the terminal endpoint. TEIs are used to distinguish between several different devices using the same ISDN links. |
| <b>Options</b>                  | <i>value</i> —Value between 0 through 63.                                                                                                                                                                                                                                                                    |
| <b>Usage Guidelines</b>         | See “Configuring ISDN Physical Interface Properties” on page 659.                                                                                                                                                                                                                                            |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                      |
| <b>Related Topics</b>           | <i>J-series Services Router Basic LAN and WAN Access Configuration Guide</i>                                                                                                                                                                                                                                 |

## supplicant

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                      |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | supplicant ( <i>single</i> );                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Hierarchy Level</b>          | [edit protocols dot1x authenticator interface <i>interface-id</i> ]                                                                                                                                                                                                                                                                                                                                                  |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 9.3.                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Description</b>              | Specify the supplicant mode<br>single mode is supported.<br><br>This option will authenticate only the first client that connects to a port. All other clients that connect later (802.1x compliant or non-compliant) will be allowed free access on that port without any further authentication. If the first authenticated client logs out, all other users will be locked out till a client authenticates again. |
| <b>Options</b>                  | single—Sets single mode.                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Usage Guidelines</b>         | See “Configuring IEEE 802.1x Port-Based Network Access Control” on page 591.                                                                                                                                                                                                                                                                                                                                         |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                              |
| <b>Related Topics</b>           | dot1x, authenticator, interface (IEEE 802.1x (dot1x)—Port-Based Network Access Control)                                                                                                                                                                                                                                                                                                                              |

## supplicant-timeout

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|                                 |                                                                                                                                                                |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | supplicant-timeout <i>seconds</i> ;                                                                                                                            |
| <b>Hierarchy Level</b>          | [edit protocols dot1x authenticator interface <i>interface-id</i> ]                                                                                            |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 9.3.                                                                                                                     |
| <b>Description</b>              | Specify the number of seconds the port waits for a response when relaying a request from the authentication server to the client before resending the request. |
| <b>Options</b>                  | <i>seconds</i> —Specify the number of seconds the port waits for the supplicant timeout.<br><b>Range:</b> 1 through 60 seconds<br><b>Default:</b> 30 seconds   |
| <b>Usage Guidelines</b>         | See “Configuring IEEE 802.1x Port-Based Network Access Control” on page 591.                                                                                   |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                        |
| <b>Related Topics</b>           | dot1x, authenticator, interface (IEEE 802.1x (dot1x)—Port-Based Network Access Control)                                                                        |

**swap**

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | swap;                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> input-vlan-map],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> output-vlan-map],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> input-vlan-map],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> output-vlan-map] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b>              | For Gigabit Ethernet IQ and 10-Gigabit Ethernet IQ2 interfaces and aggregated Ethernet using Gigabit Ethernet IQ interfaces, specify the VLAN rewrite operation to replace a VLAN tag. The outer VLAN tag of the frame is overwritten with the user-specified VLAN tag information.                                                                                                                                                                             |
| <b>Usage Guidelines</b>         | See “Rewriting the VLAN Tag” on page 557.                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                         |

**swap-push**

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | swap-push;                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> input-vlan-map],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> output-vlan-map],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> input-vlan-map],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> output-vlan-map] |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.1.                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Description</b>              | For Gigabit Ethernet IQ and IQ2 interfaces, and for aggregated Ethernet interfaces using Gigabit Ethernet IQ2 or 10-Gigabit Ethernet PICs on MX-series routing platforms, specify the VLAN rewrite operation to replace the outer VLAN tag of the frame with a user-specified VLAN tag value. A user-specified outer VLAN tag is pushed in front. The outer tag becomes an inner tag in the final frame.                                                        |
| <b>Usage Guidelines</b>         | See “Rewriting a VLAN Tag and Adding a New Tag” on page 558.                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                         |

## swap-swap

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | swap-swap;                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> input-vlan-map],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> output-vlan-map],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> input-vlan-map],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> output-vlan-map] |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.1.                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Description</b>              | For Gigabit Ethernet IQ and IQ2 interfaces, and for aggregated Ethernet interfaces using Gigabit Ethernet IQ2 or 10-Gigabit Ethernet PICs on MX-series routing platforms, specify the VLAN rewrite operation to replace both the inner and the outer VLAN tags of the frame with a user-specified VLAN tag value.                                                                                                                                               |
| <b>Usage Guidelines</b>         | See “Rewriting the Inner and Outer VLAN Tags” on page 559.                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                         |

## switching-mode

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|                                 |                                                                                                                                                                                                                                                         |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | switching-mode (bidirectional   unidirectional);                                                                                                                                                                                                        |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> sonet-options aps]                                                                                                                                                                                               |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                          |
| <b>Description</b>              | For unchannelized OC3, OC12, and OC48 SONET/SDH interfaces on T-series platforms only, configure the interface to interoperate with SONET/SDH line-terminating equipment (LTE) that is provisioned for unidirectional linear APS in 1 + 1 architecture. |
| <b>Default</b>                  | If the <b>switching-mode</b> statement is not configured, the mode is bidirectional, and the interface does not interoperate with a unidirectional SONET/SDH LTE.                                                                                       |
| <b>Options</b>                  | bidirectional—Support bidirectional mode only.<br><br>unidirectional—Interoperate with a SONET/SDH LTE provisioned for unidirectional mode.                                                                                                             |
| <b>Usage Guidelines</b>         | See “Configuring Unidirectional Switching Mode Support” on page 702.                                                                                                                                                                                    |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                 |

## switch-options

---

**Syntax**    switch-options {  
               switch-port *port-number* {  
                   (auto-negotiation | no-auto-negotiation);  
                   speed (10m | 100m | 1g);  
                   link-mode (full-duplex | half-duplex);  
               }  
           }

**Hierarchy Level**    [edit interfaces *ge-pim*/0/0]

**Release Information**    Statement introduced in JUNOS Release 8.4.

**Description**    On a J-series Services Router with multiport Gigabit Ethernet uPIMs installed and operating in access switching mode, only one physical interface is configured for the entire multiport Gigabit Ethernet uPIM. Configuration of the physical port characteristics is done under the single physical interface.

**Usage Guidelines**    See “Configuring J-series Services Router Switching Interfaces” on page 515.

**Required Privilege Level**    interface—To view this statement in the configuration.  
                                   interface-control—To add this statement to the configuration.

## switch-port

---

**Syntax**    switch-port *port-number* {  
                   (auto-negotiation | no-auto-negotiation);  
                   speed (10m | 100m | 1g);  
                   link-mode (full-duplex | half-duplex);  
                   }

**Hierarchy Level**    [edit interfaces *ge-pim*/0/0 switch-options]

**Release Information**    Statement introduced in JUNOS Release 8.4.

**Description**    On a J-series Services Router with Ethernet uPIMs installed and operating in access switching mode, configuration of the physical port characteristics, done under the single physical interface.

**Default**    Autonegotiation is enabled by default. If the link speed and duplex are also configured, the interfaces use the values configured as the desired values in the negotiation.

**Options**    *port-number*—Ports are numbered 0 through 5 on the 6-port Gigabit Ethernet uPIM, 0 through 7 on the 8-port Gigabit Ethernet uPIM, and 0 through 15 on the 16-port Gigabit Ethernet uPIM.

The remaining statements are explained separately.

**Usage Guidelines**    See “Configuring J-series Services Router Switching Interfaces” on page 515.

**Required Privilege Level**    interface—To view this statement in the configuration.  
                   interface-control—To add this statement to the configuration.



## switch-type

---

|                                 |                                                                                                                                                                                                                                                |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | switch-type (att5e   etsi   ni1   ntdms-100)                                                                                                                                                                                                   |
| <b>Hierarchy Level</b>          | [edit interfaces br-pim/0/port isdn-options]                                                                                                                                                                                                   |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                 |
| <b>Description</b>              | For J-series Services Routers only. Configure the ISDN variant supported.                                                                                                                                                                      |
| <b>Options</b>                  | <p>att5e—AT&amp;T switch variant.</p> <p>etsi—European Telecommunications Standards Institute switch variant.</p> <p>ni1—National ISDN 1 switch variant.</p> <p>ntdms-100—Northern Telecom DMS-100.</p> <p>ntt—NTT Group switch for Japan.</p> |
| <b>Usage Guidelines</b>         | See “Configuring ISDN Interfaces” on page 657.                                                                                                                                                                                                 |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                             |
| <b>Related Topics</b>           | <i>J-series Services Router Basic LAN and WAN Access Configuration Guide</i>                                                                                                                                                                   |

## symbol-period

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | symbol-period <i>count</i> ;                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Hierarchy Level</b>          | [edit protocols oam ethernet link-fault-management action-profile event, link-event-rate],<br>[edit protocols oam link-fault-management interface <i>interface-name</i> event-thresholds]                                                                                                                                                                                                                                                                                                      |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Description</b>              | <p>Configure the threshold for sending symbol period events or taking the action specified in the action profile.</p> <p>A symbol error is any symbol code error on the underlying physical layer. The symbol period threshold is reached when the number of symbol errors reaches the configured value within the period window. The default period window is the number of symbols that can be transmitted on the underlying physical layer in 1 second. The window is not configurable.</p> |
| <b>Options</b>                  | <i>count</i> —Threshold count for symbol period events.<br><b>Range:</b> 1 through 100                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Usage Guidelines</b>         | See “Configuring Threshold Values for Local Fault Events on an Interface” on page 597 and “Configuring Threshold Values for Fault Events in an Action Profile” on page 600.                                                                                                                                                                                                                                                                                                                    |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                        |

## syslog

---

See the following sections:

- syslog (Interfaces) on page 1065
- syslog (Monitoring) on page 1066
- syslog (OAM Action) on page 1066

### syslog (Interfaces)

**Syntax**

```
syslog {
 host hostname {
 facility-override facility-name;
 log-prefix prefix-number;
 services priority-level;
 }
}
```

**Hierarchy Level** [edit interfaces *interface-name* services-options]

**Release Information** Statement introduced before JUNOS Release 7.4.

**Description** For adaptive services interfaces, configure generation of system log messages for the service set. System log information is passed to the kernel for logging in the /var/log directory. Any values configured in the service set definition override these values.

**Options** The remaining statements are explained separately.

**Usage Guidelines** See the *JUNOS Services Interfaces Configuration Guide*.

**Required Privilege Level** interface—To view this statement in the configuration.  
interface-control—To add this statement to the configuration.

**syslog (Monitoring)**

|                                 |                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | (syslog   no-syslog);                                                                                                                                                                                                                                                                                                                        |
| <b>Hierarchy Level</b>          | [edit interfaces mo- <i>fpc/pic/port</i> multiservice-options]                                                                                                                                                                                                                                                                               |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                               |
| <b>Description</b>              | System logging is enabled by default. The system log information of the Monitoring Services PIC is passed to the kernel for logging in the <code>/var/log</code> directory. <ul style="list-style-type: none"> <li>■ <code>syslog</code>—Enable PIC system logging.</li> <li>■ <code>no-syslog</code>—Disable PIC system logging.</li> </ul> |
| <b>Usage Guidelines</b>         | See “Configuring Multiservice Physical Interface Properties” on page 129 or the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                                                                                       |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                      |

**syslog (OAM Action)**

|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | syslog;                                                                                                                 |
| <b>Hierarchy Level</b>          | [edit protocols oam ethernet link-fault-management action-profile action]                                               |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.5.                                                                              |
| <b>Description</b>              | Generate a syslog message for the Ethernet Operation, Administration, and Management (OAM) event.                       |
| <b>Usage Guidelines</b>         | See “Specifying the Actions to Be Taken for Link-Fault Management Events” on page 599.                                  |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |

## system-priority

---

|                                 |                                                                                                                                                                                                             |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | system-priority <i>priority</i> ;                                                                                                                                                                           |
| <b>Hierarchy Level</b>          | [edit interfaces aeX aggregated-ether-options lacp]                                                                                                                                                         |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 9.3.                                                                                                                                                                  |
| <b>Description</b>              | Define LACP system priority at the aggregated Ethernet interface level. This system priority value takes precedence over a system priority value configured at the global ([edit chassis]) hierarchy level. |
| <b>Options</b>                  | <i>priority</i> —Priority for the aggregated Ethernet system. A smaller value indicates a higher priority.<br><b>Range:</b> 0 through 65535<br><b>Default:</b> 127                                          |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                     |

## t1-options

---

**Syntax**    t1-options {  
               bert-algorithm *algorithm*;  
               bert-error-rate *rate*;  
               bert-period *seconds*;  
               buildout *value*;  
               byte-encoding (nx56 | nx64);  
               crc-major-alarm-threshold (1e-3 | 5e-4 | 1e-4 | 5e-5 | 1e-5);  
               crc-minor-alarm-threshold (1e-3 | 5e-4 | 1e-4 | 5e-5 | 1e-5 | 5e-6 | 1e-6);  
               fcs (16 | 32);  
               framing (esf | sf);  
               idle-cycle-flag (flags | ones);  
               invert-data;  
               line-encoding (ami | b8zs);  
               loopback (local | payload | remote);  
               remote-loopback-respond;  
               start-end-flag (filler | shared);  
               timeslots *time-slot-range*;  
               }

**Hierarchy Level**    [edit interfaces *interface-name*]

**Release Information**    Statement introduced before JUNOS Release 7.4.

**Description**    Configure T1-specific physical interface properties.

The statements are explained separately.

**Usage Guidelines**    See “Configuring T1 Interfaces” on page 485.

**Required Privilege Level**    interface—To view this statement in the configuration.  
                                   interface-control—To add this statement to the configuration.

## t1-time

---

|                                 |                                                                                                                                                                                                                        |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | t1-time <i>time</i> ;                                                                                                                                                                                                  |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family llc2],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family llc2] |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 7.4.                                                                                                                                                                             |
| <b>Description</b>              | For J-series Services Routers only. On Ethernet interfaces configured for DLSw, configure the length of time the router waits for an acknowledgment of transmitted frames.                                             |
| <b>Options</b>                  | <i>time</i> —Number of milliseconds.<br><b>Range:</b> 1 through 60000<br><b>Default:</b> 1000 milliseconds                                                                                                             |
| <b>Usage Guidelines</b>         | See “Configuring LLC2 Options” on page 167.                                                                                                                                                                            |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                |
| <b>Related Topics</b>           | <i>J-series Services Router Advanced WAN Access Configuration Guide</i>                                                                                                                                                |

## t2-time

---

|                                 |                                                                                                                                                                                                                        |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | t2-time <i>time</i> ;                                                                                                                                                                                                  |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family llc2],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family llc2] |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 7.4.                                                                                                                                                                             |
| <b>Description</b>              | For J-series Services Routers only. On Ethernet interfaces configured for DLSw, configure the length of time the router withholds the I-frame response.                                                                |
| <b>Options</b>                  | <i>time</i> —Number of milliseconds.<br><b>Range:</b> 1 through 60000<br><b>Default:</b> 100 milliseconds                                                                                                              |
| <b>Usage Guidelines</b>         | See “Configuring LLC2 Options” on page 167.                                                                                                                                                                            |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                |
| <b>Related Topics</b>           | <i>J-series Services Router Advanced WAN Access Configuration Guide</i>                                                                                                                                                |

**t310**

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|                                 |                                                                                                                                                           |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | t310-value <i>seconds</i> ;                                                                                                                               |
| <b>Hierarchy Level</b>          | [edit interfaces <i>br-pim/0/port</i> isdn-options]                                                                                                       |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                            |
| <b>Description</b>              | For ISDN interfaces, configure the Q.931-specific timer for T310, in seconds. The Q.931 protocol is involved in the setup and termination of connections. |
| <b>Options</b>                  | <i>seconds</i> —Timer value, in seconds.<br><b>Range:</b> 1 through 65536<br><b>Default:</b> 10 seconds                                                   |
| <b>Usage Guidelines</b>         | See “Configuring ISDN Physical Interface Properties” on page 659.                                                                                         |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                   |
| <b>Related Topics</b>           | <i>J-series Services Router Basic LAN and WAN Access Configuration Guide</i>                                                                              |

**t391**

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|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | t391 <i>seconds</i> ;                                                                                                   |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> mlfr-uni-nni-bundle-options]                                                     |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                          |
| <b>Description</b>              | For link services and voices interfaces only, set Frame Relay link integrity polling interval.                          |
| <b>Options</b>                  | <i>seconds</i> —Link integrity polling interval.<br><b>Range:</b> 5 through 30 seconds<br><b>Default:</b> 10 seconds    |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                          |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |
| <b>Related Topics</b>           | n391, n392, n393, t392                                                                                                  |



**t392**

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|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | t392 <i>seconds</i> ;                                                                                                   |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> mlfr-uni-nni-bundle-options]                                                     |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                          |
| <b>Description</b>              | For link services and voices interfaces only, set Frame Relay polling verification interval.                            |
| <b>Options</b>                  | <i>seconds</i> —Polling verification interval.<br><b>Range:</b> 5 through 30 seconds<br><b>Default:</b> 15 seconds      |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                          |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |
| <b>Related Topics</b>           | n391, n392, n393, timeslots                                                                                             |

## t3-options

---

**Syntax**    t3-options {  
               atm-encapsulation (direct | plcp);  
               bert-algorithm *algorithm*;  
               bert-error-rate *rate*;  
               bert-period *seconds*;  
               (cbit-parity | no-cbit-parity);  
               compatibility-mode (digital-link | kentrox | larscom) <subrate *value*>;  
               fcs (16 | 32);  
               (feac-loop-respond | no-feac-loop-respond);  
               idle-cycle-flag *value*;  
               (long-buildout | no-long-buildout);  
               (loop-timing | no-loop-timing);  
               loopback (local | payload | remote);  
               start-end-flag *value*;  
               }

**Hierarchy Level**    [edit interfaces *interface-name*]

**Release Information**    Statement introduced before JUNOS Release 7.4.

**Description**    Configure T3-specific physical interface properties, including the properties of DS3 channels on a channelized OC12 interface. The **long-buildout** statement is not supported for DS3 channels on a channelized OC12 interface.

On T3 interfaces, the default encapsulation is PPP.

For ATM1 interfaces, you can configure a subset of E3 options statements.

The statements are explained separately.

**Usage Guidelines**    See “Configuring T3 Interfaces” on page 495.

**Required Privilege Level**    interface—To view this statement in the configuration.  
                                   interface-control—To add this statement to the configuration.

## tag-protocol-id

---

See the following sections:

- tag-protocol-id (TPIDs Expected to Be Sent or Received) on page 1073
- tag-protocol-id (TPID to Rewrite) on page 1074

### ***tag-protocol-id (TPIDs Expected to Be Sent or Received)***

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | tag-protocol-id [ <i>tpids</i> ];                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> <i>gigether-options</i> ethernet-switch-profile],<br>[edit interfaces <i>interface-name</i> <i>aggregated-ether-options</i> ethernet-switch-profile]                                                                                                                                                                                                                                                                                                                               |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Description</b>              | For Gigabit Ethernet IQ and 10-Gigabit Ethernet IQ2 interfaces, aggregated Ethernet with Gigabit Ethernet IQ interfaces, and Gigabit Ethernet PICs with SFPs (except the 10-port Gigabit Ethernet PIC, and the built-in Gigabit Ethernet port on the M7i platform), define the TPIDs expected to be sent or received on a particular VLAN. For each Gigabit Ethernet port, you can configure up to eight TPIDs using the <i>tag-protocol-id</i> statement; but only the first four TPIDs are supported on IQ2 interfaces. |
| <b>Options</b>                  | <i>tpids</i> —TPIDs to be accepted on the VLAN. Specify TPIDs in hexadecimal.                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Usage Guidelines</b>         | See “Configuring Frames with Particular TPIDs to Be Processed as Tagged Frames” on page 550.                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                   |

**tag-protocol-id (TPID to Rewrite)**

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | tag-protocol-id <i>tpid</i> ;                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> input-vlan-map],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> output-vlan-map],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> input-vlan-map],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> output-vlan-map] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b>              | For Gigabit Ethernet IQ and 10-Gigabit Ethernet IQ2 interfaces only, configure the outer TPID value. All TPIDs you include in input and output VLAN maps must be among those you specify at the [edit interfaces <i>interface-name</i> gige-ether-options ethernet-switch-profile tag-protocol-id [ <i>tpids</i> ]] hierarchy level.                                                                                                                            |
| <b>Default</b>                  | If the tag-protocol-id statement is not configured, the TPID value is 0x8100.                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Usage Guidelines</b>         | See “Configuring Inner and Outer TPIDs and VLAN IDs” on page 551.                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                         |

**tei-option**


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|                                 |                                                                                                                                                                          |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | tei-option (first-call   power-up);                                                                                                                                      |
| <b>Hierarchy Level</b>          | [edit interfaces <i>br-pim</i> /0/ <i>port</i> isdn-options]                                                                                                             |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                           |
| <b>Description</b>              | For ISDN interfaces, configure when the Terminal Endpoint Identifier (TEI) negotiates with the ISDN provider.                                                            |
| <b>Options</b>                  | first-call—Activation does not occur until the call setup is sent.<br><br>power-up—Activation occurs when the Services Router is powered on.<br><b>Default:</b> power-up |
| <b>Usage Guidelines</b>         | See “Configuring ISDN Physical Interface Properties” on page 659.                                                                                                        |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                  |
| <b>Related Topics</b>           | <i>J-series Services Router Basic LAN and WAN Access Configuration Guide</i>                                                                                             |

## threshold

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | threshold <i>bytes</i> ;                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> ]                                                                                                                                                                                                                                                                                                                                                       |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                 |
| <b>Description</b>              | Specify the bucket threshold, which controls the burstiness of the leaky bucket mechanism. The larger the value, the more bursty the traffic, which means that over a very short amount of time, the interface can receive or transmit close to line rate, but the average over a longer time is at the configured bucket rate.                                                                |
| <b>Options</b>                  | <i>bytes</i> —Maximum size, in bytes, for traffic bursts.<br><b>Range:</b> 0 through 65,535 bytes.                                                                                                                                                                                                                                                                                             |
| <b>Usage Guidelines</b>         | See “Configuring Receive and Transmit Leaky Bucket Properties” on page 120 and “Configuring Receive and Transmit Leaky Bucket Properties” on page 711. For ease of entry, you can enter <i>number</i> either as a complete decimal number or as a decimal number followed by the abbreviation k (1,000). For example, the entry <b>threshold 2k</b> corresponds to a threshold of 2,000 bytes. |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                        |

## timeslots

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>timeslots <i>time-slot-range</i>;</code>                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> e1-options],<br>[edit interfaces <i>interface-name</i> partition <i>partition-number</i> ],<br>[edit interfaces <i>interface-name</i> t1-options]                                                                                                                                                                                                                                                          |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Description</b>              | For E1 and T1 interfaces, allocate the specific time slots by number. For E1 interfaces, time slot 0 is reserved.                                                                                                                                                                                                                                                                                                                                 |
| <b>Options</b>                  | <p><i>time-slot-range</i>—Actual time slot numbers allocated:</p> <p><b>Range:</b> 1 through 24 for T1 interfaces, 1 through 31 for 4-port E1 PICs, 2 through 32 for 10-port Channelized E1 and 10-port Channelized E1 IQ PICs.</p> <p>For fractional E1 interfaces only, if you connect a 4-port E1 PIC interface to a device that uses time slot numbering from 2 through 32, you must subtract 1 from the configured number of time slots.</p> |
| <b>Usage Guidelines</b>         | See “Configuring Fractional E1 IQ Interfaces” on page 378, “Configuring Fractional T1 IQ and IQE Interfaces” on page 444, “Configuring Fractional E1 Time Slots” on page 474, “Configuring Fractional T1 Time Slots” on page 493, and configuring “Configuring a Channelized T1/E1 Interface to Drop and Insert Time Slots” on page 387.                                                                                                          |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                                                                                                                |

**tm**

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|                                 |                                                                                                                                                                                                       |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | tm (ignore   normal   require);                                                                                                                                                                       |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> serial-options dce-options],<br>[edit interfaces <i>interface-name</i> serial-options dte-options]                                                             |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                        |
| <b>Description</b>              | For EIA-530 interfaces only, configure the from-DCE signal, test-mode (TM).                                                                                                                           |
| <b>Options</b>                  | ignore—The from-DCE signal is ignored.<br><br>normal—Normal TM signal handling as defined by the TIA/EIA Standard 530.<br><br>require—The from-DCE signal must be asserted.<br><b>Default:</b> normal |
| <b>Usage Guidelines</b>         | See “Configuring the Serial Signal Handling” on page 247.                                                                                                                                             |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                               |

**tm-polarity**

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|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | tm-polarity (negative   positive);                                                                                      |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> serial-options]                                                                  |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                          |
| <b>Description</b>              | Configure TM signal polarity.                                                                                           |
| <b>Options</b>                  | negative—Negative signal polarity.<br><br>positive—Positive signal polarity.<br><b>Default:</b> positive                |
| <b>Usage Guidelines</b>         | See “Configuring Serial Signal Polarities” on page 250.                                                                 |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |

## traceoptions

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See the following sections:

- `traceoptions` (Individual Interfaces) on page 1079
- `traceoptions` (Interface Process) on page 1080
- `traceoptions` (LACP) on page 1082
- `traceoptions` (PPP process) on page 1084



**NOTE:** For information about the `traceoptions` statement at the `[edit protocols vrrp]` hierarchy level, see the *JUNOS High Availability Configuration Guide*.

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***traceoptions (Individual Interfaces)***

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <pre> traceoptions {     flag <i>flag</i> &lt;disable&gt;; } </pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Description</b>              | <p>Define tracing operations for individual interfaces.</p> <p>To specify more than one tracing operation, include multiple <b>flag</b> statements.</p> <p>The interfaces <b>traceoptions</b> statement does not support a trace file. The logging is done by the kernel, so the tracing information is placed in the system <b>syslog</b> file in the directory <b>/var/log</b>.</p>                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Default</b>                  | If you do not include this statement, no interface-specific tracing operations are performed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Options</b>                  | <p><b>disable</b>—(Optional) Disable the tracing operation. You can use this option to disable a single operation when you have defined a broad group of tracing operations, such as <b>all</b>.</p> <p><b>flag</b>—Tracing operation to perform. To specify more than one tracing operation, include multiple <b>flag</b> statements. The following are the interface-specific tracing options.</p> <ul style="list-style-type: none"> <li>■ <b>all</b>—All interface tracing operations</li> <li>■ <b>event</b>—Interface events</li> <li>■ <b>ipc</b>—Interface interprocess communication (IPC) messages</li> <li>■ <b>media</b>—Interface media changes</li> <li>■ <b>q921</b>—Trace ISDN Q.921 frames</li> <li>■ <b>q931</b>—Trace ISDN Q.931 frames</li> </ul> |
| <b>Usage Guidelines</b>         | See “Tracing Operations of the Interface Process” on page 222.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

**traceoptions (Interface Process)**

**Syntax** traceoptions {  
     file *filename* <files *number*> <size *size*> <world-readable | no-world-readable>  
     <match *regex*>;  
     flag *flag* <disable>;  
 }

**Hierarchy Level** [edit interfaces]

**Release Information** Statement introduced before JUNOS Release 7.4.

**Description** Define tracing operations for the interface process (dcd).

**Default** If you do not include this statement, no interface-specific tracing operations are performed.

**Options** disable—(Optional) Disable the tracing operation. You can use this option to disable a single operation when you have defined a broad group of tracing operations, such as *all*.

*filename*—Name of the file to receive the output of the tracing operation. Enclose the name within quotation marks. All files are placed in the directory */var/log*. By default, interface process tracing output is placed in the file *dcd*.

files *number*—(Optional) Maximum number of trace files. When a trace file named *trace-file* reaches its maximum size, it is renamed *trace-file.0*, then *trace-file.1*, and so on, until the maximum number of trace files is reached. Then the oldest trace file is overwritten.

If you specify a maximum number of files, you also must specify a maximum file size with the *size* option.

**Range:** 2 through 1000

**Default:** 3 files

*flag*—Tracing operation to perform. To specify more than one tracing operation, include multiple *flag* statements. You can include the following flags:

- *change-events*—Log changes that produce configuration events
- *config-states*—Log the configuration state machine changes
- *kernel*—Log configuration IPC messages to kernel
- *kernel-detail*—Log details of configuration messages to kernel

no-world-readable—(Optional) Disallow any user to read the log file.

size *size*—(Optional) Maximum size of each trace file, in kilobytes (KB), megabytes (MB), or gigabytes (GB). When a trace file named *trace-file* reaches this size, it is renamed *trace-file.0*. When the *trace-file* again reaches its maximum size, *trace-file.0* is renamed *trace-file.1* and *trace-file* is renamed *trace-file.0*. This renaming scheme continues until the maximum number of trace files is reached. Then, the oldest trace file is overwritten.

If you specify a maximum file size, you also must specify a maximum number of trace files with the **files** option.

**Syntax:** **xk** to specify kilobytes, **xm** to specify megabytes, or **xg** to specify gigabytes

**Range:** 10 KB through the maximum file size supported on your routing platform

**Default:** 1 MB

**world-readable**—(Optional) Allow any user to read the log file.

**match *regex***—(Optional) Refine the output to include only those lines that match the given regular expression.

**Usage Guidelines** See “Tracing Operations of the Interface Process” on page 222.

**Required Privilege Level** **interface**—To view this statement in the configuration.  
**interface-control**—To add this statement to the configuration.

**traceoptions (LACP)**

**Syntax** traceoptions {  
     file *filename* <files *number*> <size *size*> <(world-readable | no-world-readable)>;  
     flag *flag* <disable>;  
 }

**Hierarchy Level** [edit protocols lacp]

**Release Information** Statement introduced in JUNOS Release 7.6.

**Description** Define tracing operations for the LACP protocol.

**Default** If you do not include this statement, no LACP protocol tracing operations are performed.

**Options** disable—(Optional) Disable the tracing operation. You can use this option to disable a single operation when you have defined a broad group of tracing operations, such as *all*.

*filename*—Name of the file to receive the output of the tracing operation. Enclose the name within quotation marks. All files are placed in the directory */var/log*. By default, interface process tracing output is placed in the file *lacpd*.

*files number*—(Optional) Maximum number of trace files. When a trace file named *trace-file* reaches its maximum size, it is renamed *trace-file.0*, then *trace-file.1*, and so on, until the maximum number of trace files is reached. Then the oldest trace file is overwritten.

If you specify a maximum number of files, you also must specify a maximum file size with the *size* option.

**Range:** 2 through 1000

**Default:** 3 files

*flag*—Tracing operation to perform. To specify more than one tracing operation, include multiple *flag* statements. You can include the following flags:

- *all*—All LACP tracing operations
- *configuration*—Configuration code
- *packet*—Packets sent and received
- *process*—LACP process events
- *protocol*—LACP protocol state machine
- *routing-socket*—Routing socket events
- *startup*—Process startup events

*no-world-readable*—(Optional) Prevent any user from reading the log file.

**size size**—(Optional) Maximum size of each trace file, in kilobytes (KB), megabytes (MB), or gigabytes (GB). When a trace file named *trace-file* reaches this size, it is renamed *trace-file.0*. When the *trace-file* again reaches its maximum size, *trace-file.0* is renamed *trace-file.1* and *trace-file* is renamed *trace-file.0*. This renaming scheme continues until the maximum number of trace files is reached. Then the oldest trace file is overwritten.

If you specify a maximum file size, you also must specify a maximum number of trace files with the **files** option:

Syntax: **xk** to specify kilobytes, **xm** to specify megabytes, or **xg** to specify gigabytes

**Range:** 10 KB through the maximum file size supported on your routing platform

**Default:** 1 MB

**world-readable**—(Optional) Allow any user to read the log file.

**Usage Guidelines** See “Tracing LACP Operations” on page 542.

**Required Privilege Level** interface—To view this statement in the configuration.  
interface-control—To add this statement to the configuration.

**traceoptions (PPP process)**

**Syntax** traceoptions {  
     flag *flag* <disable>;  
     file *filename* <files *number*> <size *size*>  
     <world-readable | no-world-readable> <match *regex*>;  
     flag *flag* <disable>;  
 }

**Hierarchy Level** [edit protocols ppp]

**Release Information** Statement introduced in JUNOS Release 7.5.

**Description** Define tracing operations for the PPP process.

To specify more than one tracing operation, include multiple **flag** statements.

You cannot specify a separate trace tile. Tracing information is placed in the system syslog file in the directory `/var/log/pppd`.

**Default** If you do not include this statement, no PPPD-specific tracing operations are performed.

**Options** *filename*—Name of the file to receive the output of the tracing operation. Enclose the name within quotation marks. All files are placed in the directory `/var/log`. By default, commit script process tracing output is placed in the file `ppd`. If you include the **file** statement, you must specify a filename. To retain the default, you can specify `eventd` as the filename.

*files number*—(Optional) Maximum number of trace files. When a trace file named *trace-file* reaches its maximum size, it is renamed *trace-file.0*, then *trace-file.1*, and so on, until the maximum number of trace files is reached. Then the oldest trace file is overwritten.

If you specify a maximum number of files, you also must specify a maximum file size with the **size** option and a filename.

**Range:** 2 through 1000

**Default:** 3 files

*disable*—(Optional) Disable the tracing operation. You can use this option to disable a single operation when you have defined a broad group of tracing operations, such as **all**.

*flag*—Tracing operation to perform. To specify more than one tracing operation, include multiple **flag** statements. The following are the PPPD-specific tracing options.

- **access**—Access code
- **address-pool**—Address pool code
- **all**—All areas of code
- **auth**—Authentication code

- **chap**—Challenge Handshake Authentication Protocol (CHAP) code
- **config**—Configuration code
- **ifdb**—Interface database code
- **lcp**—LCP state machine code
- **memory**—Memory management code
- **message**—Message processing code
- **mlppp**—Trace MLPPP code
- **ncp**—NCP state machine code
- **pap**—Password Authentication Protocol (PAP) code
- **ppp**—PPP protocol processing code
- **radius**—RADIUS processing code
- **rtsock**—Routing socket code
- **session**—Session management code
- **signal**—Signal handling code
- **timer**—Timer code
- **ui**—User interface code

**match *regex***—(Optional) Refine the output to include only those lines that match the given regular expression.

**size *size***—(Optional) Maximum size of each trace file, in kilobytes (KB), megabytes (MB), or gigabytes (GB). When a trace file named *trace-file* reaches this size, it is renamed *trace-file.0*. When the *trace-file* again reaches its maximum size, *trace-file.0* is renamed *trace-file.1* and *trace-file* is renamed *trace-file.0*. This renaming scheme continues until the maximum number of trace files is reached. Then the oldest trace file is overwritten.

If you specify a maximum file size, you also must specify a maximum number of trace files with the **files** option and filename.

**Syntax:** *xk* to specify KB, *xm* to specify MB, or *xg* to specify GB

**Range:** 10 KB through 1 GB

**Default:** 128 KB

**world-readable**—(Optional) Enable unrestricted file access.

**non-world-readable**—(Optional) By default, log files can be accessed only by the user who configures the tracing operation. Specify **non-world-readable** to reset the default.

**Usage Guidelines** See “Tracing Operations of the pppd Process” on page 110.

**Required Privilege Level** interface—To view this statement in the configuration.  
interface-control—To add this statement to the configuration.



## track

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <pre>track {   dls {     destination <i>mac-address</i> priority-cost <i>priority</i>;     peer <i>ip-address</i> priority-cost <i>priority</i>;   }   interface <i>interface-name</i> priority-cost <i>priority</i>; }</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Hierarchy Level</b>          | <p>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family llc2 redundancy-group <i>group-number</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family llc2 redundancy-group <i>group-number</i>]</p>                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 7.5.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Description</b>              | <p>For J-series Services Routers only. On Ethernet interfaces configured for DLSw Ethernet redundancy, enable tracking options for an interface, remote peer, or destination MAC address.</p> <p>The statements are explained separately.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Options</b>                  | <p><b>destination <i>mac-address</i></b>—Local MAC address. Specify the MAC address as six hexadecimal bytes in one of the following formats: <i>nnnn.nnnn.nnnn</i> or <i>nn:nn:nn:nn:nn:nn</i>. For example, 0011.2233.4455 or 00:11:22:33:44:55.</p> <p><b>dls</b>—DLSw protocol.</p> <p><b>interface <i>interface-name</i></b>—Interface name. Include the logical portion of the name, which corresponds to the logical unit number.</p> <p><b>peer <i>ip-address</i></b>—IP address of the remote peer.</p> <p><b>priority-cost <i>priority</i></b>—Cost value that is subtracted from the priority value when remote peer connectivity is lost. Specify a value from 1 through 254.</p> |
| <b>Usage Guidelines</b>         | See “Configuring DLSw Ethernet Redundancy Using LLC2 Properties” on page 168.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Related Topics</b>           | <p>For information about DLSw, see the <i>JUNOS Services Interfaces Configuration Guide</i>.</p> <p>For information about the track statement at the [edit interfaces <i>interface-name</i> unit <i>unit-number</i> family inet address <i>address</i> (vrrp-group   vrrp-inet6-group) <i>group-number</i>] or [edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>unit-number</i> family (inet   inet6) address <i>address</i> (vrrp-group   vrrp-inet6-group) <i>group-number</i>] hierarchy level, see the <i>JUNOS High Availability Configuration Guide</i>.</p>                                                                                   |

## translate-discard-eligible

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|                                 |                                                                                                                                                                                                                      |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | (translate-discard-eligible   no-translate-discard-eligible);                                                                                                                                                        |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family ccc],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family ccc] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                       |
| <b>Description</b>              | For interfaces with encapsulation type Frame Relay CCC, enable or disable translation of Frame Relay discard eligible (DE) control bits.                                                                             |
| <b>Default</b>                  | DE bit translation is disabled.                                                                                                                                                                                      |
| <b>Usage Guidelines</b>         | See “Configuring Frame Relay Control Bit Translation” on page 351.                                                                                                                                                   |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                              |

## translate-fecn-and-becn

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|                                 |                                                                                                                                                                                                                                                  |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | (translate-fecn-and-becn   no-translate-fecn-and-becn);                                                                                                                                                                                          |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family ccc],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family ccc]                             |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                   |
| <b>Description</b>              | For interfaces with encapsulation type Frame Relay CCC, enable or disable translation of Frame Relay forward explicit congestion notification (FECN) control bits and Frame Relay backward explicit congestion notification (BECN) control bits. |
| <b>Default</b>                  | FECN and BECN bit translation is disabled.                                                                                                                                                                                                       |
| <b>Usage Guidelines</b>         | See “Configuring Frame Relay Control Bit Translation” on page 351.                                                                                                                                                                               |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                          |

## transmit-bucket

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|                                 |                                                                                                                                                                                                                                                                                                                  |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | transmit-bucket {<br>overflow discard;<br>rate <i>percentage</i> ;<br>threshold <i>bytes</i> ;<br>}                                                                                                                                                                                                              |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> ]                                                                                                                                                                                                                                                                         |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                   |
| <b>Description</b>              | <p>Set parameters for the transmit leaky bucket, which specifies what percentage of the interface's total capacity can be used to transmit packets.</p> <p>For each DS3 channel in a channelized OC12 interface, you can configure a unique transmit bucket.</p> <p>The statements are explained separately.</p> |
| <b>Usage Guidelines</b>         | See “Configuring Receive and Transmit Leaky Bucket Properties” on page 120 and “Configuring Receive and Transmit Leaky Bucket Properties” on page 711.                                                                                                                                                           |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                          |
| <b>Related Topics</b>           | receive-bucket                                                                                                                                                                                                                                                                                                   |

## transmit-clock

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|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | transmit-clock invert;                                                                                                  |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> serial-options]                                                                  |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                          |
| <b>Description</b>              | Configure the transmit clock signal.                                                                                    |
| <b>Options</b>                  | invert—Shift the clock phase 180 degrees.                                                                               |
| <b>Usage Guidelines</b>         | See “Configuring the Serial Clocking Mode” on page 244.                                                                 |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |

## transmit-period

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|                                 |                                                                                                                                                                                          |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | transmit-period <i>seconds</i> ;                                                                                                                                                         |
| <b>Hierarchy Level</b>          | [edit protocols dot1x authenticator interface <i>interface-id</i> ]                                                                                                                      |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 9.3.                                                                                                                                               |
| <b>Description</b>              | Set the number of seconds the port waits before retransmitting the initial EAPOL PDUs to the client.                                                                                     |
| <b>Options</b>                  | <i>seconds</i> —The number of seconds the port waits before retransmitting the initial EAPOL PDUs to the client.<br><b>Range:</b> 1 through 65,535 seconds<br><b>Default:</b> 30 seconds |
| <b>Usage Guidelines</b>         | See “Configuring IEEE 802.1x Port-Based Network Access Control” on page 591.                                                                                                             |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                  |
| <b>Related Topics</b>           | dot1x, authenticator, interface (IEEE 802.1x (dot1x)—Port-Based Network Access Control)                                                                                                  |

## transmit-weight

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See the following sections:

- transmit-weight (ATM2 IQ CoS Forwarding Class) on page 1091
- transmit-weight (ATM2 IQ Virtual Circuit) on page 1092

### ***transmit-weight (ATM2 IQ CoS Forwarding Class)***

|                                 |                                                                                                                                                                                                                                                                            |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | transmit-weight (cells <i>number</i>   percent <i>number</i> );                                                                                                                                                                                                            |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> atm-options scheduler-maps <i>map-name</i> forwarding-class <i>class-name</i> ]                                                                                                                                                     |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                             |
| <b>Description</b>              | For ATM2 IQ interfaces only, assign a transmission weight to a forwarding class.                                                                                                                                                                                           |
| <b>Default</b>                  | 95 percent for queue 0, 5 percent for queue 3.                                                                                                                                                                                                                             |
| <b>Options</b>                  | percent <i>percent</i> —Transmission weight of the forwarding class as a percentage of the total bandwidth.<br><b>Range:</b> 5 through 100<br><br>cells <i>number</i> —Transmission weight of the forwarding class as a number of cells.<br><b>Range:</b> 0 through 32,000 |
| <b>Usage Guidelines</b>         | See “Configuring ATM2 IQ VC Tunnel CoS Components” on page 315.                                                                                                                                                                                                            |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                    |

**transmit-weight (ATM2 IQ Virtual Circuit)**

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>transmit-weight <i>number</i>;</code>                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ]                                                                                                                                                                                                              |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b>              | For ATM2 IQ PICs only, configure the transmission weight.<br><br>Each VC is serviced in weighted round robin (WRR) mode. When VCs have data to send, they send the number of cells equal to their weight before passing control to the next active VC. This allows proportional bandwidth sharing between multiple VCs within a rate-shaped VP tunnel. VP tunnels are not supported on multipoint interfaces. |
| <b>Options</b>                  | <i>number</i> —Number of cells a VC sends before passing control to the next active VC within a VP tunnel.<br><b>Range:</b> 1 through 32,767                                                                                                                                                                                                                                                                  |
| <b>Usage Guidelines</b>         | See “Configuring the ATM2 IQ Transmission Weight” on page 304.                                                                                                                                                                                                                                                                                                                                                |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                       |

**traps**

---

|                                 |                                                                                                                                                                                                                                               |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>(traps   no-traps);</code>                                                                                                                                                                                                              |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> ],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                |
| <b>Description</b>              | Enable or disable the sending of Simple Network Management Protocol (SNMP) notifications when the state of the connection changes.                                                                                                            |
| <b>Usage Guidelines</b>         | See “Enabling or Disabling SNMP Notifications on Physical Interfaces” on page 129 and “Enabling or Disabling SNMP Notifications on Logical Interfaces” on page 149.                                                                           |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                       |

## trej-time

---

|                                 |                                                                                                                                                                                                                        |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | trej-time <i>time</i> ;                                                                                                                                                                                                |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family llc2],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family llc2] |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 7.4.                                                                                                                                                                             |
| <b>Description</b>              | For J-series Services Routers only. On Ethernet interfaces configured for DLSw, configure the length of time a router waits for a rejected frame to be re-sent before the router sends the reject command.             |
| <b>Options</b>                  | <i>time</i> —Number of milliseconds.<br><b>Range:</b> 1 through 60000<br><b>Default:</b> 3000 milliseconds                                                                                                             |
| <b>Usage Guidelines</b>         | See “Configuring LLC2 Options” on page 167.                                                                                                                                                                            |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                |
| <b>Related Topics</b>           | <i>J-series Services Router Advanced WAN Access Configuration Guide</i>                                                                                                                                                |

**trigger**

---

**Syntax**    `trigger {  
              defect ignore;  
              defect hold-time up milliseconds down milliseconds;  
              }`

**Hierarchy Level**    [edit interfaces *interface-name* sonet-options]

**Release Information**    Statement introduced before JUNOS Release 7.4.

**Description**    For ATM over SONET/SDH, SONET/SDH interfaces, and 10-Gigabit Ethernet interfaces in WAN PHY mode, configure SONET/SDH defect triggers to be ignored.

**Default**    If you do not include this statement, all SONET/SDH defect triggers are honored.

**Options**    *defect*—Defect to ignore or hold. It can be one of the following:

- *ais-l*—Line alarm indication signal
- *ais-p*—Path alarm indication signal
- *ber-sd*—Bit error rate signal degrade
- *ber-sf*—Bit error rate signal fault
- *locd* (ATM only)—Loss of cell delineation
- *lof*—Loss of frame
- *lol*—PHY loss of light
- *lop-p*—Path loss of pointer
- *los*—Loss of signal
- *pll*—PHY phase-locked loop out of lock
- *plm-p*—Path payload label mismatch
- *rfl-l*—Line remote failure indication
- *rfl-p*—Path remote failure indication
- *uneq-p*—Path unequipped

The remaining statements are explained separately.

**Usage Guidelines**    See “Configuring SONET/SDH Defect Triggers to Be Ignored” on page 691.

**Required Privilege Level**    *interface*—To view this statement in the configuration.  
                                  *interface-control*—To add this statement to the configuration.



## trigger-link-failure

---

|                                 |                                                                                                                                       |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | [trigger-link-failure <i>interface-name</i> ];                                                                                        |
| <b>Hierarchy Level</b>          | [edit interfaces <i>lsq-fpc/pic/port</i> lsq-failure-options]                                                                         |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 7.4.                                                                                            |
| <b>Description</b>              | List of SONET interfaces connected to the LSQ interface that can implement Automatic Protection Switching (APS) if the LSQ PIC fails. |
| <b>Options</b>                  | <i>interface-name</i> —Name of SONET interface.                                                                                       |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                        |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.               |

## trunk-bandwidth

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | trunk-bandwidth <i>rate</i> ;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ]                                                                                                                                                                                                                                                                                                                                                 |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Description</b>              | For ATM2 IQ interfaces configured to use Layer 2 circuit trunk mode, configure a scheduler so that unused bandwidth from any inactive trunk is proportionally shared among the active trunks.<br><br>During congestion, each trunk receives a proportional share of the leftover bandwidth, thus minimizing the latency on each trunk.                                                                                                                                                                                                           |
| <b>Options</b>                  | <i>rate</i> —Peak rate, in bits per second (bps) or cells per second (cps). You can specify a value in bits per second either as a complete decimal number or as a decimal number followed by the abbreviation k (1000), m (1,000,000), or g (1,000,000,000). You can also specify a value in cells per second by entering a decimal number followed by the abbreviation c; values expressed in cells per second are converted to bits per second by means of the formula<br>1 cps = 384 bps.<br><b>Range:</b> 1,000,000 through 542,526,792 bps |
| <b>Usage Guidelines</b>         | See “Configuring Layer 2 Circuit Trunk Mode Scheduling” on page 285.                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                          |

**trunk-id**

---

|                                 |                                                                                                                                                                                                                                                                              |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>trunk-id <i>number</i>;</code>                                                                                                                                                                                                                                         |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ]                                                                             |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                               |
| <b>Description</b>              | For ATM2 IQ interfaces with ATM CCC cell-relay encapsulation, configure the trunk identification number.<br><br>When you associate a trunk ID number with a logical interface, you are in effect specifying the interfaces that are allowed to send ATM traffic over an LSP. |
| <b>Options</b>                  | <i>number</i> —A valid trunk identifier.<br><b>Range:</b> For UNI mode, 0 through 7. For NNI mode, 0 through 31.                                                                                                                                                             |
| <b>Usage Guidelines</b>         | See “Configuring Layer 2 Circuit Transport Mode” on page 276.                                                                                                                                                                                                                |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                      |

**ttl**

---

|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>ttl <i>value</i>;</code>                                                                                          |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>number</i> tunnel]                                                       |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4                                                                           |
| <b>Description</b>              | Set the time-to-live value bit in the header of the outer IP packet.                                                    |
| <b>Options</b>                  | <i>value</i> —Time-to-live value.<br><b>Range:</b> 0 through 255<br><b>Default:</b> 64                                  |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                          |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |

## tunnel

---

**Syntax** tunnel {  
     backup-destination *address*;  
     destination *address*;  
     key *number*;  
     routing-instance {  
         destination *routing-instance-name*;  
     }  
     source *source-address*;  
     ttl *number*;  
 }

**Hierarchy Level** [edit interfaces *interface-name* unit *logical-unit-number*],  
 [edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

**Release Information** Statement introduced before JUNOS Release 7.4.

**Description** Configure a tunnel. You can use the tunnel for unicast and multicast traffic or just for multicast traffic. You can also use tunnels for encrypted traffic or VPNs.

The statements are explained separately.

**Usage Guidelines** See the *JUNOS Services Interfaces Configuration Guide* and *JUNOS VPNs Configuration Guide*.

**Required Privilege Level** interface—To view this statement in the configuration.  
 interface-control—To add this statement to the configuration.

## underlying-interface

---

**Syntax** `underlying-interface interface-name;`

**Hierarchy Level** [edit interfaces pp0 unit *logical-unit-number* pppoe-options],  
[edit interfaces demux0 unit *logical-unit-number* demux-options],  
[edit logical-systems *logical-system-name* interfaces pp0 unit *logical-unit-number*  
pppoe-options],  
[edit logical-systems demux0 interfaces *interface-name* unit  
*logical-unit-number*demux-options]

**Release Information** Statement introduced before JUNOS Release 7.4.

**Description** For J-series Services Routers and M120 Internet routers with PPP over Ethernet interfaces, configure the interface on which PPP over Ethernet is running.

For demux interfaces, configure the underlying interface on which the demultiplexing (demux) interface is running.

**Options** *interface-name*—Name of the interface on which PPP over Ethernet or demux is running. For example, **at-0/0/1.0** (ATM VC), **fe-1/0/1.0** (Fast Ethernet interface), or **ge-2/0/0.0** (Gigabit Ethernet interface).



**NOTE:** Logical demux interfaces are currently supported only on Gigabit Ethernet, Fast Ethernet, or 10-Gigabit Ethernet interfaces.

---

**Usage Guidelines** See “Configuring an IP Demux Underlying Interface” on page 231 and “Configuring the PPPoE Underlying Interface” on page 643.

**Required Privilege Level** interface—To view this statement in the configuration.  
interface-control—To add this statement to the configuration.

**Related Topics** *J-series Services Router Basic LAN and WAN Access Configuration Guide*

## unframed

---

|                                 |                                                                                                                                                                               |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | (unframed   no-unframed);                                                                                                                                                     |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> e3-options]                                                                                                                            |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                |
| <b>Description</b>              | For E3 IQ interfaces only, enable or disable unframed mode. In unframed mode, the E3 IQ interface do not detect yellow ( <b>ylw</b> ) or loss-of-frame ( <b>lof</b> ) alarms. |
| <b>Default</b>                  | Unframed mode is disabled.                                                                                                                                                    |
| <b>Usage Guidelines</b>         | See “Configuring E3 IQ and IQE Unframed Mode” on page 484.                                                                                                                    |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                       |

## unidirectional

---

|                                 |                                                                                                                                                                                                                                      |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | unidirectional;                                                                                                                                                                                                                      |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> ]                                                                                                     |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.5.                                                                                                                                                                                           |
| <b>Description</b>              | For 10-Gigabit Ethernet interfaces on the 4-port 10-Gigabit Ethernet DPC on the MX960 router only, create two new, unidirectional (transmit-only and receive-only) physical interfaces subordinate to the original parent interface. |
| <b>Default</b>                  | Disabled.                                                                                                                                                                                                                            |
| <b>Usage Guidelines</b>         | See “Enabling Unidirectional Traffic Flow on Physical Interfaces” on page 129.                                                                                                                                                       |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                              |

## unit

---

**Syntax**    unit *logical-unit-number* {  
               accept-source-mac {  
                   mac-address *mac-address* {  
                       policer {  
                           input *cos-policer-name*;  
                           output *cos-policer-name*;  
                       }  
                   }  
               }  
               accounting-profile *name*;  
               allow-any-vci;  
               atm-scheduler-map (*map-name* | default);  
               backup-options {  
                   interface *interface-name*;  
               }  
               bandwidth *rate*;  
               cell-bundle-size *cells*;  
               clear-dont-fragment-bit;  
               compression {  
                   rtp {  
                       maximum-contexts *number* <force>;  
                       f-max-period *number*;  
                       queues [ *queue-numbers* ];  
                       port {  
                           minimum *port-number*;  
                           maximum *port-number*;  
                       }  
                   }  
               }  
               compression-device *interface-name*;  
               copy-tos-to-outer-ip-header;  
               demux-destination *family*;  
               demux-source *family*;  
               demux-options {  
                   underlying-interface *interface-name*;  
               }  
               description *text*;  
               dial-options {  
                   l2tp-interface-id *name*;  
                   (dedicated | shared);  
               }  
               dialer-options {  
                   activation-delay *seconds*;  
                   callback;  
                   callback-wait-period *time*;  
                   deactivation-delay *seconds*;  
                   dial-string [ *dial-string-numbers* ];  
                   idle-timeout *seconds*;  
                   incoming-map {  
                       caller *caller-id* | accept-all;  
                       initial-route-check *seconds*;  
                   }  
               }

```

 load-interval seconds;
 load-threshold percent;
 pool pool-name;
 redial-delay time;
 watch-list {
 [routes];
 }
}
disable;
disable-mlppp-inner-ppp-pfc;
dlci dlci-identifier;
drop-timeout milliseconds;
dynamic-call-admission-control {
 activation-priority priority;
 bearer-bandwidth-limit kilobits-per-second;
}
encapsulation type;
epd-threshold cells plp1 cells;
fragment-threshold bytes;
inner-vlan-id-range start start-id end end-id;
input-vlan-map {
 (pop | pop-pop | pop-swap | push | push-push | swap |
 swap-push | swap-swap);
 inner-tag-protocol-id tpid;
 inner-vlan-id number;
 tag-protocol-id tpid;
 vlan-id number;
}
interleave-fragments;
inverse-arp;
layer2-policer {
 input-policer policer-name;
 input-three-color policer-name;
 output-policer policer-name;
 output-three-color policer-name;
}
link-layer-overhead percent;
minimum-links number;
mrru bytes;
multicast-dlci dlci-identifier;
multicast-vci vpi-identifier.vci-identifier;
multilink-max-classes number;
multipoint;
oam-liveness {
 up-count cells;
 down-count cells;
}
oam-period (disable | seconds);
output-vlan-map {
 (pop | pop-pop | pop-swap | push | push-push | swap |
 swap-push | swap-swap);
 inner-tag-protocol-id tpid;
 inner-vlan-id number;
 tag-protocol-id tpid;
 vlan-id number;
}

```

```

}
passive-monitor-mode;
peer-unit unit-number;
plp-to-clp;
point-to-point;
ppp-options {
 chap {
 access-profile name;
 default-chap-secret name;
 local-name name;
 passive;
 }
 compression {
 acfc;
 pfc;
 }
 lcp-restart-timer milliseconds;
 loopback-clear-timer seconds;
 ncp-restart-timer milliseconds;
 pap {
 access-profile name;
 default-pap-password password;
 local-name name;
 local-password password;
 passive;
 }
}
pppoe-options {
 access-concentrator name;
 auto-reconnect seconds;
 (client | server);
 service-name name;
 underlying-interface interface-name;
}
proxy-arp;
service-domain (inside | outside);
shaping {
 (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained rate
 burst length);
 queue-length number;
}
short-sequence;
transmit-weight number;
(traps | no-traps);
trunk-bandwidth rate;
trunk-id number;
tunnel {
 backup-destination address;
 destination address;
 key number;
 routing-instance {
 destination routing-instance-name;
 }
 source source-address;
 ttl number;
}

```



```

vci vpi-identifier.vci-identifier;
vci-range start start-vci end end-vci;
vpi vpi-identifier;
vlan-id number;
vlan-id-range number-number;
vlan-tags inner tpid.vlan-id outer tpid.vlan-id;
family family {
 accounting {
 destination-class-usage;
 source-class-usage {
 direction;
 }
 }
}
bundle interface-name;
filter {
 group filter-group-number;
 input filter-name;
 input-list {
 [filter-names];
 output filter-name;
 }
 output-list {
 [filter-names];
 }
}
ipsec-sa sa-name;
interface-mode (access | trunk);
keep-address-and-control;
mac-validate (loose | strict);
mtu bytes;
multicast-only;
no-redirects;
policer {
 arp policer-template-name;
 input policer-template-name;
 output policer-template-name;
}
primary;
proxy inet-address address;
receive-options-packets;
receive-ttl-exceeded;
remote (inet-address address | mac-address address);
rpf-check <fail-filter filter-name> {
 <mode loose>;
}
sampling {
 direction;
}
service {
 input {
 service-set service-set-name <service-filter filter-name>;
 post-service-filter filter-name;
 }
 output {
 service-set service-set-name <service-filter filter-name>;
 }
}

```

```

}
(translate-discard-eligible | no-translate-discard-eligible);
(translate-fecn-and-becn | no-translate-fecn-and-becn);
unnumbered-address interface-name destination address destination-profile
 profile-name;
address address {
 arp ip-address (mac | multicast-mac) mac-address <publish>;
 broadcast address;
 destination address;
 eui-64;
 master-only;
 multipoint-destination address (dlci dlci-identifier | vci vci-identifier);
 multipoint-destination address {
 epd-threshold cells plp1 cells;
 inverse-arp;
 oam-liveness {
 up-count cells;
 down-count cells;
 }
 oam-period (disable | seconds);
 shaping {
 (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained
 rate burst length);
 queue-length number;
 }
 vci vpi-identifier.vci-identifier;
 }
 preferred;
 primary;
 (vrrp-group | vrrp-inet6-group) group-number {
 (accept-data | no-accept-data);
 advertise-interval seconds;
 authentication-type authentication;
 authentication-key key;
 fast-interval milliseconds;
 (preempt | no-preempt) {
 hold-time seconds;
 }
 priority-number number;
 track {
 priority-cost seconds;
 priority-hold-time interface-name {
 interface priority;
 bandwidth-threshold bits-per-second {
 priority;
 }
 }
 }
 }
 virtual-address [addresses];
}
}
}

```

|                                 |                                                                                                                                                                                                                                                          |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> ],<br>[edit interfaces interface-set (Ethernet Interfaces) <i>interface-set-name</i> interface<br><i>interface-name</i> ] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                           |
| <b>Description</b>              | Configure a logical interface on the physical device. You must configure a logical interface to be able to use the physical device.                                                                                                                      |
| <b>Options</b>                  | <i>logical-unit-number</i> —Number of the logical unit.<br><b>Range:</b> 0 through 16,384<br><br>The remaining statements are explained separately.                                                                                                      |
| <b>Usage Guidelines</b>         | See “Configuring Logical Interface Properties” on page 133.                                                                                                                                                                                              |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                  |
| <b>Related Topics</b>           | <i>JUNOS Services Interfaces Configuration Guide</i>                                                                                                                                                                                                     |

## unnumbered-address

---

See the following sections:

- unnumbered-address (Demux) on page 1106
- unnumbered-address (Ethernet) on page 1107
- unnumbered-address (PPP) on page 1107

### unnumbered-address (Demux)

|                                 |                                                                                                                                                                                                                                              |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>unnumbered-address interface-name &lt;preferred-source-address address&gt;;</code>                                                                                                                                                     |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet]                       |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.2.<br><code>preferred-source-address</code> option introduced in JUNOS Release 9.0.<br>IP demultiplexing interfaces supported in JUNOS Release 9.2.                                                  |
| <b>Description</b>              | For IP demultiplexing interfaces, enable the local address to be derived from the specified interface. Configuring an unnumbered interface enables IP processing on the interface without assigning an explicit IP address to the interface. |
| <b>Options</b>                  | <i>interface-name</i> —Name of the interface from which the local address is derived. The specified interface must have a logical unit number and a configured IP address, and must not be an unnumbered interface.                          |
|                                 | The <code>preferred-source-address</code> statement is explained separately.                                                                                                                                                                 |
| <b>Usage Guidelines</b>         | See “Configuring an Unnumbered Interface” on page 172.                                                                                                                                                                                       |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                      |
| <b>Related Topics</b>           | address, <i>JUNOS System Basics Configuration Guide</i>                                                                                                                                                                                      |

**unnumbered-address (Ethernet)**

|                                 |                                                                                                                                                                                                                                                                                                         |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>unnumbered-address interface-name &lt;preferred-source-address address&gt;;</code>                                                                                                                                                                                                                |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet]                                                                                  |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.2.<br><code>preferred-source-address</code> option introduced in JUNOS Release 9.0.                                                                                                                                                                             |
| <b>Description</b>              | For Ethernet interfaces, enable the local address to be derived from the specified interface. Configuring an unnumbered Ethernet interface enables IP processing on the interface without assigning an explicit IP address to the interface.                                                            |
| <b>Options</b>                  | <i>interface-name</i> —Name of the interface from which the local address is derived. The specified interface must have a logical unit number and a configured IP address, and must not be an unnumbered interface.<br><br>The <code>preferred-source-address</code> statement is explained separately. |
| <b>Usage Guidelines</b>         | See “Configuring an Unnumbered Interface” on page 172.                                                                                                                                                                                                                                                  |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                 |
| <b>Related Topics</b>           | address, <i>JUNOS System Basics Configuration Guide</i>                                                                                                                                                                                                                                                 |

**unnumbered-address (PPP)**

|                                 |                                                                                                                                                                                                                               |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>unnumbered-address interface-name destination address destination-profile profile-name;</code>                                                                                                                          |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet]        |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                |
| <b>Description</b>              | For interfaces with PPP encapsulation, enable the local address to be derived from the specified interface.                                                                                                                   |
| <b>Options</b>                  | <i>interface-name</i> —Interface from which the local address is derived. The interface name must include a logical unit number and must have a configured address.<br><br>The remaining statements are explained separately. |
| <b>Usage Guidelines</b>         | See “Configuring IPCP Options” on page 164.                                                                                                                                                                                   |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                       |
| <b>Related Topics</b>           | address, negotiate-address, <i>JUNOS System Basics Configuration Guide</i>                                                                                                                                                    |

## up-count

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | up-count <i>cells</i> ;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> atm-options vpi <i>vpi-identifier</i> oam-liveness],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> oam-liveness],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family <i>family</i> address <i>address</i> multipoint-destination <i>address</i> oam-liveness],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> oam-liveness],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family <i>family</i> address <i>address</i> multipoint-destination <i>address</i> oam-liveness] |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Description</b>              | For ATM encapsulation only, configure Operation, Administration, and Maintenance (OAM) F5 loopback cell count thresholds. Not supported on ATM-over-SHDSL interfaces.<br><br>For ATM2 IQ PICs only, configure OAM F4 loopback cell count thresholds at the [edit interfaces <i>interface-name</i> atm-options vpi <i>vpi-identifier</i> ] hierarchy level.                                                                                                                                                                                                                                                                                                                                                               |
| <b>Options</b>                  | <i>cells</i> —Minimum number of consecutive OAM F4 or F5 loopback cells received before a VC is declared up.<br><b>Range:</b> 1 through 255<br><b>Default:</b> 5 cells                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Usage Guidelines</b>         | See “Configuring the ATM OAM F5 Loopback Cell Threshold” on page 305.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

**vbr**

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>              | <code>vbr peak <i>rate</i> sustained <i>rate</i> burst <i>length</i>;</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Hierarchy Level</b>     | <p>[edit interfaces <i>interface-name</i> atm-options vpi <i>vpi-identifier</i> shaping],</p> <p>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> address <i>address</i> family <i>family</i> multipoint-destination <i>address</i> shaping],</p> <p>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> shaping],</p> <p>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> address <i>address</i> family <i>family</i> multipoint-destination <i>address</i> shaping],</p> <p>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> shaping]</p>                                                                                                                                                                                                                                                                                                                                                              |
| <b>Release Information</b> | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Description</b>         | <p>For ATM encapsulation only, define the variable bandwidth utilization in the traffic-shaping profile.</p> <p>When you configure the variable bandwidth utilization, you must specify all three options (<b>burst</b>, <b>peak</b>, and <b>sustained</b>). You can specify <i>rate</i> in bits per second either as a complete decimal number or as a decimal number followed by the abbreviation k (1000), m (1,000,000), or g (1,000,000,000). You can also specify <i>rate</i> in cells per second by entering a decimal number followed by the abbreviation c; values expressed in cells per second are converted to bits per second by means of the formula 1 cps = 384 bps.</p>                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Default</b>             | If the <b>vbr</b> statement is not specified, bandwidth utilization is unlimited.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Options</b>             | <p><b>burst <i>length</i></b>—Burst length, in cells. If you set the length to 1, the peak traffic rate is used.</p> <p><b>Range:</b> 1 through 4000 cells</p> <p><b>peak <i>rate</i></b>—Peak rate, in bits per second or cells per second.</p> <p><b>Range:</b> For ATM1 interfaces, 33 Kbps through 135.6 Mbps (ATM OC3); 33 Kbps through 276 Mbps (ATM OC12). For ATM2 IQ OC3 and OC12 interfaces, 33 Kbps through 542,526,792 bps. For ATM2 IQ OC48 interfaces, 33 Kbps through 2,170,107,168 bps. For ATM2 IQ DS3 and E3 interfaces, from 33 Kbps through the maximum rate, which depends on the ATM encapsulation and framing you configure.</p> <p>For more information, see Table 29 on page 296.</p> <p><b>sustained <i>rate</i></b>—Sustained rate, in bits per second or cells per second.</p> <p><b>Range:</b> For ATM1 interfaces, 33 Kbps through 135.6 Mbps (ATM OC3); 33 Kbps through 276 Mbps (ATM OC12).</p> <p>For ATM2 IQ OC3 and OC12 interfaces, 33 Kbps through 542,526,792 bps.</p> <p>For ATM2 IQ OC48 interfaces, 33 Kbps through 2,170,107,168 bps.</p> |

For ATM2 IQ DS3 and E3 interfaces, from 33 Kbps through the maximum rate, which depends on the ATM encapsulation and framing you configure. For more information, see Table 29 on page 296.

|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Usage Guidelines</b>         | See “Defining the ATM Traffic-Shaping Profile” on page 295.                                                             |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |
| <b>Related Topics</b>           | cbr, rtvbr, shaping                                                                                                     |

## vc-cos-mode

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|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | vc-cos-mode (alternate   strict);                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> atm-options scheduler-maps <i>map-name</i> ]                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b>              | For ATM2 IQ interfaces only, specify packet-scheduling priority value for ATM2 IQ VC tunnels.                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Options</b>                  | <p><b>alternate</b>—VC CoS queue has high priority. The scheduling of the queues alternates between the high-priority queue and the remaining queues, so every other scheduled packet is from the high-priority queue.</p> <p><b>strict</b>—VC CoS queue has strictly high priority. A queue with strict high priority is always scheduled before the remaining queues. The remaining queues are scheduled in round-robin fashion.</p> <p><b>Default:</b> alternate</p> |
| <b>Usage Guidelines</b>         | See “Configuring ATM2 IQ VC Tunnel CoS Components” on page 315.                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                 |



**vci**

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>vci vpi-identifier.vci-identifier;</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Hierarchy Level</b>          | <p>[edit interfaces <i>at-fpc/pic/port</i> unit <i>logical-unit-number</i>],<br/> [edit interfaces <i>at-fpc/pic/port</i> unit <i>logical-unit-number</i> family <i>family</i> address <i>address</i> multipoint-destination <i>address</i>],<br/> [edit logical-systems <i>logical-system-name</i> interfaces <i>at-fpc/pic/port</i> unit <i>logical-unit-number</i>],<br/> [edit logical-systems <i>logical-system-name</i> interfaces <i>at-fpc/pic/port</i> unit <i>logical-unit-number</i> family <i>family</i> address <i>address</i> multipoint-destination <i>address</i>]</p> |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Description</b>              | <p>For ATM point-to-point logical interfaces only, configure the virtual circuit identifier (VCI) and virtual path identifier (VPI).</p> <p>To configure a VPI for a point-to-multipoint interface, specify the VPI in the <b>multipoint-destination</b> statement.</p> <p>VCIs 0 through 31 are reserved for specific ATM values designated by the ATM Forum.</p>                                                                                                                                                                                                                     |
| <b>Options</b>                  | <p><b>vci-identifier</b>—ATM virtual circuit identifier. Unless you configure the interface to use promiscuous mode, this value cannot exceed the largest numbered VC configured for the interface with the <b>maximum-vcs</b> option of the <b>vpi</b> statement.</p> <p><b>Range:</b> 0 through 4089 or 0 through 65,535 with promiscuous mode, with VCIs 0 through 31 reserved.</p> <p><b>vpi-identifier</b>—ATM virtual path identifier.</p> <p><b>Range:</b> 0 through 255</p> <p><b>Default:</b> 0</p>                                                                           |
| <b>Usage Guidelines</b>         | See “Configuring a Point-to-Point ATM1 or ATM2 IQ Connection” on page 292.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Related Topics</b>           | multipoint-destination, promiscuous-mode, vpi                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

**vci-range**

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|                                 |                                                                                                                                                                                                    |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>vci-range start <i>start-vci</i> end <i>end-vci</i>;</code>                                                                                                                                  |
| <b>Hierarchy Level</b>          | [edit interfaces <i>at-fpc/pic/port</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>at-fpc/pic/port</i> unit <i>logical-unit-number</i> ] |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 9.0.                                                                                                                                                         |
| <b>Description</b>              | Range of VCI values used in ATM-to-Ethernet interworking cross-connects. VCI 0 through 31 are reserved. VCI 0 through 31 should not be used.                                                       |
| <b>Options</b>                  | <code>start-vci</code> —Lowest number VCI in the range.<br><br><code>end-vci</code> —Highest number VCI in the range.<br><b>Range:</b> 0 through 255                                               |
| <b>Usage Guidelines</b>         | See “Configuring ATM-to-Ethernet Interworking” on page 210.                                                                                                                                        |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                            |

## vlan-id

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See the following sections:

- [vlan-id \(VLAN ID to Be Bound to a Logical Interface\)](#) on page 1113
- [vlan-id \(Family Bridge\)](#) on page 1114
- [vlan-id \(VLAN ID to Rewrite\)](#) on page 1114
- [vlan-id \(Outer VLAN ID\)](#) on page 1115

### ***vlan-id (VLAN ID to Be Bound to a Logical Interface)***

**Syntax** `vlan-id number;`

**Hierarchy Level** [edit interfaces *interface-name* unit *logical-unit-number*],  
[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

**Release Information** Statement introduced before JUNOS Release 7.4.

**Description** For Fast Ethernet, Gigabit Ethernet, and Aggregated Ethernet interfaces only, bind a 802.1Q VLAN tag ID to a logical interface.

**Options** *number*—A valid VLAN identifier.

**Range:** For aggregated Ethernet, 4-port, 8-port, and 12-port Fast Ethernet PICs, and for management and internal Ethernet interfaces, 1 through 1023.

For 48-port Fast Ethernet and Gigabit Ethernet PICs, 1 through 4094.

VLAN ID 0 is reserved for tagging the priority of frames.

**Usage Guidelines** See “Configuring Mixed Tagging” on page 526.

**Required Privilege Level** interface—To view this statement in the configuration.  
interface-control—To add this statement to the configuration.

**vlan-id (Family Bridge)**

|                                 |                                                                                                                                                                                                                            |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | vlan-id <i>number</i> ;                                                                                                                                                                                                    |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family bridge],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family bridge] |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 9.2.                                                                                                                                                                                 |
| <b>Description</b>              | The VLAN ID configured on the logical port. Received packets with no VLAN tags are forwarded within the bridge domain with the matching VLAN ID.                                                                           |
| <b>Options</b>                  | number—The VLAN ID.<br><b>Range:</b> 1 through 4095                                                                                                                                                                        |
| <b>Usage Guidelines</b>         | See “Configuring a Logical Interface for Access Mode” on page 529.                                                                                                                                                         |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                    |

**vlan-id (VLAN ID to Rewrite)**

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | vlan-id <i>number</i> ;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> input-vlan-map],<br>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> output-vlan-map],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> input-vlan-map],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> output-vlan-map]                                                                                                                                                                                                                                                                                                          |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Description</b>              | For Gigabit Ethernet IQ and 10-Gigabit Ethernet IQ2 interfaces and aggregated Ethernet using Gigabit Ethernet IQ interfaces, specify the line VLAN identifiers to be rewritten at the input or output interface.<br><br>You cannot include the <b>vlan-id</b> statement with the <b>swap</b> statement, <b>swap-push</b> statement, <b>push-push</b> statement, or <b>push-swap</b> statement at the [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> output-vlan-map] hierarchy level. If you include any of those statements in the output VLAN map, the VLAN ID in the outgoing frame is rewritten to the <b>vlan-id</b> statement you include at the [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ] hierarchy level. |
| <b>Usage Guidelines</b>         | See “Rewriting the VLAN Tag” on page 557 and “Binding a VLAN ID to a Logical Interface” on page 530.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

**vlan-id (Outer VLAN ID)**

|                                 |                                                                                                                                                                                                                                                                                  |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | vlan-id <i>outer-vlan-id</i> ;                                                                                                                                                                                                                                                   |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ]                                                                                 |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 9.0.                                                                                                                                                                                                                                       |
| <b>Description</b>              | The outer VLAN ID to be used in ATM-to-Ethernet interworking cross-connects. Outer VLAN IDs are converted to the ATM VPI. The outer VLAN ID must match the VPI value configured. The allowable VPI range is 0 to 255. Do not configure the outer VLAN ID to be greater than 255. |
| <b>Options</b>                  | outer-vlan-id—Outer VLAN ID number.<br><b>Range:</b> 0 through 4094                                                                                                                                                                                                              |
| <b>Usage Guidelines</b>         | See “Configuring ATM-to-Ethernet Interworking” on page 210.                                                                                                                                                                                                                      |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                          |

**vlan-id-list**


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|                                 |                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | vlan-id-list [ <i>number number-number</i> ];                                                                                                                                                                                                                                                                                                                               |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family bridge],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family bridge]                                                                                                                                                  |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 9.2.                                                                                                                                                                                                                                                                                                                                  |
| <b>Description</b>              | Configure a logical interface to forward packets and learn MAC addresses within each bridge domain configured with a VLAN ID that matches a VLAN ID specified in the list. VLAN IDs can be entered individually using a space to separate each ID, entered as an inclusive list separating the starting VLAN ID and ending VLAN ID with a hyphen, or a combination of both. |
| <b>Options</b>                  | number number—Individual VLAN IDs separated by a space.<br><br>number-number—Starting VLAN ID and ending VLAN ID in an inclusive range.<br><b>Range:</b> 1 through 4095                                                                                                                                                                                                     |
| <b>Usage Guidelines</b>         | See “Configuring a Logical Interface for Trunk Mode” on page 528 and “Configuring the VLAN ID List for a Trunk Interface” on page 529.                                                                                                                                                                                                                                      |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                     |

## vlan-id-range

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|                                 |                                                                                                                                                                                                                                      |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>vlan-id-range number-number;</code>                                                                                                                                                                                            |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ]                                     |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.4.                                                                                                                                                                                           |
| <b>Description</b>              | Bind a range of VLAN IDs to a logical interface.                                                                                                                                                                                     |
| <b>Options</b>                  | <p><b>number</b>—The first number is the lowest VLAN ID in the range the second number is the highest VLAN ID in the range.</p> <p><b>Range:</b> 1 through 4095</p> <p>VLAN ID 0 is reserved for tagging the priority of frames.</p> |
| <b>Usage Guidelines</b>         | See “Binding a VLAN ID Range to a Logical Interface” on page 531.                                                                                                                                                                    |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                                                                   |

## vlan-tagging

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|                                 |                                                                                                                                                                                                 |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>vlan-tagging;</code>                                                                                                                                                                      |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> ]                                                                                                                                                        |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                  |
| <b>Description</b>              | For Fast Ethernet and Gigabit Ethernet interfaces and aggregated Ethernet interfaces configured for VPLS, enables the reception and transmission of 802.1Q VLAN-tagged frames on the interface. |
| <b>Usage Guidelines</b>         | See “Configuring 802.1Q VLANs” on page 525.                                                                                                                                                     |
| <b>Required Privilege Level</b> | <p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>                                                              |

## vlan-tags

---

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>vlan-tags inner <i>tpid.vlan-id</i> outer <i>tpid.vlan-id</i>;</code>                                                                                                                                                                                                                                                                                                                                                      |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> ]                                                                                                                                                                                                                                 |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Description</b>              | For Gigabit Ethernet IQ interfaces only, binds TPIDs and 802.1Q VLAN tag IDs to a logical interface. You must include the <code>stacked-vlan-tagging</code> statement at the [edit interfaces <i>interface-name</i> ] hierarchy level.                                                                                                                                                                                           |
| <b>Options</b>                  | <p>inner <i>tpid.vlan-id</i>—A TPID and a valid VLAN identifier.<br/> <b>Range:</b> For VLAN ID, 1 through 4094. VLAN ID 0 is reserved for tagging the priority of frames.</p> <p>outer <i>tpid.vlan-id</i>—A TPID and a valid VLAN identifier.<br/> <b>Range:</b> For VLAN ID, 1 through 511 for normal interfaces, and 512 through 4094 for VLAN CCC interfaces. VLAN ID 0 is reserved for tagging the priority of frames.</p> |
| <b>Usage Guidelines</b>         | See “Configuring Dual VLAN Tags” on page 551.                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                          |
| <b>Related Topics</b>           | stacked-vlan-tagging                                                                                                                                                                                                                                                                                                                                                                                                             |

## vlan-tags-outer

---

|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>vlan-tags-outer <i>vlan-tag</i>;</code>                                                                           |
| <b>Hierarchy Level</b>          | [edit interfaces interface-set (Ethernet Interfaces) <i>interface-set-name</i> interface <i>interface-name</i> ]        |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 8.5.                                                                              |
| <b>Description</b>              | The S-VLAN outer tag that belongs to a set of interfaces used to configure hierarchical CoS schedulers.                 |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Class of Service Configuration Guide</i> .                                                             |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |

## vlan-vci-tagging

---

|                                 |                                                                                                                                              |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | vlan-vci-tagging;                                                                                                                            |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> ],<br>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> ]             |
| <b>Release Information</b>      | Statement introduced in JUNOS Release 9.0.                                                                                                   |
| <b>Description</b>              | Enable the ATM-to-Ethernet interworking cross-connect function on a Gigabit Ethernet, 10-Gigabit Ethernet, or aggregated Ethernet interface. |
| <b>Usage Guidelines</b>         | See “Configuring ATM-to-Ethernet Interworking” on page 210.                                                                                  |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                      |



**vpi**

---

See the following sections:

- vpi (ATM CCC Cell-Relay Promiscuous Mode) on page 1119
- vpi (Define Virtual Path) on page 1120
- vpi (Logical Interface and Interworking) on page 1120

**vpi (ATM CCC Cell-Relay Promiscuous Mode)**

**Syntax** vpi *vpi-identifier*;

**Hierarchy Level** [edit interfaces *at-fpc/pic/port* atm-options promiscuous-mode]

**Release Information** Statement introduced before JUNOS Release 7.4.

**Description** For ATM interfaces, allow all VCIs in this VPI to open in ATM CCC cell-relay mode.

When you include vpi statements at the [edit interfaces *interface-name* atm-options promiscuous-mode] hierarchy level, the specified VPIs open in promiscuous mode.

**Options** *vpi-identifier*—ATM virtual path identifier. This is one of the VPIs that you define in the vci statement. (For a list of hierarchy levels at which you can include the vci statement, see vci.)

**Range:** 0 through 255

**Usage Guidelines** See “Configuring ATM Cell-Relay Promiscuous Mode” on page 272.

**Required Privilege Level** interface—To view this statement in the configuration.  
interface-control—To add this statement to the configuration.

**vpi (Define Virtual Path)**

**Syntax** `vpi vpi-identifier {  
     maximum-vcs maximum-vcs;  
     oam-liveness {  
         up-count cells;  
         down-count cells;  
     }  
     oam-period (disable | seconds);  
     shaping {  
         (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained rate  
         burst length);  
         queue-length number;  
     }  
 }`

**Hierarchy Level** [edit interfaces *at-fpc/pic/port* atm-options]

**Release Information** Statement introduced before JUNOS Release 7.4.

**Description** For ATM interfaces, configure the virtual path (VP).

**Options** *vpi-identifier*—ATM virtual path identifier. This is one of the VPIs that you define in the *vci* statement. (For a list of hierarchy levels at which you can include the *vci* statement, see *vci*.)

**Range:** 0 through 255

The remaining statements are explained separately.

**Usage Guidelines** See “Configuring the Maximum Number of ATM1 VCs on a VP” on page 276.

**Required Privilege Level** interface—To view this statement in the configuration.  
 interface-control—To add this statement to the configuration.

**Related Topics** multipoint-destination, promiscuous-mode, *vci*

**vpi (Logical Interface and Interworking)**

**Syntax** `vpi virtual-path-identifier;`

**Hierarchy Level** [edit interfaces *at-fpc/pic/port* unit *logical-unit-number*],  
 [edit logical-systems *logical-system-name* interfaces *at-fpc/pic/port* unit *logical-unit-number*]

**Release Information** Statement introduced in JUNOS Release 9.0.

**Description** VPI used in an ATM-to-Ethernet interworking cross-connect.

**Options** *virtual-path-identifier*—VPI to be used.

**Range:** 0 through 255

**Usage Guidelines** See “Configuring ATM-to-Ethernet Interworking” on page 210 and “Configuring ATM Cell-Relay Promiscuous Mode” on page 272.

**Required Privilege Level** interface—To view this statement in the configuration.  
 interface-control—To add this statement to the configuration.

## vtmapping

---

|                                 |                                                                                                                                                                                                                                                        |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | vtmapping (itu-t   klm);                                                                                                                                                                                                                               |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> sonet-options];<br>[edit chassis fpc <i>number</i> pic <i>number</i> ]                                                                                                                                          |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                         |
| <b>Description</b>              | For the Channelized STM1 IQ PIC or Channelized STM1 PIC, configure virtual tributary mapping.<br><br>For the Channelized STM1 PIC, you configure virtual tributary mapping at the [edit chassis fpc <i>number</i> pic <i>number</i> ] hierarchy level. |
| <b>Options</b>                  | itu-t—International Telephony Union standard<br><br>klm—KLM standard<br><b>Default:</b> klm                                                                                                                                                            |
| <b>Usage Guidelines</b>         | See “Configuring Virtual Tributary Mapping of Channelized STM1 Interfaces” on page 430.                                                                                                                                                                |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                                                |
| <b>Related Topics</b>           | <i>JUNOS System Basics Configuration Guide</i>                                                                                                                                                                                                         |

## watch-list

---

|                                 |                                                                                                                                                                                                                                   |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | watch-list {<br>[ <i>routes</i> ];<br>}                                                                                                                                                                                           |
| <b>Hierarchy Level</b>          | [edit interface dln unit <i>logical-unit-number</i> dialer-options]                                                                                                                                                               |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                    |
| <b>Description</b>              | (J-series Services Routers) For ISDN interfaces, configure an ISDN list of routes to watch. Used only for dialer watch.                                                                                                           |
| <b>Options</b>                  | <i>routes</i> —IP prefix of a route. Specify one or more. The primary interface is considered up if there is at least one valid route for any of the addresses in the watch list to an interface other than the backup interface. |
| <b>Usage Guidelines</b>         | See “Configuring Dialer Watch” on page 673.                                                                                                                                                                                       |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                                                           |
| <b>Related Topics</b>           | <i>J-series Services Router Basic LAN and WAN Access Configuration Guide</i>                                                                                                                                                      |

## wavelength

---

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>              | wavelength <i>nm</i> ;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Hierarchy Level</b>     | [edit interfaces <i>interface-name</i> optics-options]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Release Information</b> | Statement introduced before JUNOS Release 7.4.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Description</b>         | For 10-Gigabit Ethernet DWDM interfaces only, configure full C-band ITU-Grid tunable optics.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Options</b>             | <p><i>nm</i>—Wavelength value. It can be one of the following:</p> <ul style="list-style-type: none"> <li>■ 1528.77—1528.77 nanometers (nm), corresponds to 196.10 terahertz (THz)</li> <li>■ 1529.55—1529.55 nm, corresponds to 196.00 THz</li> <li>■ 1530.33—1530.33 nm, corresponds to 195.90 THz</li> <li>■ 1531.12—1531.12 nm, corresponds to 195.80 THz</li> <li>■ 1531.90—1531.90 nm, corresponds to 195.70 THz</li> <li>■ 1532.68—1532.68 nm, corresponds to 195.60 THz</li> <li>■ 1533.47—1533.47 nm, corresponds to 195.50 THz</li> <li>■ 1534.25—1534.25 nm, corresponds to 195.40 THz</li> <li>■ 1535.04—1535.04 nm, corresponds to 195.30 THz</li> <li>■ 1535.82—1535.82 nm, corresponds to 195.20 THz</li> <li>■ 1536.61—1536.61 nm, corresponds to 195.10 THz</li> <li>■ 1537.40—1537.40 nm, corresponds to 195.00 THz</li> <li>■ 1538.19—1538.19 nm, corresponds to 194.90 THz</li> <li>■ 1538.98—1538.98 nm, corresponds to 194.80 THz</li> <li>■ 1539.77—1539.77 nm, corresponds to 194.70 THz</li> <li>■ 1540.56—1540.56 nm, corresponds to 194.60 THz</li> <li>■ 1541.35—1541.35 nm, corresponds to 194.50 THz</li> <li>■ 1542.14—1542.14 nm, corresponds to 194.40 THz</li> <li>■ 1542.94—1542.94 nm, corresponds to 194.30 THz</li> <li>■ 1543.73—1543.73 nm, corresponds to 194.20 THz</li> <li>■ 1544.53—1544.53 nm, corresponds to 194.10 THz</li> <li>■ 1545.32—1545.32 nm, corresponds to 194.00 THz</li> <li>■ 1546.12—1546.12 nm, corresponds to 193.90 THz</li> <li>■ 1546.92—1546.92 nm, corresponds to 193.80 THz</li> <li>■ 1547.72—1547.72 nm, corresponds to 193.70 THz</li> </ul> |

- 1548.52—1548.52 nm, corresponds to 193.60 THz
- 1549.32—1549.32 nm, corresponds to 193.50 THz
- 1550.12—1550.12 nm, corresponds to 193.40 THz
- 1550.92—1550.92 nm, corresponds to 193.30 THz
- 1551.72—1551.72 nm, corresponds to 193.20 THz
- 1552.52—1552.52 nm, corresponds to 193.10 THz
- 1553.33—1553.33 nm, corresponds to 193.00 THz
- 1554.13—1554.13 nm, corresponds to 192.90 THz
- 1554.94—1554.94 nm, corresponds to 192.80 THz
- 1555.75—1555.75 nm, corresponds to 192.70 THz
- 1556.56—1556.56 nm, corresponds to 192.60 THz
- 1557.36—1557.36 nm, corresponds to 192.50 THz
- 1558.17—1558.17 nm, corresponds to 192.40 THz
- 1558.98—1558.98 nm, corresponds to 192.30 THz
- 1559.79—1559.79 nm, corresponds to 192.20 THz
- 1560.61—1560.61 nm, corresponds to 192.10 THz
- 1561.42—1561.42 nm, corresponds to 192.00 THz
- 1562.23—1562.23 nm, corresponds to 191.90 THz
- 1563.05—1563.05 nm, corresponds to 191.80 THz
- 1563.86—1563.86 nm, corresponds to 191.70 THz
- **Default:** 1550.12—1550.12 nm, corresponds to 193.40 THz

**Usage Guidelines** See “Configuring the 10-Gigabit Ethernet DWDM Interface Wavelength” on page 631.

**Required Privilege Level** interface—To view this statement in the configuration.  
 interface-control—To add this statement to the configuration.

## working-circuit

---

|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>working-circuit <i>group-name</i>;</code>                                                                         |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> sonet-options aps]                                                               |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                          |
| <b>Description</b>              | Configure the working router in an APS circuit pair.                                                                    |
| <b>Options</b>                  | <i>group-name</i> —Circuit's group name.                                                                                |
| <b>Usage Guidelines</b>         | See “Configuring Basic APS Support” on page 696.                                                                        |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |
| <b>Related Topics</b>           | protect-circuit                                                                                                         |

## yellow-differential-delay

---

|                                 |                                                                                                                                                                                                      |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>yellow-differential-delay <i>milliseconds</i>;</code>                                                                                                                                          |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> mlfr-uni-nni-bundle-options]                                                                                                                                  |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                                                                                                       |
| <b>Description</b>              | For link services and voices interfaces only, configure the yellow differential delay among bundle links to give warning when a link has a differential delay that exceeds the configured threshold. |
| <b>Options</b>                  | <i>milliseconds</i> —Yellow differential delay threshold.<br><b>Range:</b> 1 through 2000 milliseconds<br><b>Default:</b> 6 milliseconds                                                             |
| <b>Usage Guidelines</b>         | See the <i>JUNOS Services Interfaces Configuration Guide</i> .                                                                                                                                       |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration.                                                                              |
| <b>Related Topics</b>           | action-red-differential-delay, remote                                                                                                                                                                |

## z0-increment

---

|                                 |                                                                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | (z0-increment   no-z0-increment);                                                                                       |
| <b>Hierarchy Level</b>          | [edit interfaces <i>interface-name</i> sonet-options]                                                                   |
| <b>Release Information</b>      | Statement introduced before JUNOS Release 7.4.                                                                          |
| <b>Description</b>              | Configure an incrementing STM ID rather than a static one.                                                              |
| <b>Usage Guidelines</b>         | See “Configuring an Incrementing STM ID” on page 686.                                                                   |
| <b>Required Privilege Level</b> | interface—To view this statement in the configuration.<br>interface-control—To add this statement to the configuration. |
| <b>Related Topics</b>           | sonet-options                                                                                                           |





## **Part 13**

# **Index**

- Index on page 1129
- Index of Statements and Commands on page 1151



# Index

## Symbols

|                                               |                |
|-----------------------------------------------|----------------|
| #, comments in configuration statements.....  | liii           |
| ( ), in syntax descriptions.....              | liii           |
| 10-Gigabit Ethernet interfaces.....           | 517            |
| 802.3ah OAM.....                              | 602            |
| DWDM.....                                     | 631            |
| framing.....                                  | 633            |
| SONET.....                                    | 707            |
| 10-Gigabit Ethernet IQ PIC.....               | 633            |
| 128-bit IPv6 address.....                     | 164            |
| 802.1ag OAM                                   |                |
| configuring Ethernet interfaces.....          | 583            |
| 802.1Q VLANs                                  |                |
| mixed VLAN tagging.....                       | 527, 849, 954  |
| VLAN IDs.....                                 | 1113, 1116     |
| VLAN tagging.....                             | 525, 569, 1116 |
| 802.1Q/Ethernet 802.3 encapsulation           |                |
| encapsulation overhead.....                   | 95             |
| 802.1Q/Ethernet SNAP encapsulation            |                |
| encapsulation overhead.....                   | 95             |
| 802.1x Port-Based Network Access Control..... | 815            |
| 802.3ad statement.....                        | 725            |
| usage guidelines.....                         | 537, 546       |
| 802.3ah OAM                                   |                |
| configuring Ethernet interfaces.....          | 595            |
| example configuration.....                    | 602            |
| < >, in syntax descriptions.....              | liii           |
| [ ], in configuration statements.....         | liii           |
| { }, in configuration statements.....         | liii           |
| (pipe), in syntax descriptions.....           | liii           |

.....595, 605, 651

## A

|                                  |     |
|----------------------------------|-----|
| accept-source-mac statement..... | 726 |
| usage guidelines.....            | 611 |
| access interface                 |     |
| interface-mode statement.....    | 529 |
| access profile                   |     |
| configuring.....                 | 105 |
| default CHAP secret.....         | 105 |
| default PAP password.....        | 153 |

|                                              |          |
|----------------------------------------------|----------|
| access-concentrator statement.....           | 727      |
| usage guidelines.....                        | 643      |
| access-profile statement.....                | 728      |
| usage guidelines.....                        | 103, 106 |
| accounting profiles                          |          |
| logical interfaces.....                      | 148      |
| example configuration.....                   | 148      |
| physical interfaces.....                     | 122      |
| example configuration.....                   | 122      |
| accounting statement.....                    | 729      |
| usage guidelines.....                        | 194      |
| accounting-profile statement.....            | 729      |
| usage guidelines.....                        | 122, 148 |
| acfc statement.....                          | 730      |
| usage guidelines.....                        | 111      |
| ack-delay-time statement.....                | 730      |
| usage guidelines.....                        | 167      |
| ack-max statement.....                       | 731      |
| usage guidelines.....                        | 167      |
| acknowledge-retries statement.....           | 731      |
| acknowledge-timer statement.....             | 732      |
| usage guidelines.....                        | 732      |
| action statement.....                        | 733      |
| action-profile statement                     |          |
| applying to remote MEP.....                  | 734      |
| CFM.....                                     | 734      |
| LFM.....                                     | 735      |
| action-red-differential-delay statement..... | 736      |
| usage guidelines.....                        | 736      |
| activation-delay statement.....              | 736      |
| usage guidelines.....                        | 673      |
| activation-priority statement.....           | 737      |
| active statement                             |          |
| usage guidelines.....                        | 539      |
| address and control field compression.....   | 111      |
| address entries.....                         | 46       |
| address statement.....                       | 738      |
| usage guidelines.....                        | 162, 172 |
| ADSL                                         |          |
| example configuration.....                   | 647, 648 |
| advertise-interval statement.....            | 740      |
| APS                                          |          |
| usage guidelines.....                        | 703      |
| advertisement intervals                      |          |
| APS interfaces.....                          | 703      |

|                                          |            |  |
|------------------------------------------|------------|--|
| ae                                       |            |  |
| physical part of interface name.....     | 47         |  |
| age statement.....                       | 741        |  |
| aggregate statement.....                 | 742        |  |
| usage guidelines.....                    | 609, 718   |  |
| aggregate-ports statement.....           | 743        |  |
| aggregated Ethernet interfaces.....      | 537        |  |
| CCC.....                                 | 216, 217   |  |
| configuring.....                         | 535        |  |
| example configuration.....               | 652        |  |
| LACP.....                                | 539        |  |
| example configuration.....               | 543        |  |
| interval.....                            | 540        |  |
| traceoptions.....                        | 542        |  |
| Layer 2 VPNs.....                        | 217        |  |
| link speed.....                          | 546        |  |
| minimum links.....                       | 546        |  |
| aggregated SONET interfaces.....         | 718        |  |
| configuring.....                         | 716        |  |
| example configuration.....               | 720        |  |
| firewall filters.....                    | 719        |  |
| example configuration.....               | 719        |  |
| link speed.....                          | 718        |  |
| minimum links.....                       | 718        |  |
| aggregated-ether-options statement.....  | 744        |  |
| usage guidelines.....                    | 509        |  |
| aggregated-sonet-options statement.....  | 745        |  |
| usage guidelines.....                    | 716        |  |
| aging timer                              |            |  |
| ARP.....                                 | 522        |  |
| all (tracing flag)                       |            |  |
| interfaces.....                          | 128        |  |
| VRRP.....                                | 522        |  |
| allow-any-vci statement.....             | 745        |  |
| allow-fragmentation statement.....       | 746        |  |
| allow-remote-loopback statement.....     | 746        |  |
| annex statement.....                     | 747        |  |
| usage guidelines.....                    | 340        |  |
| apply-action-profile statement.....      | 747        |  |
| APS                                      |            |  |
| basic support.....                       | 696        |  |
| circuit pairs.....                       | 696        |  |
| circuits, switching between.....         | 700        |  |
| configuration example.....               | 697        |  |
| link PIC redundancy                      |            |  |
| example configuration.....               | 704        |  |
| link state replication.....              | 704        |  |
| load sharing.....                        | 705        |  |
| load sharing between circuits            |            |  |
| example configuration.....               | 707        |  |
| overview.....                            | 694        |  |
| revertive mode.....                      | 702        |  |
| timers.....                              | 703        |  |
| unidirectional mode.....                 | 702        |  |
| aps statement.....                       | 748        |  |
| usage guidelines.....                    | 695        |  |
| ARP                                      |            |  |
| aging timer.....                         | 522        |  |
| arp option                               |            |  |
| policers.....                            | 181        |  |
| ARP proxy, unrestricted                  |            |  |
| Ethernet interfaces.....                 | 575        |  |
| arp statement.....                       | 749        |  |
| usage guidelines.....                    | 573        |  |
| ARP table, static                        |            |  |
| Ethernet interfaces.....                 | 573        |  |
| as                                       |            |  |
| physical part of interface name.....     | 47         |  |
| asynchronous-notification statement..... | 750        |  |
| at                                       |            |  |
| physical part of interface name.....     | 47         |  |
| ATM cell-relay encapsulation             |            |  |
| encapsulation overhead.....              | 96         |  |
| ATM encapsulation.....                   | 257        |  |
| ATM CCC VC multiplex.....                | 306        |  |
| ATM cell-relay.....                      | 306        |  |
| ATM NLPID.....                           | 306        |  |
| ATM PVC.....                             | 306        |  |
| ATM PVC encapsulation.....               | 96, 98     |  |
| ATM SNAP.....                            | 306        |  |
| ATM TCC SNAP.....                        | 306        |  |
| ATM TCC SNAP multiplex.....              | 306        |  |
| ATM VC multiplex.....                    | 306        |  |
| cell-relay accumulation mode.....        | 306        |  |
| Cisco ATM NLPID.....                     | 306        |  |
| Ethernet over ATM.....                   | 306        |  |
| Ethernet VPLS over ATM.....              | 306        |  |
| keepalives.....                          | 118        |  |
| Layer 2 switching cross-connects.....    | 205        |  |
| Multilink PPP over ATM.....              | 306        |  |
| PPP over ATM.....                        | 306        |  |
| PPP over ATM multiplex.....              | 306        |  |
| <i>See also</i> ATM interfaces           |            |  |
| ATM interfaces                           |            |  |
| ATM overview.....                        | 257        |  |
| communication with ATM switches          |            |  |
| example configuration.....               | 268        |  |
| encapsulation.....                       | 98         |  |
| ILMI with cell relay                     |            |  |
| example configuration.....               | 269        |  |
| MTU sizes.....                           | 90, 91, 93 |  |
| PIC type                                 |            |  |
| example configuration.....               | 272        |  |
| PPP over ATM encapsulation               |            |  |
| example configuration.....               | 311        |  |
| virtual circuits                         |            |  |
| example configuration.....               | 273        |  |
| virtual paths                            |            |  |
| example configuration.....               | 273        |  |
| ATM PVC encapsulation.....               | 96, 98     |  |
| atm-encapsulation statement.....         | 750        |  |

|                                               |                |
|-----------------------------------------------|----------------|
| ATM-for-ADSL                                  |                |
| example configuration.....                    | 647            |
| atm-options statement.....                    | 751            |
| ATM-over-ADSL                                 |                |
| encapsulation types.....                      | 334            |
| operational mode.....                         | 333            |
| ATM-over-SHDSL.....                           | 337            |
| atm-scheduler-map statement .....             | 752            |
| ATM-to-Ethernet interworking.....             | 203, 210, 1118 |
| VCI range.....                                | 1112           |
| virtual path identifier.....                  | 1120           |
| VLAN tagging.....                             | 879, 1115      |
| ATM1 and ATM2 IQ                              |                |
| configuration differences.....                | 263            |
| ATM1 interfaces                               |                |
| cell-relay circuit                            |                |
| example configuration.....                    | 308            |
| shaping values                                |                |
| example calculation.....                      | 300            |
| ATM2 IQ interfaces                            |                |
| early packet discard threshold                |                |
| example configuration.....                    | 303            |
| eight forwarding classes                      |                |
| example configuration.....                    | 319            |
| Layer 2 circuit AAL5 mode                     |                |
| example configuration.....                    | 279            |
| Layer 2 circuit cell-relay mode               |                |
| example configuration.....                    | 279            |
| Layer 2 circuit cell-relay promiscuous mode   |                |
| example configuration.....                    | 284            |
| Layer 2 circuit trunk mode                    |                |
| example configuration.....                    | 279            |
| MTU sizes.....                                | 92, 93         |
| authentication-key statement.....             | 752            |
| APS.....                                      | 696            |
| usage guidelines.....                         | 696            |
| authentication-profile-name statement         |                |
| access-profile-name.....                      | 753            |
| authenticator statement.....                  | 754            |
| auto-discovery statement.....                 | 755            |
| auto-negotiation statement                    |                |
| Gigabit Ethernet.....                         | 756            |
| usage guidelines.....                         | 619            |
| J-series uPIM.....                            | 515, 757       |
| auto-reconnect statement.....                 | 757            |
| usage guidelines.....                         | 643            |
| auto-synchronize statement                    |                |
| usage guidelines.....                         | 247            |
| Automatic Protection Switching <i>See</i> APS |                |
| autonegotiation                               |                |
| configuring manually.....                     | 619            |
| <b>B</b>                                      |                |
| backup routers                                |                |
| VRRP.....                                     | 603            |

|                                          |               |
|------------------------------------------|---------------|
| backup-destination statement.....        | 758           |
| backup-interface statement.....          | 758           |
| backup-options statement.....            | 759           |
| bandwidth statement.....                 | 759           |
| usage guidelines.....                    | 148           |
| bandwidth-limit statement.....           | 760           |
| usage guidelines.....                    | 609           |
| bchannel-allocation statement.....       | 760           |
| bearer-bandwidth-limit statement.....    | 761           |
| BERT                                     |               |
| configuring interface diagnostics.....   | 125           |
| bert-algorithm statement.....            | 762           |
| usage guidelines.....                    | 479, 486, 497 |
| bert-error-rate statement.....           | 764           |
| usage guidelines.....                    | 125           |
| bert-period statement.....               | 765           |
| usage guidelines.....                    | 125           |
| BGP                                      |               |
| tracing operations.....                  | 222           |
| bit error rate test <i>See</i> BERT      |               |
| BOOTP                                    |               |
| accepting packets.....                   | 193           |
| Bootstrap Protocol <i>See</i> BOOTP      |               |
| borrower interface                       |               |
| unnumbered demux.....                    | 173           |
| unnumbered Ethernet.....                 | 173           |
| br                                       |               |
| physical part of interface name.....     | 47            |
| braces, in configuration statements..... | liii          |
| brackets                                 |               |
| angle, in syntax descriptions.....       | liii          |
| square, in configuration statements..... | liii          |
| broadcast statement.....                 | 765           |
| usage guidelines.....                    | 163           |
| buildout statement.....                  | 766           |
| bundle statement.....                    | 768           |
| burst-size-limit statement.....          | 768           |
| usage guidelines.....                    | 609           |
| byte encoding.....                       | 769           |
| byte-encoding statement.....             | 769           |
| bytes statement.....                     | 770           |
| usage guidelines.....                    | 685           |
| <b>C</b>                                 |               |
| C-bit parity mode.....                   | 774           |
| c2 SONET header byte.....                | 685           |
| callback statement.....                  | 771           |
| usage guidelines.....                    | 672           |
| callback-wait-period statement.....      | 772           |
| usage guidelines.....                    | 672           |
| caller statement.....                    | 773           |
| usage guidelines.....                    | 671           |
| calling-number statement.....            | 774           |
| usage guidelines.....                    | 659           |

|                                                        |                   |  |  |
|--------------------------------------------------------|-------------------|--|--|
| cau4                                                   |                   |  |  |
| physical part of interface name.....                   | 47                |  |  |
| cbit-parity statement.....                             | 774               |  |  |
| cbr statement.....                                     | 775               |  |  |
| CCC.....                                               | 203               |  |  |
| aggregated Ethernet.....                               | 216, 217          |  |  |
| Layer 2 VPNs.....                                      | 217               |  |  |
| ce1                                                    |                   |  |  |
| physical part of interface name.....                   | 47                |  |  |
| cell-bundle-size statement.....                        | 776               |  |  |
| Challenge Handshake Authentication Protocol <i>See</i> |                   |  |  |
| CHAP                                                   |                   |  |  |
| channel part of interface name.....                    | 51                |  |  |
| channelized AU-4 interfaces.....                       | 412               |  |  |
| example configuration.....                             | 413               |  |  |
| channelized E1 interfaces                              |                   |  |  |
| example configuration.....                             | 379, 382, 429     |  |  |
| interface naming.....                                  | 379, 429          |  |  |
| channelized E1 IQ and IQE interfaces                   |                   |  |  |
| time slots.....                                        | 425               |  |  |
| channelized E1 IQ interfaces                           |                   |  |  |
| example configuration.....                             | 381               |  |  |
| time slots.....                                        | 378               |  |  |
| channelized interfaces                                 |                   |  |  |
| clock sources.....                                     | 364               |  |  |
| channelized IQ interfaces                              |                   |  |  |
| supported options.....                                 | 367               |  |  |
| channelized NxDS0 IQ interfaces                        |                   |  |  |
| example configuration.....                             | 379, 413, 439     |  |  |
| channelized OC12 interfaces                            |                   |  |  |
| example configuration.....                             | 415, 420          |  |  |
| traffic-shaping rates.....                             | 296, 299, 303     |  |  |
| channelized OC12 IQ interfaces                         |                   |  |  |
| example configuration.....                             | 416               |  |  |
| channelized OC3 IQ interfaces.....                     | 404               |  |  |
| example configuration.....                             | 405               |  |  |
| channelized OC48 interfaces                            |                   |  |  |
| SONET header bytes.....                                | 685               |  |  |
| channelized STM1 interfaces                            |                   |  |  |
| example configuration.....                             | 433, 637          |  |  |
| interface naming.....                                  | 637               |  |  |
| time slots.....                                        | 378, 426          |  |  |
| virtual tributary mapping.....                         | 637               |  |  |
| channelized STM1 IQ interfaces                         |                   |  |  |
| example configuration.....                             | 427               |  |  |
| channelized T1 interfaces                              |                   |  |  |
| example configuration.....                             | 390, 414          |  |  |
| channelized T1 IQ interfaces                           |                   |  |  |
| VT mapping.....                                        | 398, 406, 415     |  |  |
| channelized T3 interfaces                              |                   |  |  |
| loop timing.....                                       | 687               |  |  |
| channelized T3 IQ interfaces                           |                   |  |  |
| example configuration.....                             | 396, 404          |  |  |
| CHAP.....                                              | 103, 106          |  |  |
| configuring default CHAP secret.....                   | 105               |  |  |
| example configuration.....                             | 106, 109          |  |  |
| chap statement.....                                    | 777               |  |  |
| usage guidelines.....                                  | 103, 106          |  |  |
| chap-secret statement.....                             | 778               |  |  |
| checksums <i>See</i> frame checksums                   |                   |  |  |
| ci                                                     |                   |  |  |
| physical part of interface name.....                   | 47                |  |  |
| circuit cross-connect CCC.....                         | 203               |  |  |
| circuit pairs, APS.....                                | 696               |  |  |
| Cisco HDLC encapsulation.....                          | 98                |  |  |
| configuring on physical interfaces.....                | 98                |  |  |
| encapsulation overhead.....                            | 96                |  |  |
| example configuration.....                             | 505               |  |  |
| keepalives.....                                        | 118               |  |  |
| Layer 2 switching cross-connect.....                   | 205               |  |  |
| cisco-interoperability statement.....                  | 778               |  |  |
| class of service <i>See</i> CoS                        |                   |  |  |
| classifier statement.....                              | 779               |  |  |
| usage guidelines.....                                  | 610               |  |  |
| clear-dont-fragment-bit statement.....                 | 779               |  |  |
| client statement.....                                  | 780               |  |  |
| clock rates.....                                       | 246               |  |  |
| clock sources.....                                     | 56, 119, 710, 780 |  |  |
| channelized interfaces.....                            | 364               |  |  |
| clock-rate statement.....                              | 782               |  |  |
| usage guidelines.....                                  | 246               |  |  |
| clocking modes.....                                    | 245               |  |  |
| clocking statement.....                                | 780               |  |  |
| usage guidelines.....                                  | 56, 119, 710      |  |  |
| clocking-mode statement.....                           | 781               |  |  |
| usage guidelines.....                                  | 244               |  |  |
| coc1                                                   |                   |  |  |
| physical part of interface name.....                   | 47                |  |  |
| coc12                                                  |                   |  |  |
| physical part of interface name.....                   | 47                |  |  |
| coc3                                                   |                   |  |  |
| physical part of interface name.....                   | 47                |  |  |
| comments, in configuration statements.....             | liii              |  |  |
| communication with ATM switches                        |                   |  |  |
| example configuration.....                             | 268               |  |  |
| compatibility-mode statement.....                      | 783               |  |  |
| compression.....                                       | 151               |  |  |
| compression statement.....                             | 784               |  |  |
| usage guidelines.....                                  | 111, 113          |  |  |
| compression-device statement.....                      | 785               |  |  |
| connections                                            |                   |  |  |
| configuration statements.....                          | 23, 25            |  |  |
| connections statement.....                             | 786               |  |  |
| usage guidelines.....                                  | 208               |  |  |
| connectivity-fault management.....                     | 734               |  |  |
| connectivity-fault-management statement.....           | 787               |  |  |
| container interfaces.....                              | 32                |  |  |
| configuration example.....                             | 697               |  |  |
| container-devices statement.....                       | 788               |  |  |
| device-count.....                                      | 788               |  |  |
| container-list statement.....                          | 788               |  |  |
| container-options statement.....                       | 789               |  |  |

container-type statement.....789  
 continuity-check statement.....790  
 control leads  
     serial interfaces.....247  
 control-leads statement  
     usage guidelines.....247  
 control-polarity statement.....790  
     usage guidelines.....250  
 control-signal statement.....791  
     usage guidelines.....247  
 conventions  
     text and syntax.....lii  
 copy-tos-to-outer-ip-header statement.....791  
 core-dump statement.....792  
     usage guidelines.....129  
 CoS  
     eight forwarding classes  
         example configuration.....319  
 cp  
     physical part of interface name.....47  
 crc-major-alarm-threshold statement.....792  
 crc-minor-alarm-threshold statement.....793  
 cstm1  
     physical part of interface name.....47  
 cstm4  
     physical part of interface name.....47  
 ct1  
     physical part of interface name.....47  
 ct3  
     physical part of interface name.....47  
 cts statement.....793  
     usage guidelines.....247  
 cts-polarity statement.....794  
     usage guidelines.....250  
 curly braces, in configuration statements.....liii  
 current statement.....794  
 customer support.....lxi  
     contacting JTAC.....lxi

## D

damping  
     interface transitions.....128, 712  
 data circuit-terminating equipment *See* DCE  
 data terminal equipment *See* DTE  
 data-input statement.....795  
 database (tracing flag).....522  
 dcd statement.....796  
     usage guidelines.....247  
 dcd-polarity statement.....796  
     usage guidelines.....250  
 DCE.....120, 505, 797  
 dce statement.....797  
     usage guidelines.....120  
 dce-options statement.....797

deactivation-delay statement.....798  
     usage guidelines.....662  
 default router addresses.....179  
 default-action statement.....798  
 default-chap-secret statement.....799  
 default-pap-password statement.....799  
 defect triggers, SONET interfaces.....691  
     configuration example.....693  
     hold timers.....692  
 demux  
     physical part of interface name.....47  
 demux interfaces.....229  
     configuring underlying interfaces for.....605  
     unnumbered.....173  
 demux-destination statement.....801  
     demux interfaces.....801  
 demux-options statement.....802  
 demux-source statement.....803  
     demux interfaces.....803  
 demux0 statement.....800  
 dense wavelength-division multiplexing *See* DWDM  
 description statement.....804  
     example configuration.....88  
     usage guidelines.....88, 146  
 descriptors, interface.....46  
 destination statement.....805  
     usage guidelines.....163, 166  
 destination-class usage  
     example configuration.....197  
 destination-class-usage statement.....807  
     usage guidelines.....194  
 destination-profile  
     usage guidelines.....166  
 destination-profile statement.....808  
     usage guidelines.....163  
 dfc  
     physical part of interface name.....47  
 DHCP  
     accepting.....193  
 dial-options statement.....810  
 dial-string statement.....811  
     usage guidelines.....673  
 dialer statement.....808  
 dialer-options  
     usage guidelines.....662  
 dialer-options statement.....809  
 dialin statement.....810  
 direction statement.....811  
 disable statement.....812  
     logical interfaces  
         usage guidelines.....156  
     physical interfaces  
         usage guidelines.....130  
 disable-mlppp-inner-ppp-pfc statement.....813

|                                      |          |
|--------------------------------------|----------|
| disabling                            |          |
| keepalives.....                      | 118      |
| logical interfaces.....              | 156      |
| physical interfaces.....             | 130      |
| example configuration.....           | 131      |
| discard interface.....               | 227      |
| dlci statement.....                  | 813      |
| dlsr statement.....                  | 814      |
| usage guidelines.....                | 168      |
| do-not-fragment statement.....       | 814      |
| documentation set                    |          |
| comments on.....                     | lxi      |
| donor interface                      |          |
| unnumbered demux.....                | 173      |
| unnumbered Ethernet.....             | 173      |
| dot1x.....                           | 815      |
| authenticator.....                   | 815      |
| authentication-profile-name.....     | 815      |
| interface.....                       | 815      |
| <i>See also</i> maximum-requests     |          |
| <i>See also</i> quiet-period         |          |
| <i>See also</i> reauthentication     |          |
| <i>See also</i> retries              |          |
| <i>See also</i> supplicant           |          |
| <i>See also</i> supplicant-timeout   |          |
| <i>See also</i> transmit-period      |          |
| configuration statements.....        | 24       |
| interface                            |          |
| .....                                | 815      |
| <i>See also</i> server-timeout       |          |
| <i>See also</i> server-timeout       |          |
| down-count statement.....            | 816      |
| drop-timeout statement.....          | 817      |
| ds                                   |          |
| physical part of interface name..... | 47       |
| ds0-options statement.....           | 817      |
| usage guidelines.....                | 379, 429 |
| DS3 IQ interfaces                    |          |
| MTU sizes.....                       | 90, 91   |
| dsc                                  |          |
| physical part of interface name..... | 47       |
| dsl-options                          |          |
| usage guidelines.....                | 332      |
| dsl-options statement.....           | 818      |
| dslr statement.....                  | 818      |
| usage guidelines.....                | 247      |
| dslr-polarity statement.....         | 819      |
| usage guidelines.....                | 250      |
| DTE.....                             | 505      |
| dte-options statement.....           | 819      |
| DTR circuit                          |          |
| serial interfaces.....               | 250      |
| dtr statement.....                   | 820      |
| usage guidelines.....                | 247      |
| dtr-circuit statement.....           | 821      |
| usage guidelines.....                | 250      |

|                                                     |          |
|-----------------------------------------------------|----------|
| dtr-polarity statement.....                         | 821      |
| usage guidelines.....                               | 250      |
| DWDM.....                                           | 657, 679 |
| Dynamic Host Configuration Protocol <i>See</i> DHCP |          |
| dynamic-call-admission-control statement.....       | 822      |

## E

|                                      |                    |
|--------------------------------------|--------------------|
| e1                                   |                    |
| physical part of interface name..... | 47                 |
| E1 interfaces                        |                    |
| configuration statements.....        | 469                |
| example configuration.....           | 379, 429           |
| ITU-T standards.....                 | 469                |
| MTU sizes.....                       | 90, 91             |
| physical interface properties.....   | 469                |
| time slots                           |                    |
| example configuration.....           | 475                |
| E1 IQ interfaces                     |                    |
| example configuration.....           | 424                |
| E1 IQE interfaces                    |                    |
| example configuration.....           | 424                |
| e1-options statement.....            | 823                |
| usage guidelines.....                | 379, 429, 469, 637 |
| e3                                   |                    |
| physical part of interface name..... | 47                 |
| E3 interfaces                        |                    |
| configuration statements.....        | 477                |
| encapsulation.....                   | 98                 |
| ITU-T standards.....                 | 477                |
| MTU sizes.....                       | 90, 91             |
| E3 IQ interfaces                     |                    |
| MTU sizes.....                       | 90, 91             |
| e3-options statement.....            | 824                |
| usage guidelines.....                | 477                |
| encapsulation.....                   | 98                 |
| CCC.....                             | 205                |
| Ethernet 802.3.....                  | 96                 |
| example configuration.....           | 103, 715           |
| extended VLAN CCC.....               | 533, 569           |
| media MTU size and.....              | 353, 708           |
| on logical interfaces.....           | 150, 715           |
| on physical interfaces.....          | 98, 713            |
| overheads.....                       | 96                 |
| <i>See also</i> ATM encapsulation    |                    |
| encapsulation statement.....         | 825                |
| Layer 2 switching cross-connect..... | 205                |
| logical interfaces                   |                    |
| usage guidelines.....                | 150, 715           |
| physical interfaces                  |                    |
| usage guidelines.....                | 98, 713            |
| encoding                             |                    |
| byte.....                            | 769                |
| line.....                            | 253                |
| encoding statement.....              | 832                |
| usage guidelines.....                | 253                |



- Enhanced IQ (IQE) interfaces
    - channelized OC3.....393
  - epd-threshold statement.....833
    - usage guidelines.....317
  - es
    - physical part of interface name.....47
  - es-options statement.....834
  - Ethernet bridging.....567, 568
  - Ethernet CCC and TCC encapsulation
    - physical interfaces.....98
  - Ethernet CCC encapsulation
    - encapsulation overhead.....96
  - Ethernet interfaces.....567
    - 802.1ag OAM.....583
    - 802.3ah OAM.....595
    - configuration statements.....509
    - example configuration.....651
    - Fast Ethernet interfaces.....509
    - Gigabit Ethernet interfaces.....509
    - gratuitous ARP.....521
    - internal Ethernet interface.....30, 225
    - management Ethernet interface.....627
    - mixed VLAN tagging.....527, 849, 954
    - passive monitoring.....581
    - proxy ARP, unrestricted.....575
    - static ARP table entries.....573
    - unnumbered.....173
      - preferred source address.....1006
    - VLAN IDs.....1113
    - VLAN tagging.....525, 569, 1116
    - VRRP.....603
  - Ethernet link aggregation.....537
  - Ethernet over ATM encapsulation
    - encapsulation overhead.....96
    - physical interfaces.....98
  - Ethernet SNAP encapsulation
    - encapsulation overhead.....96
  - ethernet statement.....835
  - Ethernet switching.....567, 568
  - Ethernet switching interfaces.....515
  - Ethernet TCC
    - applying.....570
    - encapsulation.....569
      - encapsulation overhead.....96
    - example configuration.....571
  - ethernet-policer-profile statement.....837
    - usage guidelines.....609
  - ethernet-switch-profile statement.....613, 838
    - usage guidelines.....550, 609
  - eui-64 statement.....840
    - usage guidelines.....162
  - event (tracing flag).....128
  - event statement.....839
  - event-thresholds
    - frame-error statement.....854
    - frame-period statement.....855
  - frame-period-summary statement.....856
    - symbol-period statement.....1064
  - event-thresholds statement.....839
  - extended VLAN
    - CCC
      - applying.....533
      - encapsulation.....98
      - encapsulation overhead.....96
      - example configuration.....534
    - TCC
      - applying.....569
      - encapsulation.....98, 569
      - encapsulation overhead.....96
  - external clock sources.....119, 710, 780
  - external synchronization interface
    - usage guidelines.....57
- ## F
- f-max-period statement.....850
  - f1 SONET header byte.....685
  - f2 SONET header byte.....685
  - facility-override statement.....840
  - fail-filter statement.....1031
    - usage guidelines.....189
  - family bridge
    - VLAN IDs.....1113
  - family descriptors.....46
  - family statement.....841
    - usage guidelines.....160
  - family type
    - specifying for underlying interfaces.....605
  - Fast Ethernet interfaces
    - configuration statements.....509
    - Ethernet link aggregation.....537
    - example configuration.....651
    - ignoring Layer 3 incomplete errors.....520
    - ingress rate-limit.....523
    - interface speed.....115
    - link modes.....89, 520
    - link protection.....537
    - loopback mode.....519
    - MAC address filtering.....517
    - MTU sizes.....90, 91
    - physical interface properties.....509
    - proxy ARP, unrestricted.....575
    - speed.....522
    - static ARP table entries.....573
    - usage guidelines.....569
    - VLAN IDs.....1113
    - VLAN tagging.....525, 569, 1116
    - VRRP.....603
  - fastether-options statement.....845
    - usage guidelines.....509

|                                                |                    |                                         |                           |
|------------------------------------------------|--------------------|-----------------------------------------|---------------------------|
| fcs statement.....                             | 846                | framing statement.....                  | 857                       |
| SONET interfaces                               |                    | channelized OC12 IQ interfaces          |                           |
| usage guidelines.....                          | 687                | usage guidelines.....                   | 410                       |
| fe                                             |                    | usage guidelines.....                   | 633, 682                  |
| physical part of interface name.....           | 47                 | fxp                                     |                           |
| feac-loop-respond statement.....               | 847                | physical part of interface name.....    | 47                        |
| filter statement.....                          | 848                | fxp0                                    |                           |
| usage guidelines.....                          | 184                | physical part of interface name.....    | 47                        |
| filters.....                                   | 719                | fxp0 interface                          |                           |
| on aggregated links.....                       | 719                | configuring.....                        | 627                       |
| example configuration.....                     | 719                | management Ethernet interface.....      | 627                       |
| <i>See also</i> firewall filters               |                    | fxp1                                    |                           |
| firewall filters                               |                    | physical part of interface name.....    | 47                        |
| applying.....                                  | 184                | fxp1 interface.....                     | 225                       |
| example configuration.....                     | 186                | fxp2                                    |                           |
| logical interfaces.....                        | 184                | physical part of interface name.....    | 47                        |
| flexible-vlan-tagging statement.....           | 849                |                                         |                           |
| flow control.....                              | 520                | <b>G</b>                                |                           |
| flow-control statement.....                    | 850                | ge                                      |                           |
| usage guidelines.....                          | 520                | physical part of interface name.....    | 47                        |
| font conventions.....                          | lii                | general (tracing flag).....             | 522                       |
| force statement.....                           | 851                | Gigabit Ethernet interfaces.....        | 517, 567                  |
| forwarding-class statement.....                | 852                | 802.1ag .....                           | 583                       |
| usage guidelines.....                          | 317, 610           | 802.3ah .....                           | 595                       |
| fractional E1 IQ and IQE interfaces            |                    | autonegotiation.....                    | 619                       |
| time slots.....                                | 425                | configuration statements.....           | 509                       |
| fractional E1 IQ interfaces                    |                    | Ethernet link aggregation.....          | 537                       |
| example configuration.....                     | 378, 426           | example configuration.....              | 651                       |
| time slots.....                                | 378                | flow control.....                       | 520                       |
| fractional T1 IQ interfaces                    |                    | ignoring Layer 3 incomplete errors..... | 520                       |
| example configuration.....                     | 400, 410, 438, 445 | link protection.....                    | 537                       |
| time slots.....                                | 409                | loopback mode.....                      | 519                       |
| fragment-threshold statement                   |                    | MAC address filtering.....              | 517                       |
| usage guidelines.....                          | 669                | MTU sizes.....                          | 90, 91, 92                |
| fragment-threshold statement (interfaces)..... | 853                | proxy ARP, unrestricted.....            | 575                       |
| frame checksums                                |                    | static ARP table entries.....           | 573                       |
| SONET interfaces.....                          | 687                | usage guidelines.....                   | 569                       |
| Frame Relay encapsulation.....                 | 98                 | VLAN IDs.....                           | 1113, 1116                |
| DCE.....                                       | 120, 797           | VLAN tagging.....                       | 525, 569, 879, 1115, 1116 |
| encapsulation overhead.....                    | 96                 | VRRP.....                               | 603                       |
| example configuration.....                     | 350, 505           | Gigabit Ethernet IQ interfaces          |                           |
| Frame Relay protocol.....                      | 347                | configuring.....                        | 607                       |
| keepalives.....                                | 118                | MAC address accounting.....             | 618                       |
| Layer 2 switching cross-connect.....           | 206                | MAC address filtering.....              | 613                       |
| logical interfaces.....                        | 715                | policer                                 |                           |
| physical interfaces.....                       | 98, 713            | example configuration.....              | 613                       |
| Frame Relay ether type encapsulation           |                    | rate limiting.....                      | 609                       |
| physical interfaces.....                       | 98                 | VLAN tag stacking and rewriting.....    | 547                       |
| Frame Relay Ether Type encapsulation.....      | 350                | Gigabit Ethernet uPIM interfaces        |                           |
| physical interfaces.....                       | 713                | speed.....                              | 522                       |
| frame-error statement.....                     | 854                | gigether-options statement.....         | 859                       |
| frame-period statement.....                    | 855                | usage guidelines.....                   | 509                       |
| frame-period-summary statement.....            | 856                | gr                                      |                           |
|                                                |                    | physical part of interface name.....    | 47                        |
|                                                |                    | gratuitous ARP.....                     | 521                       |

|                                      |     |
|--------------------------------------|-----|
| gratuitous-arp-reply statement.....  | 860 |
| usage guidelines.....                | 521 |
| gre                                  |     |
| physical part of interface name..... | 47  |
| group option                         |     |
| firewall filters.....                | 184 |

## H

|                                       |          |
|---------------------------------------|----------|
| HDLC encapsulation                    |          |
| Cisco HDLC encapsulation.....         | 98       |
| HDLC payload scrambling               |          |
| SONET interfaces.....                 | 689      |
| header byte values.....               | 685      |
| hello-timer statement.....            | 861      |
| high-plp-max-threshold statement..... | 861      |
| high-plp-threshold statement.....     | 862      |
| hold-interval statement.....          | 862      |
| hold-time statement.....              | 863      |
| APS                                   |          |
| usage guidelines.....                 | 703      |
| damping interface transitions         |          |
| usage guidelines.....                 | 128, 712 |
| SONET defect triggers                 |          |
| usage guidelines.....                 | 692      |
| host statement.....                   | 867      |

## I

|                                         |          |
|-----------------------------------------|----------|
| icons defined, notice.....              | lii      |
| idle-cycle-flag statement.....          | 868      |
| serial interfaces                       |          |
| usage guidelines.....                   | 247      |
| idle-time statement.....                | 869      |
| usage guidelines.....                   | 167      |
| idle-timeout                            |          |
| usage guidelines.....                   | 662      |
| idle-timeout statement.....             | 869      |
| IEEE 802.1p policer profile             |          |
| usage guidelines.....                   | 610      |
| ieee802.1p statement.....               | 870      |
| ignore statement.....                   | 870      |
| ignore-all statement.....               | 871      |
| usage guidelines.....                   | 247      |
| ignore-l3-incompletes statement.....    | 871      |
| ignoring Layer 3 incomplete errors..... | 520      |
| ilmi statement.....                     | 872      |
| usage guidelines.....                   | 268      |
| ILMI with cell relay                    |          |
| encapsulation types supported.....      | 268, 306 |
| example configuration.....              | 269      |
| inactivity-timeout statement.....       | 872      |
| incoming-called-number statement.....   | 873      |
| usage guidelines.....                   | 661      |
| incoming-map statement.....             | 873      |
| usage guidelines.....                   | 671      |

|                                                           |          |
|-----------------------------------------------------------|----------|
| incrementing STM ID.....                                  | 686      |
| indication statement.....                                 | 874      |
| usage guidelines.....                                     | 247      |
| indication-polarity statement.....                        | 874      |
| usage guidelines.....                                     | 250      |
| inet6 protocol family                                     |          |
| interface addresses.....                                  | 164      |
| ingress-rate-limit statement.....                         | 875      |
| usage guidelines.....                                     | 523      |
| init-command-string statement.....                        | 876      |
| usage guidelines.....                                     | 85       |
| initial-route-check statement.....                        | 877      |
| inner-tag-protocol-id statement.....                      | 877      |
| usage guidelines.....                                     | 551      |
| inner-vlan-id statement.....                              | 878      |
| usage guidelines.....                                     | 551      |
| inner-vlan-id-range statement.....                        | 879      |
| input option                                              |          |
| firewall filters.....                                     | 184      |
| policers.....                                             | 181      |
| input statement.....                                      | 879      |
| input-list statement.....                                 | 880      |
| usage guidelines.....                                     | 184      |
| input-policer statement.....                              | 880      |
| input-priority-map statement.....                         | 881      |
| usage guidelines.....                                     | 610      |
| input-three-color statement.....                          | 881      |
| input-vlan-map statement.....                             | 882      |
| usage guidelines.....                                     | 547      |
| integrated routing and bridging interfaces <i>See</i> IRB |          |
| interface.....                                            | 887      |
| maximum-requests.....                                     | 887      |
| quiet-period.....                                         | 887      |
| reauthentication.....                                     | 887      |
| retries.....                                              | 887      |
| server-timeout.....                                       | 887      |
| supplicant.....                                           | 887      |
| supplicant-timeout.....                                   | 887      |
| transmit-period.....                                      | 887      |
| interface addresses                                       |          |
| logical interfaces.....                                   | 162      |
| preferred interface addresses.....                        | 179, 180 |
| primary interface addresses.....                          | 179      |
| interface groups.....                                     | 186      |
| interface naming                                          |          |
| chassis, routing matrix.....                              | 54       |
| routing matrix.....                                       | 52       |
| TX Matrix platform.....                                   | 52       |
| interface preservation.....                               | 704      |
| interface statement.....                                  | 884      |
| CoS.....                                                  | 885      |
| DLSw.....                                                 | 884      |
| IEEE 802.1ag.....                                         | 885      |
| IEEE 802.3ah.....                                         | 886      |
| interface transitions                                     |          |
| damping.....                                              | 128, 712 |

|                                                    |               |
|----------------------------------------------------|---------------|
| interface-down statement.....                      | 798, 888      |
| interface-mode statement.....                      | 889           |
| usage guidelines.....                              | 528, 529      |
| interface-set statement.....                       | 890           |
| interface-switch statement.....                    | 891           |
| usage guidelines.....                              | 204           |
| interface-type statement.....                      | 892           |
| channelized OC3 IQ interfaces                      |               |
| usage guidelines.....                              | 404, 412      |
| channelized T1 IQ interfaces                       |               |
| usage guidelines.....                              | 405, 414, 424 |
| channelized T3 IQ interfaces                       |               |
| usage guidelines.....                              | 413           |
| NxDS0 IQ interfaces                                |               |
| usage guidelines.....                              | 407           |
| interfaces.....                                    | 55            |
| 10-Gigabit Ethernet DWDM.....                      | 631           |
| 10-Gigabit Ethernet framing.....                   | 633           |
| aggregated Ethernet.....                           | 535           |
| aggregated SONET.....                              | 716           |
| channelized E1 PRI.....                            | 385           |
| channelized T1 PRI.....                            | 385           |
| clock sources.....                                 | 56, 119, 780  |
| configuration statements.....                      | 3, 4, 725     |
| container interfaces.....                          | 32            |
| demux underlying.....                              | 605           |
| descriptive text.....                              | 804           |
| descriptors.....                                   | 46            |
| disabling.....                                     | 130, 156      |
| display order in configurations.....               | 56            |
| encapsulation <i>See</i> encapsulation             |               |
| firewall filters firewall filters.....             | 184           |
| Gigabit Ethernet                                   |               |
| configuring.....                                   | 619           |
| Gigabit Ethernet IQ.....                           | 607           |
| Gigabit Ethernet IQ policer                        |               |
| example configuration.....                         | 613           |
| mixed VLAN tagging.....                            | 527, 849, 954 |
| names.....                                         | 47            |
| overview.....                                      | 657, 679      |
| permanent interfaces.....                          | 30            |
| physical.....                                      | 59            |
| services interfaces.....                           | 31            |
| transient interfaces.....                          | 30, 31        |
| interfaces (tracing flag).....                     | 522           |
| interfaces statement.....                          | 888           |
| interleave-fragments statement.....                | 893           |
| internal clock sources.....                        | 119, 710, 780 |
| internal Ethernet interface.....                   | 30, 225       |
| Internet Protocol Control Protocol <i>See</i> IPCP |               |
| interval statement.....                            | 894           |
| inverse-arp statement.....                         | 895           |
| invert-data statement.....                         | 895           |
| ip                                                 |               |
| physical part of interface name.....               | 47            |
| IP addresses                                       |               |
| 128-bit.....                                       | 164           |
| IPCP.....                                          | 165           |
| management Ethernet interface.....                 | 627           |
| mapping to MAC address.....                        | 573, 575      |
| unnumbered interfaces.....                         | 172           |
| ipc (tracing flag).....                            | 128           |
| IPCP.....                                          | 164           |
| assigning PPP properties.....                      | 166           |
| configuring IP address.....                        | 165           |
| negotiating IP addresses.....                      | 165           |
| unnumbered interfaces.....                         | 166           |
| ipip                                               |               |
| physical part of interface name.....               | 47            |
| ipsec-sa statement.....                            | 896           |
| IPv4 Protocol family                               |               |
| interface addresses.....                           | 162           |
| on logical interfaces.....                         | 160           |
| IPv6.....                                          | 161           |
| standards documents.....                           | 162           |
| transition.....                                    | 162           |
| IPv6 Protocol family                               |               |
| on logical interfaces.....                         | 160           |
| IQ interfaces.....                                 | 361           |
| channelized.....                                   | 361           |
| channelized E1.....                                | 377, 437      |
| channelized OC12.....                              | 401           |
| channelized OC3.....                               | 393           |
| channelized STM1.....                              | 637           |
| channelized T3.....                                | 443           |
| Gigabit Ethernet.....                              | 607           |
| IQE interfaces.....                                | 361           |
| channelized.....                                   | 361           |
| channelized STM1.....                              | 637           |
| ISDN interfaces                                    |               |
| callback-wait-period.....                          | 772           |
| caller.....                                        | 773           |
| calling-number.....                                | 774           |
| redial-delay.....                                  | 1022          |
| isdn-options statement.....                        | 897           |
| usage guidelines.....                              | 659           |
| ISO Protocol family.....                           | 160, 162      |
| ITU-T standards                                    |               |
| E1 interfaces.....                                 | 469           |
| E3 interfaces.....                                 | 477           |
| <b>J</b>                                           |               |
| J-series Routers.....                              | 515           |
| <b>K</b>                                           |               |
| keep-address-and-control statement.....            | 898           |
| usage guidelines.....                              | 178           |
| keepalives                                         |               |
| disabling.....                                     | 118           |

- keepalives statement.....899
  - usage guidelines.....118
- key statement.....900
- L**
- l2tp-interface-id statement.....900
- LACP
  - Ethernet aggregation.....539
    - example configuration.....543
    - interval.....540
    - traceoptions.....542
    - tracing operations.....542
- lacp statement.....902
  - 802.3ad.....901
  - usage guidelines.....539
- LAN PHY.....633, 707
- Layer 2 bridging
  - Ethernet.....568
- Layer 2 circuit cell-relay promiscuous mode
  - ATM2 IQ interfaces
    - example configuration.....284
- Layer 2 circuit transport mode
  - ATM2 IQ interfaces
    - example configuration.....279
- Layer 2 switching cross-connect
  - CCC connections.....208
  - CCC encapsulation.....205
  - example configuration.....213
  - MPLS.....209
  - router configuration.....204
- Layer 2.5 VPNs
  - Ethernet.....533, 569, 570
- Layer 3 incomplete errors.....871
- layer2-policer statement.....903
- lc
  - physical part of interface name.....47
- LCC.....52
- LCP
  - address and control field compression.....111
  - protocol field compression.....113, 151
- lcp-restart-timer statement.....904
  - usage guidelines.....151
- leaky bucket properties.....120, 711
- level statement.....904
- line.....253
  - protocol.....241
- line-card chassis *See* LCC
- line-encoding statement.....906
- line-protocol statement.....907
  - usage guidelines.....241
- line-rate statement.....907
  - usage guidelines.....338, 340
- line-vlan-id statement
  - usage guidelines.....547
- linear-red-profile statement.....905
  - usage guidelines.....317
- linear-red-profiles statement.....906
- link aggregation.....537
  - SONET interfaces.....718
- link modes.....89, 520
- link PIC failover
  - channelized OC12 IQ interfaces.....416
  - channelized STM1 IQ and IQE PICs.....433
- link protection
  - aggregated Ethernet interfaces.....537
  - disable statement.....812
  - non-revertive statement.....960
  - revertive statement.....1029
- link speed
  - Ethernet aggregation.....546
  - SONET aggregation.....718
- link state replication
  - APS.....704
- link-adjacency-loss statement.....908
- link-discovery statement.....909
- link-down statement.....908
- link-event-rate statement.....909
- link-fault management.....735
- link-fault-management statement.....910
- link-layer-overhead statement.....911
- link-mode statement.....912
  - usage guidelines.....89, 115, 520
- link-protection statement.....913
- link-speed statement.....914
  - usage guidelines.....546, 718
- linktrace statement.....915
- llc2 statement.....916
  - usage guidelines.....167
- LMI packets *See* keepalives
- lmi statement.....917
- lmi-type statement.....918
- lo
  - physical part of interface name.....47
- load sharing
  - APS.....705
- load-interval statement.....918
  - usage guidelines.....662
- load-threshold statement.....919
  - usage guidelines.....662
- Local Management Interface packets *See* keepalives
- local name, configuring.....105, 108, 153
- local password, configuring.....108, 154
- local-mac statement.....919
- local-name statement.....920
  - usage guidelines.....103, 106
- local-password statement.....921
- local-window statement.....921
  - usage guidelines.....167
- lockout statement.....922
  - usage guidelines.....701

|                                                   |            |
|---------------------------------------------------|------------|
| log-prefix statement.....                         | 923        |
| logical interface properties, statements for..... | 137        |
| logical interfaces                                |            |
| accounting profiles.....                          | 148        |
| example configuration.....                        | 148        |
| CCC.....                                          | 203, 213   |
| clear loopback detected timer.....                | 152        |
| configuration statements.....                     | 133        |
| default router addresses.....                     | 179        |
| descriptive text.....                             | 146        |
| descriptors.....                                  | 46         |
| disabling.....                                    | 156        |
| encapsulation <i>See</i> encapsulation            |            |
| example configuration                             |            |
| dynamic CAC.....                                  | 156        |
| firewall filters.....                             | 184        |
| interface addresses.....                          | 162, 179   |
| interface bandwidth.....                          | 148        |
| Layer 2 switching cross-connect.....              | 204        |
| logical interface properties.....                 | 133        |
| multipoint connections.....                       | 147        |
| point-to-point connections.....                   | 146        |
| policers.....                                     | 181        |
| PPP over ATM encapsulation                        |            |
| example configuration.....                        | 311        |
| PPP restart timers.....                           | 151        |
| preferred interface addresses.....                | 179, 180   |
| primary interface addresses.....                  | 179, 180   |
| primary router addresses.....                     | 179        |
| primary router interfaces.....                    | 179        |
| protocol families.....                            | 157, 160   |
| protocol MTU.....                                 | 177        |
| protocol redirect messages.....                   | 178        |
| SNMP notifications.....                           | 149        |
| static ARP table entries.....                     | 573, 575   |
| unit numbers.....                                 | 144        |
| unnumbered interfaces.....                        | 172        |
| VLAN IDs.....                                     | 1113, 1116 |
| logical part of interface name.....               | 51         |
| logical routers <i>See</i> logical systems        |            |
| logical systems                                   |            |
| configuration statements.....                     | 18         |
| interfaces.....                                   | 145        |
| logical-interface-policer statement.....          | 922        |
| logical-systems statement.....                    | 923        |
| usage guidelines.....                             | 145        |
| long-buildout statement.....                      | 924        |
| loop timing                                       |            |
| channelized T3 interfaces.....                    | 687        |
| loop-timing statement.....                        | 927        |
| usage guidelines.....                             | 687        |
| loopback capability.....                          | 251, 688   |
| E1 interfaces                                     |            |
| example configuration.....                        | 473        |
| E3 interfaces                                     |            |
| example configuration.....                        | 482        |
| serial interfaces                                 |            |
| example configuration.....                        | 252        |
| SONET interfaces                                  |            |
| example configuration.....                        | 688        |
| loopback mode.....                                | 519        |
| loopback statement.....                           | 925        |
| 10-Gigabit Ethernet interfaces                    |            |
| usage guidelines.....                             | 707        |
| Fast Ethernet interfaces                          |            |
| usage guidelines.....                             | 519        |
| Gigabit Ethernet interfaces                       |            |
| usage guidelines.....                             | 519        |
| serial interfaces                                 |            |
| usage guidelines.....                             | 251        |
| SONET interfaces                                  |            |
| usage guidelines.....                             | 688        |
| loopback testing.....                             | 123        |
| loopback-clear-timer statement.....               | 927        |
| usage guidelines.....                             | 152        |
| loss-priority statement.....                      | 928        |
| usage guidelines.....                             | 610        |
| loss-threshold statement.....                     | 928        |
| low-plp-max-threshold statement.....              | 929        |
| low-plp-threshold statement.....                  | 929        |
| ls                                                |            |
| physical part of interface name.....              | 47         |
| lsi                                               |            |
| physical part of interface name.....              | 47         |
| lsq-failure-options statement.....                | 930        |
| <b>M</b>                                          |            |
| MAC address accounting                            |            |
| Gigabit Ethernet IQ interfaces.....               | 618        |
| MAC address filtering                             |            |
| Fast Ethernet interfaces.....                     | 517        |
| Gigabit Ethernet interfaces.....                  | 517        |
| Gigabit Ethernet IQ interfaces.....               | 613        |
| MAC addresses                                     |            |
| management Ethernet interface.....                | 517, 628   |
| mapping to IP addresses.....                      | 573, 575   |
| mac statement.....                                | 930        |
| usage guidelines.....                             | 628        |
| mac-address statement.....                        | 931        |
| mac-learn-enable statement.....                   | 932        |
| usage guidelines.....                             | 618        |
| mac-validate statement.....                       | 933        |
| maintenance-association statement.....            | 934        |
| maintenance-domain statement.....                 | 935        |
| management Ethernet interface                     |            |
| configuring.....                                  | 627        |
| configuring for M-series and T-series routing     |            |
| platforms.....                                    | 114        |
| configuring J-series Gigabit Ethernet             |            |
| interfaces.....                                   | 115        |
| interface speed.....                              | 114        |

- IP address.....627
- link modes.....89, 520
- MAC address.....628
- overview.....30
- speed.....522
- manuals
  - comments on.....lxi
- map statement.....936
- master routers
  - VRRP.....603
- master-only statement.....937
- usage guidelines.....627
- max-retry statement.....939
- usage guidelines.....168
- maximum transmission unit *See* MTU
- maximum-contexts statement.....937
- maximum-requests statement.....938
- maximum-vcs statement.....938
- media (tracing flag).....128
- media MTUs.....89
- SONET interfaces.....708
- See also* MTU
- member-interface-speed statement.....939
- member-interface-type statement.....940
- member-interface-speed.....940
- mep statement.....941
- minimum links for aggregation
  - Ethernet links.....546
  - SONET links.....718
- minimum-links statement.....942
- usage guidelines.....719
- mixed VLAN tagging.....527, 849, 954
- ml
  - physical part of interface name.....47
- mlfr-uni-nni-bundle-options statement.....943
- mo
  - physical part of interface name.....47
- mode statement.....944
- usage guidelines.....190
- modem-options statement.....944
- usage guidelines.....85
- monitor-session statement.....945
- usage guidelines.....110
- monitoring services interfaces
  - physical interface properties.....129
- MPLS
  - Layer 2 switching cross-connect.....209
  - protocol family.....160, 162
- mpls statement
  - 10-Gigabit Ethernet interfaces
    - usage guidelines.....707
  - ATM interfaces.....945
  - SONET/SDH interfaces.....945
  - usage guidelines.....709
- mrru statement.....946
- usage guidelines.....669

- MSP.....694
- mt
  - physical part of interface name.....47
- MTU
  - physical interfaces.....89
- mtu statement.....946
- logical interfaces
  - usage guidelines.....177
- SONET interfaces
  - usage guidelines.....708
- usage guidelines.....89
- mtun
  - physical part of interface name.....47
- MTUs
  - logical interfaces.....177
  - media MTUs.....708
  - physical interfaces.....708
  - protocol MTUs.....177
  - SONET interfaces.....708
- multicast-dlci statement.....947
- multicast-only statement.....948
- usage guidelines.....161
- multicast-vci statement.....948
- multilink-max-classes statement.....949
- multiplex section protection *See* MSP
- multipoint connections.....147, 293
- See also* point-to-multipoint connections
- multipoint statement.....949
- usage guidelines.....147
- multipoint-destination statement.....950
- Multiprotocol Label Switching *See* MPLS
- multiservice-options statement.....951
- usage guidelines.....129
- MX-series Routers.....517

## N

- n391 statement.....951
- n392 statement.....952
- n393 statement.....952
- name-format statement.....953
- names.....55
- of interfaces.....47
- native-vlan-id statement.....954
- ncp-restart-timer statement.....955
- usage guidelines.....151
- negotiate-address statement.....955
- usage guidelines.....165, 643
- negotiating IP addresses
  - IPCP.....165
- negotiation-options
  - allow-remote-loopback statement.....746
  - no-allow-link-events statement.....957
- negotiation-options statement.....956
- neighbor statement.....956
- usage guidelines.....696

|                                              |          |
|----------------------------------------------|----------|
| no unidirectional statement.....             | 1099     |
| no-allow-link-events statement.....          | 957      |
| no-asynchronous-notification statement.....  | 750      |
| no-auto-negotiation statement                |          |
| Gigabit Ethernet.....                        | 756      |
| usage guidelines.....                        | 619      |
| J-series uPIM.....                           | 515, 757 |
| no-cbit-parity statement.....                | 774      |
| no-core-dump statement.....                  | 792      |
| usage guidelines.....                        | 129      |
| no-feac-loop-respond statement.....          | 847      |
| no-flow-control statement.....               | 850      |
| usage guidelines.....                        | 520      |
| no-gratuitous-arp-reply statement.....       | 860      |
| usage guidelines.....                        | 521      |
| no-gratuitous-arp-request statement.....     | 958      |
| usage guidelines.....                        | 521      |
| no-keepalives statement.....                 | 959      |
| usage guidelines.....                        | 118      |
| no-long-buildout statement.....              | 924      |
| no-loop-timing statement.....                | 927      |
| usage guidelines.....                        | 687      |
| no-loopback statement.....                   | 925, 926 |
| usage guidelines.....                        | 519      |
| no-mac-learn-enable statement.....           | 932      |
| usage guidelines.....                        | 618      |
| no-partition statement.....                  | 961      |
| channelized E1 IQ interfaces                 |          |
| usage guidelines.....                        | 377      |
| channelized OC12 IQ interfaces               |          |
| usage guidelines.....                        | 403, 411 |
| channelized OC3 IQ interfaces                |          |
| usage guidelines.....                        | 386, 395 |
| channelized T3 IQ interfaces                 |          |
| usage guidelines.....                        | 404, 423 |
| no-payload-scrambler statement.....          | 986      |
| SONET interfaces                             |          |
| usage guidelines.....                        | 689      |
| no-preempt statement.....                    | 1004     |
| no-redirects statement.....                  | 964      |
| usage guidelines.....                        | 178      |
| no-source-filtering statement.....           | 1053     |
| usage guidelines.....                        | 517, 613 |
| no-syslog statement.....                     | 1066     |
| usage guidelines.....                        | 129      |
| no-termination-request statement.....        | 965      |
| no-translate-discard-eligible statement..... | 1088     |
| no-translate-fecn-and-becn statement.....    | 1088     |
| no-traps statement.....                      | 1092     |
| usage guidelines.....                        | 129, 149 |
| no-unframed statement.....                   | 1099     |
| no-z0-increment statement.....               | 1125     |
| usage guidelines.....                        | 686      |
| non-revertive statement.....                 | 960      |
| normal (tracing flag)                        |          |
| arp aging timer.....                         | 522      |

|                            |          |
|----------------------------|----------|
| notice icons defined.....  | lii      |
| NxDS0 IQ interfaces        |          |
| example configuration..... | 427, 446 |
| usage guidelines.....      | 414      |

## O

|                                      |               |
|--------------------------------------|---------------|
| OAM                                  |               |
| configuration statements.....        | 24            |
| OAM cells <i>See</i> keepalives      |               |
| oam statement.....                   | 966           |
| oam-liveness statement.....          | 968           |
| usage guidelines.....                | 291, 305      |
| oam-period statement.....            | 969           |
| usage guidelines.....                | 291           |
| oc-slice statement.....              | 970           |
| usage guidelines.....                | 404, 411      |
| OC12 interfaces                      |               |
| example configuration.....           | 415           |
| traffic-shaping rates.....           | 296, 299, 303 |
| oc3                                  |               |
| physical part of interface name..... | 47            |
| OC3 interfaces.....                  | 296, 299, 303 |
| example configuration.....           | 716           |
| OC48 interfaces                      |               |
| SONET header bytes.....              | 685           |
| OC48 PIC                             |               |
| framing.....                         | 682           |
| open-timeout statement.....          | 970           |
| operating-mode statement.....        | 971           |
| optics-options statement.....        | 972           |
| usage guidelines.....                | 631           |
| output option                        |               |
| firewall filters.....                | 184           |
| policers.....                        | 181           |
| output statement.....                | 972           |
| output-list statement.....           | 973           |
| usage guidelines.....                | 184           |
| output-policer statement.....        | 973           |
| output-priority-map statement.....   | 974           |
| usage guidelines.....                | 610           |
| output-three-color statement.....    | 974           |
| output-vlan-map statement.....       | 975           |
| usage guidelines.....                | 547           |
| overflow option.....                 | 120, 712      |
| overflow statement.....              | 977           |
| usage guidelines.....                | 120, 711      |

## P

|                                       |     |
|---------------------------------------|-----|
| p-bit-timeout statement.....          | 987 |
| packets (tracing flag).....           | 522 |
| paired-group statement.....           | 978 |
| usage guidelines.....                 | 705 |
| PAP                                   |     |
| configuring default PAP password..... | 153 |



- pap statement.....979
- pap-password statement.....980
- parentheses, in syntax descriptions.....liii
- partition statement.....981
  - channelized AU-4 interfaces
    - usage guidelines.....412
  - channelized OC3 IQ interfaces
    - usage guidelines.....404
  - channelized T1 IQ interfaces
    - usage guidelines.....405, 414, 424
  - channelized T3 IQ interfaces
    - usage guidelines.....413
  - NxDS0 IQ interfaces
    - usage guidelines.....407, 414
  - SDH (VC-4) interfaces
    - usage guidelines.....411
- passive access, configuring.....105, 108, 154
- passive monitoring flow
  - Ethernet interfaces.....581
  - SONET/SDH interfaces.....709
- passive statement.....982
  - usage guidelines.....103, 106, 539
- passive-monitor-mode statement.....983
  - usage guidelines.....581, 709
- path trace identifier.....689
- path-database-size statement.....984
- path-trace statement.....985
  - 10-Gigabit Ethernet interfaces
    - usage guidelines.....707
  - usage guidelines.....689
- payload-scrambler statement.....986
  - SONET interfaces
    - usage guidelines.....689
- pd
  - physical part of interface name.....47
- pdu-interval statement.....987
- pdu-threshold statement.....988
- pe
  - physical part of interface name.....47
- peer statement.....988
- peer-unit statement.....989
- per-unit-scheduler statement.....990
- periodic statement.....989
  - usage guidelines.....540
- permanent interfaces.....30
- permanent virtual circuit encapsulation *See* ATM PVC
- pfc statement.....990
  - usage guidelines.....113
- physical interfaces.....59
  - accounting profiles.....122
    - example configuration.....122
  - APS.....694
  - byte encoding.....769
  - C-bit parity mode.....774
  - clock rates.....246
  - clock sources.....56, 119, 710, 780
  - clocking mode.....245
  - configuration statements.....59
  - DCE.....120, 797
  - descriptive text.....88, 804
  - descriptors.....46
  - disabling.....130
  - DTR circuit.....250
  - encapsulation.....98
  - Ethernet link aggregation.....537
  - flow control.....520
  - frame checksums *See* frame checksums
  - HDLC payload scrambling.....689
  - header byte values.....685
  - idle cycle flag.....247
  - keepalives.....118
  - leaky bucket properties.....120, 711
  - line encoding.....253
  - line protocol.....241
  - link modes.....89, 520
  - loop timing.....687
  - loopback capability
    - serial interfaces.....251
    - SONET interfaces.....688
  - loopback mode.....519
  - MAC address filtering.....517
  - media MTU size.....89, 708
  - mixed VLAN tagging.....527, 849, 954
  - MSP.....694
  - path trace identifier.....689
  - physical interface properties.....59
  - PPP CHAP.....103, 106
  - revertive mode, APS.....702
  - RFC 2615 support.....690
  - signal polarity.....250
  - SNMP notifications.....129
  - SONET defect triggers.....691
    - configuration example.....693
    - hold timers.....692
  - SONET link aggregation.....718
  - speed.....114, 115, 116, 683
  - statements.....69
  - time slots.....426
    - fractional E1 IQ and IQE interfaces.....425
    - fractional E1 IQ interfaces.....378
    - fractional T1 IQ interfaces.....409
    - NxDS0 IQ interfaces.....378
  - transitions, damping.....128
  - unidirectional mode.....129
  - unidirectional mode, APS.....702
  - VLAN tagging.....525, 569, 1116
  - See also* names of specific interfaces
- physical part of interface name.....47
- pic-type statement.....991
- pimd
  - physical part of interface name.....47

|                                            |          |  |
|--------------------------------------------|----------|--|
| pime                                       |          |  |
| physical part of interface name.....       | 47       |  |
| plp-to-clp statement.....                  | 993      |  |
| plp1 statement.....                        | 992      |  |
| usage guidelines.....                      | 317      |  |
| point-to-point connections                 |          |  |
| logical interfaces.....                    | 146      |  |
| unnumbered Ethernet interfaces.....        | 172      |  |
| Point-to-Point Protocol encapsulation..... | 98       |  |
| encapsulation overhead.....                | 96       |  |
| keepalives.....                            | 118      |  |
| on physical interfaces.....                | 98, 713  |  |
| PPP CHAP.....                              | 103, 106 |  |
| point-to-point statement.....              | 993      |  |
| usage guidelines.....                      | 146      |  |
| policer statement                          |          |  |
| CoS.....                                   | 994      |  |
| interface MAC.....                         | 996      |  |
| usage guidelines.....                      | 181, 609 |  |
| policers                                   |          |  |
| applying.....                              | 181      |  |
| arp option.....                            | 181      |  |
| input option.....                          | 181      |  |
| logical interfaces.....                    | 181      |  |
| output option.....                         | 181      |  |
| policing                                   |          |  |
| Gigabit Ethernet IQ interfaces.....        | 609      |  |
| pool statement.....                        | 997      |  |
| usage guidelines.....                      | 659      |  |
| pop statement                              |          |  |
| Gigabit Ethernet IQ interfaces.....        | 998      |  |
| usage guidelines.....                      | 547      |  |
| usage guidelines.....                      | 555      |  |
| pop-all-labels statement.....              | 999      |  |
| usage guidelines.....                      | 709      |  |
| pop-pop statement                          |          |  |
| Gigabit Ethernet IQ interfaces.....        | 1000     |  |
| usage guidelines.....                      | 555      |  |
| pop-swap statement                         |          |  |
| Gigabit Ethernet IQ interfaces.....        | 1000     |  |
| usage guidelines.....                      | 556      |  |
| port statement                             |          |  |
| voice services.....                        | 1001     |  |
| Port-Based Network Access Control Protocol |          |  |
| IEEE 802.1x                                |          |  |
| dot1x.....                                 | 591      |  |
| port-priority statement                    |          |  |
| LACP.....                                  | 1001     |  |
| post-service-filter statement.....         | 1002     |  |
| PPP                                        |          |  |
| address and control field compression..... | 111      |  |
| PPP clear loopback detected timer.....     | 152      |  |
| protocol field compression.....            | 113      |  |
| restart timer.....                         | 151      |  |
| PPP over ATM encapsulation                 |          |  |
| example configuration.....                 | 311      |  |
| PPP properties, assigning                  |          |  |
| IPCP.....                                  | 166      |  |
| ppp-options statement.....                 | 1003     |  |
| usage guidelines.....                      | 103, 106 |  |
| PPPD processes, trace operations.....      | 110      |  |
| PPPoE                                      |          |  |
| example configuration.....                 | 647, 648 |  |
| PPPoE client                               |          |  |
| example configuration.....                 | 647      |  |
| PPPoE server                               |          |  |
| example configuration.....                 | 648      |  |
| pppoe-options statement.....               | 1002     |  |
| usage guidelines.....                      | 643      |  |
| preempt statement.....                     | 1004     |  |
| preferred interface addresses.....         | 179, 180 |  |
| preferred statement.....                   | 1005     |  |
| usage guidelines.....                      | 163, 180 |  |
| preferred-source-address statement.....    | 1006     |  |
| example.....                               | 176      |  |
| usage guidelines.....                      | 174      |  |
| premium statement.....                     | 1007     |  |
| usage guidelines.....                      | 609, 610 |  |
| preserve interfaces statement              |          |  |
| usage guidelines.....                      | 704      |  |
| preserve-interface statement.....          | 1008     |  |
| primary interface addresses.....           | 179, 180 |  |
| primary router addresses.....              | 179      |  |
| primary router interfaces.....             | 179      |  |
| primary statement                          |          |  |
| address for interface.....                 | 1009     |  |
| usage guidelines.....                      | 180      |  |
| interface for routing platform.....        | 1009     |  |
| usage guidelines.....                      | 179      |  |
| priority (IEEE 802.1ag OAM) statement..... | 1011     |  |
| priority statement.....                    | 1010     |  |
| usage guidelines                           |          |  |
| ATM scheduler map.....                     | 317      |  |
| priority-cost statement.....               | 1012     |  |
| promiscuous-mode statement.....            | 1012     |  |
| usage guidelines.....                      | 272      |  |
| protect circuit, APS                       |          |  |
| configuring.....                           | 696      |  |
| load sharing between paired groups.....    | 705      |  |
| paired groups, switching between.....      | 700      |  |
| protect-circuit statement.....             | 1013     |  |
| usage guidelines.....                      | 696      |  |
| protocol families                          |          |  |
| configuration statements.....              | 157      |  |
| logical interfaces.....                    | 157, 160 |  |
| protocol MTUs.....                         | 177      |  |
| unnumbered interfaces.....                 | 172      |  |
| protocol field compression.....            | 113      |  |
| protocol MTUs.....                         | 89       |  |
| logical interfaces.....                    | 177      |  |
| <i>See also</i> MTU                        |          |  |
| protocol redirect messages.....            | 178      |  |

protocol-down statement.....1013  
 protocols  
   families.....157  
   line.....241  
 protocols connections  
   configuration statements.....23, 25  
 protocols dot1x  
   configuration statements.....24  
 protocols OAM  
   configuration statements.....24  
 protocols statement.....1014  
 protocols VRRP  
   configuration statements.....24, 26  
 proxy statement.....1014  
   usage guidelines.....570  
 proxy-arp statement.....1015  
   usage guidelines.....575  
 push statement  
   Gigabit Ethernet IQ interfaces.....1015  
   usage guidelines.....547  
   usage guidelines.....554  
 push-push statement  
   Gigabit Ethernet IQ interfaces.....1016  
   usage guidelines.....557  
 PVC encapsulation *See* ATM PVC encapsulation

## Q

QPP interfaces channelized IQ and IQE  
   interfaces.....361  
 queue-depth statement.....1016  
 queue-length statement.....1017  
 queues statement.....1017  
 quiet-period statement.....1018

## R

rate statement.....1018  
   usage guidelines.....120, 711  
 reassemble-packets statement.....1019  
 reauthentication statement.....1019  
 receive (tracing flag modifier).....128  
 receive-bucket statement.....1020  
   usage guidelines.....120, 711  
 receive-options-packets statement.....1020  
   usage guidelines.....270, 709  
 receive-ttl-exceeded statement.....1021  
   usage guidelines.....270, 709  
 red-differential-delay statement.....1021  
 redial-delay statement.....1022  
 redirect messages.....178  
 redundancy-options statement.....1023, 1024  
 remote statement.....1025  
   usage guidelines.....533, 569, 570  
 remote-loopback statement.....1025  
 remote-loopback-respond statement.....1026

remote-mep statement.....1026  
 request statement.....1027  
 required-depth statement.....1028  
   usage guidelines.....709  
 retries statement.....1029  
 revert-time statement.....1030  
   usage guidelines.....702  
 revertive mode, APS.....702  
 revertive statement.....1029  
 rewrite-on-egress statement  
   usage guidelines.....547  
 rewrite-on-ingress statement  
   usage guidelines.....547  
 RFC 2615 support, SONET interfaces.....690  
 rfc-2615 statement.....1030  
   usage guidelines.....690  
 routers  
   default addresses.....179  
   primary addresses.....179  
   primary interfaces.....179  
 routing matrix  
   chassis, interface naming.....54  
   interface naming.....52  
 routing-instance statement.....1031  
 rpf-check statement.....1031  
   usage guidelines.....189  
 rsp  
   physical part of interface name.....47  
 rtp statement.....1032  
 rts statement.....1032  
   usage guidelines.....247  
 rts-polarity statement.....1033  
   usage guidelines.....250  
 rtvbr statement.....1034

## S

s1 SONET header byte.....685  
 sampling on aggregated links.....719  
   example configuration.....719  
 sampling statement.....1035  
 SCC.....52  
 scheduler-maps statement.....1035  
 schedulers statement.....1036  
 SDH (VC-4) interfaces  
   example configuration.....412  
 SDH (VC-4-4C) interface  
   example configuration.....411  
 SDH interfaces.....657, 679  
   configuration statements.....680  
   framing.....682  
   MTU sizes.....90, 91, 92  
   overview.....657, 679  
   physical properties.....680  
   *See also* SONET interfaces

- se
  - physical part of interface name.....47
- secondary statement.....1036
- send (tracing flag modifier).....128
- send-critical-event statement.....1037
- separators, in interface names.....51
- serial interfaces
  - clock rates.....246
  - clocking mode.....244, 245
  - configuration statements.....239
  - control leads.....247
  - correcting phase shift.....245
  - default settings.....241
  - DTR circuit.....250
  - idle cycle flag.....247
  - invalid statements.....243
  - line encoding.....253
  - line protocol.....241
  - loopback capability.....251
  - physical interface properties.....239
  - signal polarity.....250
- serial-options statement.....1038
  - usage guidelines.....239
- server statement.....1039
- server-timeout statement.....1039
- service statement.....1040
- service-domain statement.....1040
- service-filter statement.....1041
- service-name statement.....1041
  - usage guidelines.....643
- service-set statement.....1042
- services interfaces.....31
- services statement.....1042
- services-options statement.....1043
- shaping statement.....1044
- SHDSL.....337
- shdsl-options statement.....1045
  - usage guidelines.....337
- short-name-format statement.....1045
- short-sequence statement.....1046
- signal polarity, serial interfaces.....250
- snext statement.....1046
  - usage guidelines.....337
- snr-margin statement.....1047
  - usage guidelines.....337
- so
  - physical part of interface name.....47
- SONET interfaces.....657, 679
  - APS.....657, 679
  - clock sources.....119, 710
  - configuration statements.....680
  - damping interface transitions.....712
  - defect triggers.....691
    - configuration example.....693
  - hold timers.....692
  - encapsulation.....98, 713
  - example configuration.....716
  - frame checksum.....687
  - framing.....682
  - HDLC payload scrambling.....689
  - header byte values.....685
  - incrementing STM ID.....686
  - leaky bucket properties.....711
  - link aggregation.....718
  - loopback capability.....688
  - MTU sizes.....90, 91, 92, 708
  - overview.....657, 679
  - path trace identifier.....689
  - physical interface properties.....680
  - RFC 2615 support.....690
  - See also* SDH interfaces
- SONET parameters
  - on channelized OC12 interfaces.....415
- sonet-options statement.....1048
  - usage guidelines.....415, 637, 680
- SONET/SDH interfaces
  - interface speed.....116, 683
  - passive monitoring.....709
- source address filtering
  - Fast Ethernet interfaces.....517, 518, 546
  - Gigabit Ethernet interfaces.....517, 518, 546
- source statement.....1050
- source-address-filter statement.....1051
  - usage guidelines.....518, 546
- source-class usage
  - example configuration.....197
- source-class-usage statement.....1052
  - usage guidelines.....194
- source-filtering statement.....1053
  - usage guidelines.....517, 546, 613
- sp
  - physical part of interface name.....47
- speed statement.....1054, 1055
  - usage guidelines.....114, 115, 116, 522, 683
- spid1 statement.....1055
- spid2 statement.....1056
- stacked-vlan-tagging statement.....1056
  - usage guidelines.....547
- start-end-flag statement.....1057
- startup-silent-period statement.....604
- state (tracing flag).....522
- statement
  - usage guidelines.....643
- static ARP table entries
  - Ethernet interfaces.....573, 575
  - example configuration.....574
- static routes
  - unnumbered Ethernet interfaces.....175
- static-tei-val statement.....1057
- STM1 interfaces
  - example configuration.....637

|                                                         |      |
|---------------------------------------------------------|------|
| supplicant statement                                    |      |
| single.....                                             | 1058 |
| supplicant-timeout statement.....                       | 1058 |
| support, technical <i>See</i> technical support         |      |
| swap statement                                          |      |
| Gigabit Ethernet IQ interfaces.....                     | 1059 |
| usage guidelines.....                                   | 547  |
| swap-push statement                                     |      |
| Gigabit Ethernet IQ interfaces.....                     | 1059 |
| usage guidelines.....                                   | 558  |
| swap-swap statement                                     |      |
| Gigabit Ethernet IQ interfaces.....                     | 1060 |
| usage guidelines.....                                   | 559  |
| switch-card chassis SCC.....                            | 52   |
| switch-options statement.....                           | 1061 |
| switch-port statement                                   |      |
| access switching.....                                   | 1062 |
| switch-type statement.....                              | 1063 |
| switching-mode statement.....                           | 1060 |
| usage guidelines.....                                   | 702  |
| symbol-period statement.....                            | 1064 |
| Synchronous Digital Hierarchy <i>See</i> SDH interfaces |      |
| Synchronous Optical Network <i>See</i> SONET interfaces |      |
| syntax conventions.....                                 | lii  |
| syslog statement.....                                   | 1065 |
| usage guidelines.....                                   | 129  |
| system processes                                        |      |
| configuration statements.....                           | 26   |
| system-priority statement                               |      |
| LACP                                                    |      |
| interface.....                                          | 1067 |

## T

|                                      |        |
|--------------------------------------|--------|
| t1                                   |        |
| physical part of interface name..... | 47     |
| T1 interfaces                        |        |
| byte encoding.....                   | 769    |
| configuration statements.....        | 485    |
| MTU sizes.....                       | 90, 91 |
| overview.....                        | 485    |
| time slots                           |        |
| example configuration.....           | 493    |
| T1 IQ interfaces                     |        |
| example configuration.....           | 444    |
| t1-options statement.....            | 1068   |
| usage guidelines.....                | 485    |
| t1-time statement.....               | 1069   |
| usage guidelines.....                | 167    |
| t2-time statement.....               | 1069   |
| usage guidelines.....                | 167    |
| t3                                   |        |
| physical part of interface name..... | 47     |
| T3 interfaces                        |        |
| C-bit parity mode.....               | 774    |
| configuration statements.....        | 496    |

|                                           |          |
|-------------------------------------------|----------|
| encapsulation.....                        | 98       |
| MTU sizes.....                            | 90, 91   |
| overview.....                             | 495      |
| t3-options statement.....                 | 1072     |
| usage guidelines.....                     | 496      |
| t310 statement.....                       | 1070     |
| usage guidelines.....                     | 659      |
| t391 statement.....                       | 1070     |
| t392 statement.....                       | 1071     |
| T640 routing nodes.....                   | 52       |
| tag-protocol-id statement.....            | 1073     |
| usage guidelines.....                     | 547, 551 |
| tap                                       |          |
| physical part of interface name.....      | 47       |
| TCC.....                                  | 203      |
| encapsulation.....                        | 102      |
| technical support                         |          |
| contacting JTAC.....                      | lxi      |
| tei-option statement.....                 | 1074     |
| threshold statement.....                  | 1075     |
| usage guidelines.....                     | 120, 711 |
| time slots                                |          |
| channelized E1 IQ and IQE interfaces..... | 425      |
| channelized E1 IQ interfaces.....         | 378      |
| channelized NxDS0 IQ interfaces.....      | 378, 426 |
| E1 interfaces                             |          |
| example configuration.....                | 475      |
| fractional E1 IQ and IQE interfaces.....  | 425      |
| fractional E1 IQ interfaces.....          | 378      |
| fractional T1 IQ interfaces.....          | 409      |
| T1 interfaces                             |          |
| example configuration.....                | 493      |
| timer (tracing flag)                      |          |
| Ethernet interface speed.....             | 522      |
| timers                                    |          |
| APS.....                                  | 703      |
| timeslots statement.....                  | 1076     |
| channelized E1 IQ and IQE interfaces      |          |
| usage guidelines.....                     | 425      |
| channelized E1 IQ interfaces              |          |
| usage guidelines.....                     | 378      |
| channelized NxDS0 IQ interfaces           |          |
| usage guidelines.....                     | 378, 426 |
| fractional E1 IQ and IQE interfaces       |          |
| usage guidelines.....                     | 425      |
| fractional E1 IQ interfaces               |          |
| usage guidelines.....                     | 378      |
| fractional T1 IQ interfaces               |          |
| usage guidelines.....                     | 409      |
| NxDS0 IQ interfaces                       |          |
| usage guidelines.....                     | 407      |
| tm statement.....                         | 1077     |
| usage guidelines.....                     | 247      |
| tm-polarity statement.....                | 1077     |
| usage guidelines.....                     | 250      |

|                                                           |                |  |
|-----------------------------------------------------------|----------------|--|
| trace operations                                          |                |  |
| PPPD.....                                                 | 110            |  |
| VRRP.....                                                 | 522            |  |
| tracoptions (LACP) statement                              |                |  |
| usage guidelines.....                                     | 542            |  |
| tracoptions statement                                     |                |  |
| interface processes.....                                  | 1080           |  |
| interfaces.....                                           | 1079           |  |
| usage guidelines.....                                     | 128            |  |
| LACP.....                                                 | 1082           |  |
| PPPD.....                                                 | 1084           |  |
| PPPD processes                                            |                |  |
| usage guidelines.....                                     | 110            |  |
| VRRP                                                      |                |  |
| usage guidelines.....                                     | 522            |  |
| tracing flags                                             |                |  |
| all.....                                                  | 128            |  |
| event.....                                                | 128            |  |
| ipc.....                                                  | 128            |  |
| media.....                                                | 128            |  |
| tracing operations                                        |                |  |
| BGP.....                                                  | 222            |  |
| LACP.....                                                 | 542            |  |
| PPPD.....                                                 | 111            |  |
| track statement                                           |                |  |
| DLSw.....                                                 | 1087           |  |
| usage guidelines.....                                     | 168            |  |
| transient interfaces.....                                 | 30, 31         |  |
| transitions                                               |                |  |
| damping.....                                              | 128, 712       |  |
| transitions, damping.....                                 | 128, 712       |  |
| translate-discard-eligible statement.....                 | 1088           |  |
| translate-ecn-and-beqn statement.....                     | 1088           |  |
| translational cross-connect <i>See</i> TCC                |                |  |
| translational cross-connect encapsulation <i>See</i> TCC, |                |  |
| encapsulation                                             |                |  |
| transmit clock sources.....                               | 119, 710       |  |
| transmit-bucket statement.....                            | 1089           |  |
| usage guidelines.....                                     | 120, 711       |  |
| transmit-clock statement.....                             | 1089           |  |
| usage guidelines.....                                     | 245            |  |
| transmit-period statement.....                            | 1090           |  |
| transmit-weight statement.....                            | 1091           |  |
| usage guidelines.....                                     | 317            |  |
| traps statement.....                                      | 1092           |  |
| usage guidelines.....                                     | 129, 149       |  |
| trej-time statement.....                                  | 1093           |  |
| usage guidelines.....                                     | 168            |  |
| Tri-Rate Ethernet copper interfaces                       |                |  |
| speed.....                                                | 522            |  |
| Tri-Rate Ethernet interfaces                              |                |  |
| interface speed.....                                      | 116            |  |
| trigger statement.....                                    | 1094           |  |
| 10-Gigabit Ethernet interfaces                            |                |  |
| usage guidelines.....                                     | 707            |  |
| usage guidelines.....                                     | 691            |  |
| trigger-link-failure statement.....                       | 1095           |  |
| Trivial Network Protocol family                           |                |  |
| interface addresses.....                                  | 162            |  |
| on logical interfaces.....                                | 160            |  |
| trunk interface.....                                      | 889            |  |
| interface-mode statement.....                             | 528            |  |
| vlan-id-list statement.....                               | 529            |  |
| trunk port.....                                           | 529, 889, 1115 |  |
| trunk-bandwidth statement.....                            | 1095           |  |
| trunk-id statement.....                                   | 1096           |  |
| ttl statement.....                                        | 1096           |  |
| tunnel statement.....                                     | 1097           |  |
| TX Matrix platform                                        |                |  |
| interface naming.....                                     | 52             |  |
| chassis.....                                              | 54             |  |
| <b>U</b>                                                  |                |  |
| umd                                                       |                |  |
| physical part of interface name.....                      | 47             |  |
| underlying interfaces                                     |                |  |
| specifying family type for.....                           | 605            |  |
| underlying-interface statement.....                       | 1098           |  |
| unframed statement.....                                   | 1099           |  |
| unicast RPF.....                                          | 189            |  |
| example configuration.....                                | 193            |  |
| fail filters.....                                         | 192, 193       |  |
| loose mode.....                                           | 190            |  |
| routing asymmetry.....                                    | 192            |  |
| strict mode.....                                          | 189            |  |
| VPNs.....                                                 | 193            |  |
| example configuration.....                                | 193            |  |
| unidirectional mode, APS.....                             | 702            |  |
| unidirectional statement.....                             | 1099           |  |
| unit numbers.....                                         | 144            |  |
| unit statement                                            |                |  |
| logical interfaces.....                                   | 1100           |  |
| usage guidelines.....                                     | 133, 144       |  |
| unnumbered interfaces                                     |                |  |
| demux.....                                                | 173            |  |
| Ethernet.....                                             | 173            |  |
| preferred source address.....                             | 1006           |  |
| IPCP.....                                                 | 166            |  |
| point-to-point.....                                       | 172            |  |
| unnumbered-address statement.....                         | 1106           |  |
| preferred source address                                  |                |  |
| usage guidelines.....                                     | 174            |  |
| usage guidelines.....                                     | 166, 173       |  |
| unnumbered-interface statement                            |                |  |
| usage guidelines.....                                     | 166, 643       |  |
| up-count statement.....                                   | 1108           |  |
| uPIM Ethernet interfaces.....                             | 515            |  |
| USB modem                                                 |                |  |
| configuring.....                                          | 85             |  |

**V**

vbr statement.....1109

vc-cos-mode statement.....1110

vc4

- physical part of interface name.....47

vci statement.....1111

vci-range statement.....1112

VCIs.....257

VCs.....273

virtual circuits *See* ATM VCs

virtual paths *See* ATM VPs

Virtual Router Redundancy Protocol *See* VRRP

VLAN CCC

- configuration guidelines.....532
- example configuration.....533

VLAN CCC encapsulation

- encapsulation overhead.....96
- physical interfaces.....98

VLAN IDs.....1113, 1116

VLAN tag stacking and rewriting

- Gigabit Ethernet IQ interfaces.....547

VLAN tagging.....525, 569, 1116

VLAN VPLS

- configuration guidelines.....532
- example configuration.....533

vlan-id statement.....1113, 1115

- Ethernet interfaces.....1113
- usage guidelines.....525, 569

Fast Ethernet interfaces

- usage guidelines.....525, 569

Gigabit Ethernet interfaces

- usage guidelines.....530

usage guidelines.....547

vlan-id-list statement.....1115

- usage guidelines.....529

vlan-id-range statement.....1116

- Ethernet interfaces.....1116

vlan-tagging statement.....1116

- Ethernet interfaces

  - usage guidelines.....525, 569

Fast Ethernet interfaces

- usage guidelines.....525, 569

Gigabit Ethernet interfaces

- usage guidelines.....525

vlan-tags statement.....1117

- usage guidelines.....551

vlan-tags-outer statement.....1117

vlan-vci-ccc encapsulation

- ATM-to-Ethernet interworking.....210

vlan-vci-tagging statement.....1118

- ATM-to-Ethernet interworking.....210

voice over IP

- dynamic CAC.....156

vpi statement.....1119, 1120

VPIs.....257

vpls protocol family

- interface addresses.....162
- on logical interfaces.....160

VPNs

- unicast RPF.....193

VPs.....273

VRRP.....603

- configuration statements.....24, 26
- trace operations.....522
- tracing flag.....522

vsp

- physical part of interface name.....47

vt

- physical part of interface name.....47

VT mapping

- channelized T1 IQ interfaces.....398, 406, 415

vtmapping statement.....1121

- usage guidelines.....430

**W**

WAN PHY.....707

- configuring.....633

watch-list statement.....1121

- usage guidelines.....673

wavelength statement.....1122

- usage guidelines.....631

wavelength-division multiplexing *See* WDM

WDM.....657, 679

working circuit, APS

- configuring.....696
- load sharing between paired groups.....705
- paired groups, switching between.....700

working-circuit statement.....1124

- usage guidelines.....696

**X**

xe

- physical part of interface name.....47

**Y**

yellow-differential-delay statement.....1124

**Z**

z0-increment statement.....1125

- usage guidelines.....686

z3 SONET header byte.....685

z4 SONET header byte.....685





# Index of Statements and Commands

## Symbols

802.3ad statement.....725

## A

accept-source-mac statement.....726  
 access-concentrator statement.....727  
 access-profile statement.....728  
 accounting statement.....729  
 accounting-profile statement.....729  
 acfc statement.....730  
 ack-delay-time statement.....730  
 ack-max statement.....731  
 acknowledge-retries statement.....731  
 acknowledge-timer statement.....732  
 action statement.....733  
 action-profile statement  
   applying to remote MEP.....734  
   CFM.....734  
   LFM.....735  
 action-red-differential-delay statement.....736  
 activation-delay statement.....736  
 activation-priority statement.....737  
 address statement.....738  
 advertise-interval statement.....740  
 age statement.....741  
 aggregate statement.....742  
 aggregate-ports statement.....743  
 aggregated-ether-options statement.....744  
 aggregated-sonet-options statement.....745  
 allow-any-vci statement.....745  
 allow-fragmentation statement.....746  
 allow-remote-loopback statement.....746  
 annex statement.....747  
 aps statement.....748  
 arp statement.....749  
 asynchronous-notification statement.....750  
 atm-encapsulation statement.....750  
 atm-options statement.....751  
 atm-scheduler-map statement.....752  
 authentication-key statement.....752  
 authentication-profile-name statement  
   access-profile-name.....753  
 authenticator statement.....754

auto-discovery statement.....755  
 auto-negotiation statement  
   Gigabit Ethernet.....756  
   J-series uPIM.....515, 757  
 auto-reconnect statement.....757

## B

backup-destination statement.....758  
 backup-interface statement.....758  
 backup-options statement.....759  
 bandwidth statement.....759  
 bandwidth-limit statement.....760  
 bchannel-allocation statement.....760  
 bearer-bandwidth-limit statement.....761  
 bert-algorithm statement.....762  
 bert-error-rate statement.....764  
 bert-period statement.....765  
 broadcast statement.....765  
 buildout statement.....766  
 bundle statement.....768  
 burst-size-limit statement.....768  
 byte-encoding statement.....769  
 bytes statement.....770

## C

callback statement.....771  
 callback-wait-period statement.....772  
 caller statement.....773  
 calling-number statement.....774  
 cbit-parity statement.....774  
 cbr statement.....775  
 cell-bundle-size statement.....776  
 chap statement.....777  
 chap-secret statement.....778  
 cisco-interoperability statement.....778  
 classifier statement.....779  
 clear-dont-fragment-bit statement.....779  
 client statement.....780  
 clock-rate statement.....782  
 clocking statement.....780  
 clocking-mode statement.....781  
 compatibility-mode statement.....783  
 compression statement.....784  
 compression-device statement.....785

|                                              |     |
|----------------------------------------------|-----|
| connections statement.....                   | 786 |
| connectivity-fault-management statement..... | 787 |
| container-devices statement.....             | 788 |
| device-count.....                            | 788 |
| container-list statement.....                | 788 |
| container-options statement.....             | 789 |
| container-type statement.....                | 789 |
| continuity-check statement.....              | 790 |
| control-polarity statement.....              | 790 |
| control-signal statement.....                | 791 |
| copy-tos-to-outer-ip-header statement.....   | 791 |
| core-dump statement.....                     | 792 |
| crc-major-alarm-threshold statement.....     | 792 |
| crc-minor-alarm-threshold statement.....     | 793 |
| cts statement.....                           | 793 |
| cts-polarity statement.....                  | 794 |
| current statement.....                       | 794 |

**D**

|                                            |     |
|--------------------------------------------|-----|
| data-input statement.....                  | 795 |
| dcd statement.....                         | 796 |
| dcd-polarity statement.....                | 796 |
| dce statement.....                         | 797 |
| dce-options statement.....                 | 797 |
| deactivation-delay statement.....          | 798 |
| default-action statement.....              | 798 |
| default-chap-secret statement.....         | 799 |
| default-pap-password statement.....        | 799 |
| demux-destination statement.....           | 801 |
| demux interfaces.....                      | 801 |
| demux-options statement.....               | 802 |
| demux-source statement.....                | 803 |
| demux interfaces.....                      | 803 |
| demux0 statement.....                      | 800 |
| description statement.....                 | 804 |
| destination statement.....                 | 805 |
| destination-class-usage statement.....     | 807 |
| destination-profile statement.....         | 808 |
| dial-options statement.....                | 810 |
| dial-string statement.....                 | 811 |
| dialer statement.....                      | 808 |
| dialer-options statement.....              | 809 |
| dialin statement.....                      | 810 |
| direction statement.....                   | 811 |
| disable statement.....                     | 812 |
| disable-mlppp-inner-ppp-pfc statement..... | 813 |
| dlci statement.....                        | 813 |
| dlsd statement.....                        | 814 |
| do-not-fragment statement.....             | 814 |

|                                               |     |
|-----------------------------------------------|-----|
| dot1x.....                                    | 815 |
| authenticator.....                            | 815 |
| authentication-profile-name.....              | 815 |
| interface.....                                | 815 |
| <i>See also</i> maximum-requests              |     |
| <i>See also</i> quiet-period                  |     |
| <i>See also</i> reauthentication              |     |
| <i>See also</i> retries                       |     |
| <i>See also</i> supplicant                    |     |
| <i>See also</i> supplicant-timeout            |     |
| <i>See also</i> transmit-period               |     |
| interface.....                                | 815 |
| .....                                         | 815 |
| <i>See also</i> server-timeout                |     |
| <i>See also</i> server-timeout                |     |
| down-count statement.....                     | 816 |
| drop-timeout statement.....                   | 817 |
| ds0-options statement.....                    | 817 |
| dsl-options statement.....                    | 818 |
| dsr statement.....                            | 818 |
| dsr-polarity statement.....                   | 819 |
| dte-options statement.....                    | 819 |
| dtr statement.....                            | 820 |
| dtr-circuit statement.....                    | 821 |
| dtr-polarity statement.....                   | 821 |
| dynamic-call-admission-control statement..... | 822 |

**E**

|                                         |          |
|-----------------------------------------|----------|
| e1-options statement.....               | 823      |
| e3-options statement.....               | 824      |
| encapsulation statement.....            | 825      |
| encoding statement.....                 | 832      |
| epd-threshold statement.....            | 833      |
| es-options statement.....               | 834      |
| ethernet statement.....                 | 835      |
| ethernet-policer-profile statement..... | 837      |
| ethernet-switch-profile statement.....  | 613, 838 |
| eui-64 statement.....                   | 840      |
| event-thresholds statement.....         | 839      |

**F**

|                                                |     |
|------------------------------------------------|-----|
| f-max-period statement.....                    | 850 |
| facility-override statement.....               | 840 |
| family statement.....                          | 841 |
| fastether-options statement.....               | 845 |
| fcs statement.....                             | 846 |
| feac-loop-respond statement.....               | 847 |
| filter statement.....                          | 848 |
| flexible-vlan-tagging statement.....           | 849 |
| flow-control statement.....                    | 850 |
| force statement.....                           | 851 |
| forwarding-class statement.....                | 852 |
| fragment-threshold statement (interfaces)..... | 853 |
| frame-error statement.....                     | 854 |

|                                     |     |
|-------------------------------------|-----|
| frame-period statement.....         | 855 |
| frame-period-summary statement..... | 856 |
| framing statement.....              | 857 |

**G**

|                                     |     |
|-------------------------------------|-----|
| gether-options statement.....       | 859 |
| gratuitous-arp-reply statement..... | 860 |

**H**

|                                       |     |
|---------------------------------------|-----|
| hello-timer statement.....            | 861 |
| high-plp-max-threshold statement..... | 861 |
| high-plp-threshold statement.....     | 862 |
| hold-interval statement.....          | 862 |
| hold-time statement.....              | 863 |
| host statement.....                   | 867 |

**I**

|                                       |     |
|---------------------------------------|-----|
| idle-cycle-flag statement.....        | 868 |
| idle-time statement.....              | 869 |
| idle-timeout statement.....           | 869 |
| ieee802.1p statement.....             | 870 |
| ignore statement.....                 | 870 |
| ignore-all statement.....             | 871 |
| ignore-l3-incompletes statement.....  | 871 |
| ilmi statement.....                   | 872 |
| inactivity-timeout statement.....     | 872 |
| incoming-called-number statement..... | 873 |
| incoming-map statement.....           | 873 |
| indication statement.....             | 874 |
| indication-polarity statement.....    | 874 |
| ingress-rate-limit statement.....     | 875 |
| init-command-string statement.....    | 876 |
| initial-route-check statement.....    | 877 |
| inner-tag-protocol-id statement.....  | 877 |
| inner-vlan-id statement.....          | 878 |
| inner-vlan-id-range statement.....    | 879 |
| input statement.....                  | 879 |
| input-list statement.....             | 880 |
| input-policer statement.....          | 880 |
| input-priority-map statement.....     | 881 |
| input-three-color statement.....      | 881 |
| input-vlan-map statement.....         | 882 |
| interface.....                        | 887 |
| maximum-requests.....                 | 887 |
| quiet-period.....                     | 887 |
| reauthentication.....                 | 887 |
| retries.....                          | 887 |
| server-timeout.....                   | 887 |
| supplicant.....                       | 887 |
| supplicant-timeout.....               | 887 |
| transmit-period.....                  | 887 |

|                                     |          |
|-------------------------------------|----------|
| interface statement.....            | 884      |
| CoS.....                            | 885      |
| DLSw.....                           | 884      |
| IEEE 802.1ag.....                   | 885      |
| IEEE 802.3ah.....                   | 886      |
| interface-down statement.....       | 798, 888 |
| interface-mode statement.....       | 889      |
| interface-set statement.....        | 890      |
| interface-switch statement.....     | 891      |
| interface-type statement.....       | 892      |
| interfaces statement.....           | 888      |
| interleave-fragments statement..... | 893      |
| interval statement.....             | 894      |
| inverse-arp statement.....          | 895      |
| invert-data statement.....          | 895      |
| ipsec-sa statement.....             | 896      |
| isdn-options statement.....         | 897      |

**K**

|                                         |     |
|-----------------------------------------|-----|
| keep-address-and-control statement..... | 898 |
| keepalives statement.....               | 899 |
| key statement.....                      | 900 |

**L**

|                                      |     |
|--------------------------------------|-----|
| l2tp-interface-id statement.....     | 900 |
| lACP statement.....                  | 902 |
| 802.3ad.....                         | 901 |
| layer2-policer statement.....        | 903 |
| lcp-restart-timer statement.....     | 904 |
| level statement.....                 | 904 |
| line-encoding statement.....         | 906 |
| line-protocol statement.....         | 907 |
| line-rate statement.....             | 907 |
| linear-red-profile statement.....    | 905 |
| linear-red-profiles statement.....   | 906 |
| link-adjacency-loss statement.....   | 908 |
| link-discovery statement.....        | 909 |
| link-down statement.....             | 908 |
| link-event-rate statement.....       | 909 |
| link-fault-management statement..... | 910 |
| link-layer-overhead statement.....   | 911 |
| link-mode statement.....             | 912 |
| link-protection statement.....       | 913 |
| link-speed statement.....            | 914 |
| linktrace statement.....             | 915 |
| llc2 statement.....                  | 916 |
| lmi statement.....                   | 917 |
| lmi-type statement.....              | 918 |
| load-interval statement.....         | 918 |
| load-threshold statement.....        | 919 |
| local-mac statement.....             | 919 |
| local-name statement.....            | 920 |
| local-password statement.....        | 921 |
| local-window statement.....          | 921 |

|                                          |     |
|------------------------------------------|-----|
| lockout statement.....                   | 922 |
| log-prefix statement.....                | 923 |
| logical-interface-policer statement..... | 922 |
| logical-systems statement.....           | 923 |
| long-buildout statement.....             | 924 |
| loop-timing statement.....               | 927 |
| loopback statement.....                  | 925 |
| loopback-clear-timer statement.....      | 927 |
| loss-priority statement.....             | 928 |
| loss-threshold statement.....            | 928 |
| low-plp-max-threshold statement.....     | 929 |
| low-plp-threshold statement.....         | 929 |
| lsq-failure-options statement.....       | 930 |

## M

|                                            |     |
|--------------------------------------------|-----|
| mac statement.....                         | 930 |
| mac-address statement.....                 | 931 |
| mac-learn-enable statement.....            | 932 |
| mac-validate statement.....                | 933 |
| maintenance-association statement.....     | 934 |
| maintenance-domain statement.....          | 935 |
| map statement.....                         | 936 |
| max-retry statement.....                   | 937 |
| maximum-contexts statement.....            | 937 |
| maximum-requests statement.....            | 938 |
| maximum-vcs statement.....                 | 938 |
| member-interface-speed statement.....      | 939 |
| member-interface-type statement.....       | 940 |
| member-interface-speed.....                | 940 |
| mep statement.....                         | 941 |
| minimum-links statement.....               | 942 |
| mlfr-uni-nni-bundle-options statement..... | 943 |
| mode statement.....                        | 944 |
| modem-options statement.....               | 944 |
| monitor-session statement.....             | 945 |
| mpls statement                             |     |
| ATM interfaces.....                        | 945 |
| mrru statement.....                        | 946 |
| mtu statement.....                         | 946 |
| multicast-dlci statement.....              | 947 |
| multicast-only statement.....              | 948 |
| multicast-vci statement.....               | 948 |
| multilink-max-classes statement.....       | 949 |
| multipoint statement.....                  | 949 |
| multipoint-destination statement.....      | 950 |
| multiservice-options statement.....        | 951 |

## N

|                               |     |
|-------------------------------|-----|
| n391 statement.....           | 951 |
| n392 statement.....           | 952 |
| n393 statement.....           | 952 |
| name-format statement.....    | 953 |
| native-vlan-id statement..... | 954 |

|                                              |          |
|----------------------------------------------|----------|
| ncp-restart-timer statement.....             | 955      |
| negotiate-address statement.....             | 955      |
| negotiation-options statement.....           | 956      |
| neighbor statement.....                      | 956      |
| no-allow-link-events statement.....          | 957      |
| no-asynchronous-notification statement.....  | 750      |
| no-auto-negotiation statement                |          |
| Gigabit Ethernet.....                        | 756      |
| J-series uPIM.....                           | 515, 757 |
| no-cbit-parity statement.....                | 774      |
| no-core-dump statement.....                  | 792      |
| no-feac-loop-respond statement.....          | 847      |
| no-flow-control statement.....               | 850      |
| no-gratuitous-arp-reply statement.....       | 860      |
| no-gratuitous-arp-request statement.....     | 958      |
| no-keepalives statement.....                 | 959      |
| no-long-buildout statement.....              | 924      |
| no-loop-timing statement.....                | 927      |
| no-loopback statement.....                   | 925, 926 |
| no-mac-learn-enable statement.....           | 932      |
| no-partition statement.....                  | 961      |
| no-payload-scrambler statement.....          | 986      |
| no-preempt statement.....                    | 1004     |
| no-redirects statement.....                  | 964      |
| no-source-filtering statement.....           | 1053     |
| no-syslog statement.....                     | 1066     |
| no-termination-request statement.....        | 965      |
| no-translate-discard-eligible statement..... | 1088     |
| no-translate-fecn-and-beqn statement.....    | 1088     |
| no-unframed statement.....                   | 1099     |
| no-z0-increment statement.....               | 1125     |
| non-revertive statement.....                 | 960      |

## O

|                                    |     |
|------------------------------------|-----|
| oam statement.....                 | 966 |
| oam-liveness statement.....        | 968 |
| oam-period statement.....          | 969 |
| oc-slice statement.....            | 970 |
| open-timeout statement.....        | 970 |
| operating-mode statement.....      | 971 |
| optics-options statement.....      | 972 |
| output statement.....              | 972 |
| output-list statement.....         | 973 |
| output-policer statement.....      | 973 |
| output-priority-map statement..... | 974 |
| output-three-color statement.....  | 974 |
| output-vlan-map statement.....     | 975 |
| overflow statement.....            | 977 |

## P

|                              |     |
|------------------------------|-----|
| p-bit-timeout statement..... | 987 |
| paired-group statement.....  | 978 |
| pap statement.....           | 979 |
| pap-password statement.....  | 980 |

|                                            |      |
|--------------------------------------------|------|
| partition statement.....                   | 981  |
| passive statement.....                     | 982  |
| passive-monitor-mode statement.....        | 983  |
| path-database-size statement.....          | 984  |
| path-trace statement.....                  | 985  |
| payload-scrambler statement.....           | 986  |
| pdu-interval statement.....                | 987  |
| pdu-threshold statement.....               | 988  |
| peer statement.....                        | 988  |
| peer-unit statement.....                   | 989  |
| per-unit-scheduler statement.....          | 990  |
| periodic statement.....                    | 989  |
| pfc statement.....                         | 990  |
| pic-type statement.....                    | 991  |
| plp-to-clp statement.....                  | 993  |
| plp1 statement.....                        | 992  |
| point-to-point statement.....              | 993  |
| policer statement                          |      |
| CoS.....                                   | 994  |
| interface MAC.....                         | 996  |
| pool statement.....                        | 997  |
| pop statement                              |      |
| Gigabit Ethernet IQ interfaces.....        | 998  |
| pop-all-labels statement.....              | 999  |
| pop-pop statement                          |      |
| Gigabit Ethernet IQ interfaces.....        | 1000 |
| pop-swap statement                         |      |
| Gigabit Ethernet IQ interfaces.....        | 1000 |
| port statement                             |      |
| voice services.....                        | 1001 |
| port-priority statement                    |      |
| LACP.....                                  | 1001 |
| post-service-filter statement.....         | 1002 |
| ppp-options statement.....                 | 1003 |
| pppoe-options statement.....               | 1002 |
| preempt statement.....                     | 1004 |
| preferred statement.....                   | 1005 |
| preferred-source-address statement.....    | 1006 |
| premium statement.....                     | 1007 |
| preserve-interface statement.....          | 1008 |
| primary statement                          |      |
| interface for routing platform.....        | 1009 |
| priority (IEEE 802.1ag OAM) statement..... | 1011 |
| priority statement.....                    | 1010 |
| priority-cost statement.....               | 1012 |
| promiscuous-mode statement.....            | 1012 |
| protect-circuit statement.....             | 1013 |
| protocol-down statement.....               | 1013 |
| protocols statement.....                   | 1014 |
| proxy statement.....                       | 1014 |
| proxy-arp statement.....                   | 1015 |
| push statement                             |      |
| Gigabit Ethernet IQ interfaces.....        | 1015 |
| push-push statement                        |      |
| Gigabit Ethernet IQ interfaces.....        | 1016 |

**Q**

|                             |      |
|-----------------------------|------|
| queue-depth statement.....  | 1016 |
| queue-length statement..... | 1017 |
| queues statement.....       | 1017 |
| quiet-period statement..... | 1018 |

**R**

|                                        |            |
|----------------------------------------|------------|
| rate statement.....                    | 1018       |
| reassemble-packets statement.....      | 1019       |
| reauthentication statement.....        | 1019       |
| receive-bucket statement.....          | 1020       |
| receive-options-packets statement..... | 1020       |
| receive-ttl-exceeded statement.....    | 1021       |
| red-differential-delay statement.....  | 1021       |
| redial-delay statement.....            | 1022       |
| redundancy-options statement.....      | 1023, 1024 |
| remote statement.....                  | 1025       |
| remote-loopback statement.....         | 1025       |
| remote-loopback-respond statement..... | 1026       |
| remote-mep statement.....              | 1026       |
| request statement.....                 | 1027       |
| required-depth statement.....          | 1028       |
| retries statement.....                 | 1029       |
| revert-time statement.....             | 1030       |
| revertive statement.....               | 1029       |
| rfc-2615 statement.....                | 1030       |
| routing-instance statement.....        | 1031       |
| rpf-check statement.....               | 1031       |
| rtp statement.....                     | 1032       |
| rts statement.....                     | 1032       |
| rts-polarity statement.....            | 1033       |
| rtvbr statement.....                   | 1034       |

**S**

|                                    |      |
|------------------------------------|------|
| sampling statement.....            | 1035 |
| scheduler-maps statement.....      | 1035 |
| schedulers statement.....          | 1036 |
| secondary statement.....           | 1036 |
| send-critical-event statement..... | 1037 |
| serial-options statement.....      | 1038 |
| server statement.....              | 1039 |
| server-timeout statement.....      | 1039 |
| service statement.....             | 1040 |
| service-domain statement.....      | 1040 |
| service-filter statement.....      | 1041 |
| service-name statement.....        | 1041 |
| service-set statement.....         | 1042 |
| services statement.....            | 1042 |
| services-options statement.....    | 1043 |
| shaping statement.....             | 1044 |
| shdsl-options statement.....       | 1045 |
| short-name-format statement.....   | 1045 |
| short-sequence statement.....      | 1046 |
| snext statement.....               | 1046 |

|                                           |            |
|-------------------------------------------|------------|
| snr-margin statement.....                 | 1047       |
| sonet-options statement.....              | 1048       |
| source statement.....                     | 1050       |
| source-address-filter statement.....      | 1051       |
| source-class-usage statement.....         | 1052       |
| source-filtering statement.....           | 1053       |
| speed statement.....                      | 1054, 1055 |
| spid1 statement.....                      | 1055       |
| spid2 statement.....                      | 1056       |
| stacked-vlan-tagging statement.....       | 1056       |
| start-end-flag statement.....             | 1057       |
| startup-silent-period statement.....      | 604        |
| static-tei-val statement.....             | 1057       |
| supplicant statement                      |            |
| single.....                               | 1058       |
| supplicant-timeout statement.....         | 1058       |
| swap statement                            |            |
| Gigabit Ethernet IQ interfaces.....       | 1059       |
| swap-push statement                       |            |
| Gigabit Ethernet IQ interfaces.....       | 1059       |
| swap-swap statement                       |            |
| Gigabit Ethernet IQ interfaces.....       | 1060       |
| switch-options statement.....             | 1061       |
| switch-port statement                     |            |
| access switching.....                     | 1062       |
| switch-type statement.....                | 1063       |
| switching-mode statement.....             | 1060       |
| symbol-period statement.....              | 1064       |
| syslog statement.....                     | 1065       |
| system-priority statement                 |            |
| LACP                                      |            |
| interface.....                            | 1067       |
| <b>T</b>                                  |            |
| t1-options statement.....                 | 1068       |
| t1-time statement.....                    | 1069       |
| t2-time statement.....                    | 1069       |
| t3-options statement.....                 | 1072       |
| t310 statement.....                       | 1070       |
| t391 statement.....                       | 1070       |
| t392 statement.....                       | 1071       |
| tag-protocol-id statement.....            | 1073       |
| tei-option statement.....                 | 1074       |
| threshold statement.....                  | 1075       |
| timeslots statement.....                  | 1076       |
| tm statement.....                         | 1077       |
| tm-polarity statement.....                | 1077       |
| traceoptions statement                    |            |
| interface processes.....                  | 1080       |
| interfaces.....                           | 1079       |
| LACP.....                                 | 1082       |
| PPPD.....                                 | 1084       |
| track statement                           |            |
| DLSw.....                                 | 1087       |
| translate-discard-eligible statement..... | 1088       |

|                                        |      |
|----------------------------------------|------|
| translate-fecn-and-becn statement..... | 1088 |
| transmit-bucket statement.....         | 1089 |
| transmit-clock statement.....          | 1089 |
| transmit-period statement.....         | 1090 |
| transmit-weight statement.....         | 1091 |
| traps statement.....                   | 1092 |
| trej-time statement.....               | 1093 |
| trigger statement.....                 | 1094 |
| trigger-link-failure statement.....    | 1095 |
| trunk-bandwidth statement.....         | 1095 |
| trunk-id statement.....                | 1096 |
| ttl statement.....                     | 1096 |
| tunnel statement.....                  | 1097 |

**U**

|                                     |      |
|-------------------------------------|------|
| underlying-interface statement..... | 1098 |
| unframed statement.....             | 1099 |
| unidirectional statement.....       | 1099 |
| unit statement                      |      |
| logical interfaces.....             | 1100 |
| unnumbered-address statement.....   | 1106 |
| up-count statement.....             | 1108 |

**V**

|                                 |            |
|---------------------------------|------------|
| vbr statement.....              | 1109       |
| vc-cos-mode statement.....      | 1110       |
| vci statement.....              | 1111       |
| vci-range statement.....        | 1112       |
| vlan-id statement.....          | 1113, 1115 |
| vlan-id-list statement.....     | 1115       |
| vlan-id-range statement.....    | 1116       |
| vlan-tagging statement.....     | 1116       |
| vlan-tags statement.....        | 1117       |
| vlan-tags-outer statement.....  | 1117       |
| vlan-vci-tagging statement..... | 1118       |
| vpi statement.....              | 1119, 1120 |
| vtmapping statement.....        | 1121       |

**W**

|                                |      |
|--------------------------------|------|
| watch-list statement.....      | 1121 |
| wavelength statement.....      | 1122 |
| working-circuit statement..... | 1124 |

**Y**

|                                          |      |
|------------------------------------------|------|
| yellow-differential-delay statement..... | 1124 |
|------------------------------------------|------|

**Z**

|                             |      |
|-----------------------------|------|
| z0-increment statement..... | 1125 |
|-----------------------------|------|