



Provider Backbone Bridging on MX Series Routers

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Table of Contents

Part 1	Overview	
Chapter 1	Layer 2 Forwarding	3
	Understanding Provider Backbone Bridging on MX Series Routers	3
	How PBB Improves on Q-in-Q in Layer 2 Ethernet Switching	3
	How PBB Works on MX Series Routers	4
	Understanding How Interface Sets Work With E-LINE and E-LAN Services on MX Series Routers	5
	Understanding PIP and CBP Interfaces on MX Series Routers	6
Chapter 2	Class of Service	9
	Understanding Class of Service and PBB for MX Series Routers	9
	Understanding JUNOS CoS Components for MX Series Routers	10
	Code-Point Aliases	10
	Policers	10
	Classifiers	10
	Forwarding Classes	11
	Drop Profiles	11
	Schedulers	11
	Rewrite Rules	11
Chapter 3	Connectivity Fault Management	13
	Understanding Fault Isolation and Detection in a PBB using Connectivity Fault Management for MX Series Routers	13
Part 2	Configuration	
Chapter 4	Solutions	17
	Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX series Routers	17
	Example: Configuring CoS for a PBB Network on MX Series Routers	84
	Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers	108

Chapter 5	PBB Configuration Statements	151
	bridge-domains	152
	bridge-domain-type	153
	default-bvlan	153
	default-isid	154
	family	155
	isid	159
	isid-list	159
	isid-list (interfaces)	160
	family	161
	mac-address	165
	pbb-options	165
	pbb-service-options	166
	peer-instance	166
	routing-instances	167
	service-groups	168
	service-type	169
	unit	170
	vlan-id	176
	vlan-id	177
Chapter 6	Connectivity Fault Management Configuration Statements	179
	[edit protocols oam] Hierarchy Level	179
	auto-discovery	181
	bridge-domain	181
	connectivity-fault-management	182
	continuity-check	183
	direction	184
	ethernet	185
	interface (IEEE 802.1ag OAM Connectivity-Fault Management)	187
	interval	188
	level	188
	maintenance-association	189
	maintenance-domain	190
	mep	191
	mip-half-function	192
	virtual-switch	192
Chapter 7	CoS Configuration Statements	193
	buffer-size	193
	classifiers (Definition)	194
	code-point	194
	code-points	195
	family	196
	filter	197

firewall	198
forwarding-classes	198
ieee-802.1	199
interfaces	199
interface-set	200
interface-set (Ethernet Interfaces)	200
loss-priority (Rewrite Rules)	201
loss-priority (BA Classifiers)	202
output-traffic-control-profile	203
policer	204
rewrite-rules (Definition)	205
scheduler (Scheduler Map)	206
scheduler-maps (For Most Interface Types)	206
scheduler-maps (For Most Interface Types)	207
schedulers (Class-of-Service)	208
term	209
traffic-control-profiles	210
transmit-rate	211

Chapter 8 Interface Set Statements 213

interface-set (Ethernet Interfaces)	213
interface-set	214

Part 3 Administration

Chapter 9 PBB Monitoring Commands 217

show bridge mac-table	218
show interfaces (Gigabit Ethernet)	221
show l2-learning backbone-instance	228
show l2-learning provider-instance	231
show l2-learning remote-backbone-edge-bridge	234

Chapter 10 CoS Monitoring Commands 237

show class-of-service interface-set	238
show class-of-service scheduler-map	240
show class-of-service traffic-control-profile	242
show firewall	244
show interfaces interface-set queue	247

Chapter 11 Connectivity Fault Management Monitoring Commands 255

show class-of-service interface-set	256
show oam ethernet connectivity-fault-management interfaces	258

show oam ethernet connectivity-fault-management mep-database	264
show oam ethernet connectivity-fault-management mip	270
traceroute ethernet	271

Part 4	Troubleshooting	
---------------	------------------------	--

Chapter 12	Knowledge Base	275
-------------------	-----------------------	------------

Part 5	Index	
---------------	--------------	--

Index	279
-------------	-----

List of Figures

Part 1

Overview

Chapter 1	Layer 2 Forwarding	3
	Figure 1: Relationship of Forwarding Classes, Services, Interface Sets, and Physical Interface	6

Part 2

Configuration

Chapter 4	Solutions	17
	Figure 2: Network Topology for E-LAN Service in a Provider Bridged Network	19
	Figure 3: Network Topology for E-LINE Service in a Provider Bridged Network	20
	Figure 4: Network Topology for CoS for Provider Backbone Bridging	86
	Figure 5: Egress Shaping	87
	Figure 6: Achieving Ingress SLA by Applying Policers for Each Traffic Class	88
	Figure 7: Network Topology for the PBBN	110
	Figure 8: Network Topology for the PBN	112

List of Tables

Part 2

Configuration

Chapter 4	Solutions	17
	Table 1: Components of the Topology for Configuring E-LINE and E-LAN Service on MX Series Routers	20
	Table 2: BEB1 Mapping	24
	Table 3: BEB2 Mapping	33
	Table 4: BEB2 Mapping	39
	Table 5: BEB4 Mapping	45
	Table 6: ES1 C-VLAN to S-VLAN Mapping	55
	Table 7: ES3 C-VLAN to S-VLAN Mapping	58
	Table 8: ES4 C-VLAN to S-VLAN Mapping	61
	Table 9: Egress SLA Enforcement	87
	Table 10: Ingress SLA Enforcement	88
	Table 11: Components of the Topology for Configuring CoS on MX Series Routers	88
	Table 12: CFM Components Configured for the PBBN	111
	Table 13: CFM Components Configured for the PBN	112

Part 3

Administration

Chapter 9	PBB Monitoring Commands	217
	Table 14: show bridge mac-table Output fields	219
	Table 15: show l2-learning instance Output Fields	228
	Table 16: show l2-learning instance Output Fields	231
	Table 17: show l2-learning instance Output Fields	234
Chapter 10	CoS Monitoring Commands	237
	Table 18: show class-of-service interface-set Output Fields	238
	Table 19: show class-of-service scheduler-map Output Fields	240
	Table 20: show class-of-service traffic-control-profile Output Fields	242
	Table 21: show firewall Output Fields	244
	Table 22: Ethernet show interfaces interface-set queue Output Fields	248
Chapter 11	Connectivity Fault Management Monitoring Commands	255
	Table 23: show class-of-service interface-set Output Fields	256
	Table 24: show oam ethernet connectivity-fault-management interfaces Output Fields	258
	Table 25: show oam ethernet connectivity-fault-management mep-database Output Fields	265
	Table 26: show oam ethernet connectivity-fault-management mip Output Fields	270
	Table 27: traceroute ethernet Output Fields	271

Part 1

Overview

- Layer 2 Forwarding on page 3
- Class of Service on page 9
- Connectivity Fault Management on page 13

Chapter 1

Layer 2 Forwarding

- Understanding Provider Backbone Bridging on MX Series Routers on page 3
- Understanding How Interface Sets Work With E-LINE and E-LAN Services on MX Series Routers on page 5
- Understanding PIP and CBP Interfaces on MX Series Routers on page 6

Understanding Provider Backbone Bridging on MX Series Routers

Provider backbone bridging (PBB) extends Layer 2 Ethernet switching to provide enhanced scalability, quality of service (QoS) features, and carrier-class reliability. The Juniper Networks JUNOS Software implementation of PBB supports the IEEE 802.1ah standard.

This topic describes the following concepts regarding PBB on Juniper Networks MX Series routers:

- How PBB Improves on Q-in-Q in Layer 2 Ethernet Switching on page 3
- How PBB Works on MX Series Routers on page 4

How PBB Improves on Q-in-Q in Layer 2 Ethernet Switching

When provider bridges (also known as Q-in-Q) extended Layer 2 Ethernet switching to create a two-level system of customer bridges and provider bridges, the solution adequately supported the needs of enterprise networks, but fell short of service provider network requirements.

The IEEE 802.1ad standard supporting Q-in-Q provides for an additional Q-tag that splits the VLAN plane to create two separate VLAN ID (VID) fields: a customer bridge VLAN ID (C-VID) used by customers and a provider bridge VLAN ID (S-VID) used by service providers. This hierarchical layer allows a packet from a C-VID to travel through the customer VLAN, then “stacks” a tag by adding an additional 802.1q tag for the service provider to facilitate segregated travel through a service provider’s VLAN. As the packet leaves the S-VID, the extra tag is removed in the downstream direction.

Provider bridge networks (PBNs) have the following limitations:

- Limited number of service instances—PBNs can support a maximum of 4096 service instances per PBN.

- Potential scaling issue—Service provider switches supporting 802.1ad control their own bridges (S-VIDs), but are also required to learn all customer end-station MAC addresses. As a service provider supports more customers, the increased number of learned MAC addresses doesn't scale according to needs. When the number of entries exceeds the capacity permitted in the forwarding table, the forwarding table overflows and can potentially trigger a broadcast storm in the provider network.
- No clear demarcation between customer and provider networks—Customer networks cannot be cleanly separated from provider networks. A clear demarcation point determines what services are provisioned and how fault and performance management is performed for the services provided.

PBB (also known as MAC-in-MAC) is used by service providers to resolve these problems. PBBNs have the following benefits:

- Imposes no change to the Ethernet switching process in the core bridges.
- Supports Ethernet transparent LAN (E-LAN), Ethernet private line (E-LINE), and Ethernet tree service (E-TREE) connectivity models.
- Separates Ethernet as a service from Ethernet as infrastructure.
- Provides a clear demarcation between the customer and provider domain.
- Learns customer MAC addresses only through the backbone edge bridges (BEBs).
- Supports up to 16 million service instances.
- Achieves additional PBBN scaling and interconnection using hierarchical and peer PBBN features.

PBB duplicates the MAC layer of the customer packet and keeps it separate from the provider domain, creating an infrastructure that is transparent from a customer network. BEBs append their forwarding fields (source address [B-SA], destination address [B-DA] and a backbone VID [B-VID]) with the MAC address and a service identifier (I-SID) at the border. A service provider switch only encapsulates the MAC addresses at the edge, between the customer cloud and the provider cloud on the BEB.

To solve the issue of identifying a customer service instance, a new 24-bit I-SID field is used. I-SIDs enable a PBB to support up to 16 million service instances without any impact to the forwarding fields (B-VID, B-SA, and B-DA).

How PBB Works on MX Series Routers

A provider backbone bridged network (PBBN) is composed of a set of BEBs interconnected by some or all of the S-VLANs supported by a PBN. Each BEB provides interfaces that encapsulate (or verify the encapsulation of) customer frames, thus allowing customer MAC (C-MAC) addresses and VLANs to be independent of the backbone MAC (B-MAC) addresses and VLANs administered by the PBBN operator. The backbone is segregated into broadcast domains by means of a VLAN identifier (B-VID). A new 24-bit service identifier (I-SID) is defined and used to associate a given customer MAC frame with a provider service instance (also called the service delimiter).

To configure PBB on an MX Series router, configure an I-component routing instance and a B-component routing instance. The B-component is the provider routing instance. Each B-component routing instance contains the B-VLAN bridge domains of a PBBN network that map the backbone service instance tag (I-Tag) to a BVLAN. The I-component is the customer routing instance. The I-component contains the SVLAN bridge domains of a PBN network that map to a backbone service instance tag (I-Tag). Each SVLAN is uniquely mapped to a single ISID (1:1 mapping), or multiple SVLANs can be mapped to an ISID (N:1 mapping).

Each I-component routing instance must be associated with a **pip** interface, and each B-component routing instance must be associated with a **cbp** interface. These interfaces provide a connection between the customer routing instances (PBN or PBBN I-component) and a provider routing instance (PBBN B-component).

MX Series routers support multiple PBBNs (B-components) on a single router. Each router can support up to 16 PBBNs.

The JUNOS Software also supports enhanced carrier-level CoS and IEEE 802.1ag connectivity fault management (CFM) for PBB.

To configure PBB, include the **routing-instance** *instance-name* statement at the [edit] hierarchy level. You must create a routing instance for both the I-component and B-component.

- Related Topics**
- Understanding How Interface Sets Work With E-LINE and E-LAN Services on MX Series Routers on page 5
 - Understanding PIP and CBP Interfaces on MX Series Routers on page 6
 - Understanding Class of Service and PBB for MX Series Routers on page 9
 - Understanding JUNOS CoS Components for MX Series Routers on page 10
 - Understanding Fault Isolation and Detection in a PBB using Connectivity Fault Management for MX Series Routers on page 13

Understanding How Interface Sets Work With E-LINE and E-LAN Services on MX Series Routers

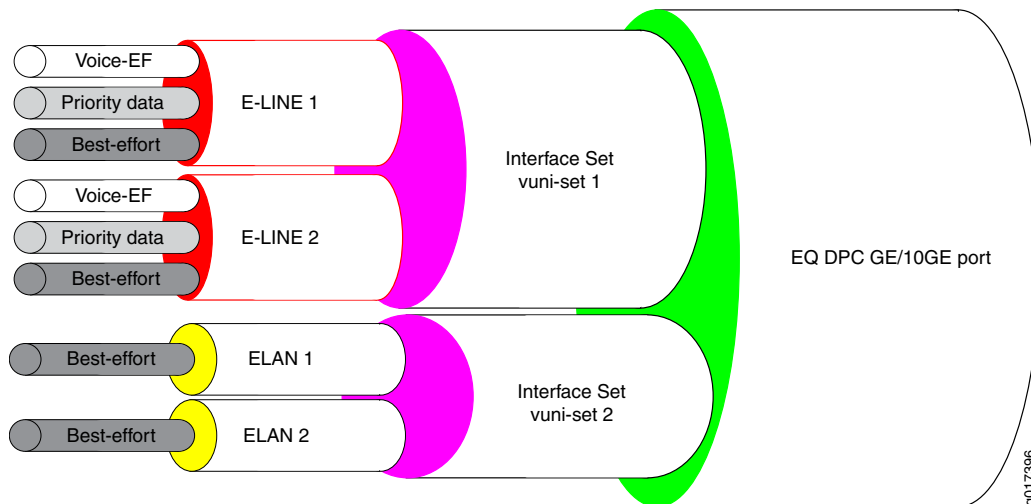
Provider backbone bridging (PBB) extends Layer 2 Ethernet switching to provide enhanced scalability, quality of service (QoS) features, and carrier-class reliability in service provider networks. The JUNOS Software implementation of PBB supports the IEEE 802.1ah (PBB) standards including the provisioning of Ethernet private line (E-LINE) (point-to-point) and Ethernet transparent LAN (E-LAN) (point-to-multipoint) services.

To support hierarchical CoS schedulers on Ethernet interfaces and to transport E-LINE and E-LAN traffic over the provider backbone bridged network (PBBN) core, you can configure an existing feature in JUNOS Software called an *interface set*. An interface set groups a number of logical interfaces into one interface set name.

Figure 1 on page 6 shows the relationship of the forwarding classes in this example. The three types of forwarding classes are **Voice-EF**, **VPN-PR-DATA**, and **INET-BEST-EFFORT**. These forwarding classes are associated with E-LINE 1, E-LINE 2,

E-LAN 1, and E-LAN 2. E-LINE 1 and E-LINE 2 are bundled into interface set **vuni-set1**. E-LAN 1 and E-LAN 2 are bundled into interface set **vuni-set2**. The interface set then transports packets through the physical interface. Interface sets provide the same function as a *virtual UNI* in the carrier Ethernet.

Figure 1: Relationship of Forwarding Classes, Services, Interface Sets, and Physical Interface



To configure an interface set, include the `interface-set` statement at the [edit interfaces] hierarchy level.

- Related Topics**
- Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX series Routers on page 17
 - Example: Configuring CoS for a PBB Network on MX Series Routers on page 84
 - Understanding Provider Backbone Bridging on MX Series Routers on page 3

Understanding PIP and CBP Interfaces on MX Series Routers

The JUNOS Software supports provider backbone bridging (PBB) described in the IEEE 802.1ah standard. When configuring PBB in carrier Ethernet networks, configure new pseudo-logical interfaces to provide a connection between customer routing instances (PBBN I-component) and provider routing instance (PBBN B-component).

The interfaces `cpb` and `pip` are pseudo-logical interfaces in a PBBN network. A customer backbone port (CBP) is a backbone edge bridge (BEB) port that receives and transmits I-tagged frames for multiple customers, and assigns B-VIDs and translates I-SIDs on the basis of a received I-SID. A provider instance port (`pip`) logical interface in a PBBN can transmit and receive S-tagged frames and map them to a service identifier (I-SID) while optionally stripping the S-VLAN tag.

Multiple customer routing instances must be associated with a single PBBN provider routing instance. To do this, configure a `cpb` pseudo-logical interface in the

B-component of the BEB and a **pip** pseudo-logical interface in each of the I-components of the BEB.

Configure **cpb** and **pip** pseudo-logical interfaces in the same way that you configure other logical interfaces in the JUNOS Software.

To configure a **cbp** or a **pip** pseudo-logical interface, include the **cbp** or **pip** statement at the `[edit interface interface-name unit logical-unit-number]` hierarchy level, then associate the interface to a routing instance by including the `interface [cbp | pip]` statement at the `[edit routing-instances instance-name]` hierarchy level.

- Related Topics**
- Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX series Routers on page 17
 - Understanding Provider Backbone Bridging on MX Series Routers on page 3

Chapter 2

Class of Service

- Understanding Class of Service and PBB for MX Series Routers on page 9
- Understanding JUNOS CoS Components for MX Series Routers on page 10

Understanding Class of Service and PBB for MX Series Routers

Provider backbone bridging (PBB) extends Layer 2 Ethernet switching to provide enhanced scalability, quality of service (QoS) features, and carrier-class reliability. The JUNOS Software implementation of PBB supports the IEEE 802.1ah standard.

Class-of-service (CoS) support for PBB enables information to be mapped and carried across a provider backbone bridge. Service information is mapped and carried across the network using three bits of priority code point (PCP) and one bit of drop eligibility indicator (DEI). The PCP and DEI bits are present in the service VLAN (S-VLAN) and the backbone service instance identifier (ISID).

To provide appropriate QoS treatment inside the MX Series router and transport QoS information across the network, it is important to provide capabilities to classify and rewrite (mark) the PCP + DEI from one tag to another.

Behavior aggregate (BA) classification is used to classify a packet into various forwarding classes (FCs) and packet loss priorities (PLPs) based on certain fields of the packet. A VLAN-tagged logical interface can be configured to classify packets based on the PCP and DEI bits using the existing IEEE 802.1p (only PCP) or IEEE 802.1ad (PCP and DEI) classifier.

To classify packets for a VLAN-tagged logical interface based only on the PCP bits, include the `ieee-802.1` statement at the `[edit class-of-service interfaces interface-name unit logical-unit-number classifiers]` hierarchy level. To classify packets based on both PCP and DEI bits, include the `ieee-802.1ad` statement at the same hierarchy level.

A rewrite rule sets the appropriate CoS bits in the outgoing packet, thus allowing the next downstream device to classify the packet into the appropriate service group. A VLAN-tagged logical interface can be configured to rewrite the PCP and DEI classifier of outgoing packets based on the forwarding class and the loss priority using IEEE 802.1p (PCP) or IEEE 802.1ad (PCP and DEI) rewrite rules.

To rewrite packets for a VLAN-tagged logical interface using the existing IEEE 802.1p (PCP) rewrite rules, include the `ieee-802.1` statement at the `[edit class-of-service interfaces interface-name unit logical-unit-number rewrite-rules]` hierarchy level. To

classify packets based on the IEEE 802.1ad (PCP and DEI) rewrite rules, include the `ieee-802.1ad` statement at the same hierarchy level.

To further support CoS for PBB, new ISID and DEI terms are available when configuring firewall filters. Include terms at the `[edit firewall family bridge filter filter-name term term-name]` hierarchy level.

- Related Topics**
- Understanding JUNOS CoS Components for MX Series Routers on page 10
 - Understanding Bridging and VLANs on EX Series Switches
 - Example: Configuring CoS for a PBB Network on MX Series Routers on page 84

Understanding JUNOS CoS Components for MX Series Routers

This topic describes the JUNOS class-of-service (CoS) components for Juniper Networks MX Series routers:

- Code-Point Aliases on page 10
- Policers on page 10
- Classifiers on page 10
- Forwarding Classes on page 11
- Drop Profiles on page 11
- Schedulers on page 11
- Rewrite Rules on page 11

Code-Point Aliases

A code-point alias assigns a name to a pattern of code-point bits. You can use this name instead of the bit pattern when you configure other CoS components such as classifiers, drop-profile maps, and rewrite rules.

Policers

Policers limit traffic of a certain class to a specified bandwidth and burst size. Packets exceeding the policer limits can be discarded. You define policers with filters that can be associated with input interfaces.

Classifiers

Packet classification associates incoming packets with a particular CoS servicing level. In JUNOS Software, classifiers associate packets with a forwarding class and loss priority and assign packets to output queues based on the associated forwarding class. JUNOS Software supports two general types of classifiers:

- Behavior aggregate or CoS value traffic classifiers—Examine the CoS value in the packet header. The value in this single field determines the CoS settings applied to the packet. BA classifiers allow you to set the forwarding class and loss priority of a packet based on the Differentiated Services code point (DSCP) value, IP precedence value, and IEEE 802.1p value.

- Multifield traffic classifiers—Examine multiple fields in the packet such as source and destination addresses and source and destination port numbers of the packet. With multifield classifiers, you set the forwarding class and loss priority of a packet based on firewall filter rules.

Forwarding Classes

Forwarding classes group the packets for transmission. Based on forwarding classes, you assign packets to output queues. Forwarding classes affect the forwarding, scheduling, and marking policies applied to packets as they transit a switch. By default, four categories of forwarding classes are defined: best effort, assured forwarding, expedited forwarding, and network control. For MX Series routers, 16 forwarding classes are supported, providing granular classification capability.

Drop Profiles

Drop profile is a mechanism that defines parameters that allow packets to be dropped from the network. Drop profiles define the meanings of the loss priorities. When you configure drop profiles, you are essentially setting the value for queue fullness. The queue fullness represents a percentage of the queue used to store packets in relation to the total amount that has been allocated for that specific queue.

Loss priorities set the priority of dropping a packet. Loss priority affects the scheduling of a packet without affecting the packet's relative ordering. You can use the loss priority setting to identify packets that have experienced congestion. Typically you mark packets exceeding some service level with a high loss priority.

Schedulers

Each switch interface has multiple queues assigned to store packets. The switch determines which queue to service based on a particular method of scheduling. This process often involves determining which type of packet should be transmitted before another. You can define the priority, bandwidth, delay buffer size, and drop profiles to be applied to a particular queue for packet transmission.

A scheduler map associates a specified forwarding class with a scheduler configuration. You can associate up to four user-defined scheduler maps with the interfaces.

Rewrite Rules

A rewrite rule sets the appropriate CoS bits in the outgoing packet, thus allowing the next downstream device to classify the packet into the appropriate service group. Rewriting, or marking, outbound packets is useful when the switch is at the border of a network and must alter the CoS values to meet the policies of the targeted peer.



NOTE: Egress firewall filters can also assign forwarding class and loss priority so that the packets are rewritten based on forwarding class and loss priority.

Related Topics ■ Example: Configuring CoS for a PBB Network on MX Series Routers on page 84

- Understanding Class of Service and PBB for MX Series Routers on page 9

Chapter 3

Connectivity Fault Management

- Understanding Fault Isolation and Detection in a PBB using Connectivity Fault Management for MX Series Routers on page 13

Understanding Fault Isolation and Detection in a PBB using Connectivity Fault Management for MX Series Routers

Connectivity Fault Management (CFM) provides fault isolation and detection over large Layer 2 networks which may span several service provider networks. Provider backbone bridging (PBB) extends Layer 2 Ethernet switching to provide enhanced scalability, QoS features, and carrier-class reliability in service provider networks. CFM is used with PBB to support that carrier-class reliability. CFM is used to monitor, isolate and verify the faults in a network. The JUNOS Software implementation of PBB supports the IEEE 802.1ah (PBB) and IEEE 802.1ag (CFM) standards.

PBB defines an architecture and bridge protocols for connecting multiple provider bridge networks (PBN). A Provider Backbone Bridged Network (PBBN) comprises a set of Backbone Edge Bridges (BEBs) interconnected by some or all of the service VLANs (S-VLANs) supported by a Provider Bridged Network (PBN). S-VLANs are first encapsulated with an I-TAG to uniquely identify the service with PBBN and then are encapsulated within a B-VLAN to be carried over the PBBN core.

CFM uses a set of protocols (Continuity Check, Linktrace and Loopback) for operation, administration and management (OAM) to provide fault isolation and detection. OAM is enabled in a PBN or PBBN by customers, service providers, and network operators in their respective maintenance domains. The OAM operations in PBN and PBBN can coexist and are independent of each other.

In the OAM protocol, the end nodes in maintenance domains are called maintenance end points (MEPs) and initiate OAM processes.

Intermediate nodes respond to these OAM processes and are called maintenance intermediate points (MIPs). MIPs are configured for the I-Component of the BEB. Using MEPs and MIPs, CFM provides end-to-end connectivity in the S-VLAN.

To configure a MEP or a MIP, include the `mep` or `mip` statement at the `[edit protocols oam ethernet connectivity-fault-management maintenance-domain domain-name maintenance-association]` hierarchy level.



NOTE: UP MEPs for S-VLANs within an I-component are not supported.

To enable the continuity check protocol to provide fault detection and notification, include the `continuity-check` statement at the `[edit protocols oam ethernet connectivity-fault-management maintenance-domain domain-name maintenance-association]` hierarchy level.

The Linktrace protocol provides path discovery and fault verification. Linktrace is enabled by default and can be used whenever a MEP is configured.

The Loopback protocol (modeled on the standard IP ping) is used to perform fault verification and isolation after a fault is detected. Loopback, like Linktrace, is enabled by default and can be used whenever a MEP is configured.

- Related Topics**
- Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers on page 108
 - Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX series Routers on page 17
 - Understanding Provider Backbone Bridging on MX Series Routers on page 3

Part 2

Configuration

- Solutions on page 17
- PBB Configuration Statements on page 151
- Connectivity Fault Management Configuration Statements on page 179
- CoS Configuration Statements on page 193
- Interface Set Statements on page 213

Chapter 4

Solutions

- Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX series Routers on page 17
- Example: Configuring CoS for a PBB Network on MX Series Routers on page 84
- Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers on page 108

Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX series Routers

The IEEE 802.1ah provider backbone bridge (PBB) is a new standard for connecting and interoperating with provider backbone networks. PBB for MX Series routers supports Ethernet private line (E-LINE) and Ethernet transparent LAN (E-LAN) services on the same PBBN network. In an E-LINE service, premises are connected with a point-to-point Ethernet link. E-LAN services are the multipoint version of E-LINE services and are ideal for multi-site companies that require a transparent Layer 2 Virtual LAN.

The MX Series routers provides a solution to deliver these services, including:

- Class of service (CoS)—to reliably deliver the correct amount of bandwidth and quality of service to subscribers.
- Connectivity fault management (CFM)—to monitor, isolate and verify faults in the network.
- Multiple Spanning Tree Protocol (MSTP)—to ensure that services are carried through a loop-free topology for multiple optimization.

This example describes how to configure two E-LAN services and two E-LINE services for one customer on a PBBN, and demonstrates:

- How to configure an MX Series router to load-balance traffic on a per-VLAN basis to optimally utilize links in the PBBN.
- How to configure an MX Series router to carry E-LINE and E-LAN traffic (from the same customer or multiple customers) on the same PBBN.

To configure services in a PBBN, perform these tasks:

- Requirements on page 18
- Overview and Topology on page 18

- Configuring E-LINE and E-LAN Services on BEB1 (Sangiovese) on page 24
- Configuring E-LINE Service on BEB2 (Barbera) on page 33
- Configuring E-LAN Services on BEB3 (Malbec) on page 39
- Configuring E-LINE and E-LAN Services on BEB4 (Cubs) on page 45
- Configuring Routing Instances and Interfaces on ES1 (Pinot Noir) on page 54
- Configuring a Routing Instance and Interfaces on ES3 (Dolcetto) on page 58
- Configuring a Routing Instance and Interfaces on ES4 (Reds) on page 61
- Configuring a Routing Instance and Interfaces on BCB1 (Syrah) on page 66
- Configuring a Routing Instance and Interfaces on BCB2 (Cabernet) on page 70
- Verification on page 73

Requirements

This example uses the following hardware and software components:

- JUNOS Release 10.0 or later for MX Series routers
- 9 MX Series routers in a PBB configuration

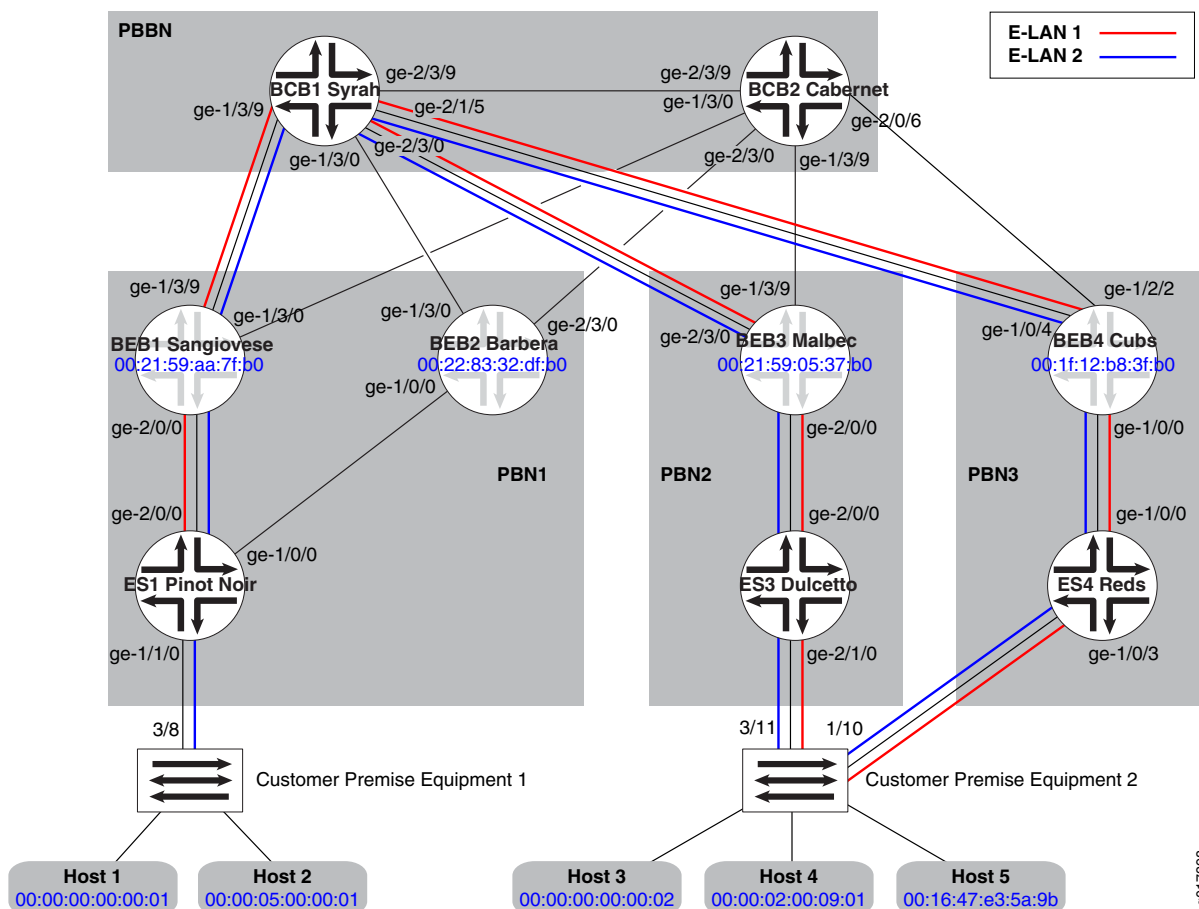
Before you configure the routers for PBB and services, be sure you have:

- Installed your MX Series routers.
- Performed the initial router configuration.

Overview and Topology

Figure 2 on page 19 displays the E-LAN service topology for this example. A provider backbone bridge network (PBBN) containing Backbone Core Bridge 1 and 2 (BCB1 and BCB2) provide services for Provider Bridged Networks 1, 2, and 3 (PBN1, PBN2, and PBN3). PBN1 contains Backbone Edge Bridge 1 and 2 (BEB1 and BEB2) and Edge Switches 1 (ES1). PBN2 contains BEB3 and ES3. PBN3 contains BEB4 and ES4. All connecting lines between the PBBN, PBN1, PBN2, and PBN3 represent the E-LAN service.

The active paths shown in the topology are based on the MSTP configuration in the PBBN core network and the resulting paths for all traffic through the network.

Figure 2: Network Topology for E-LAN Service in a Provider Bridged Network

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Figure 3 on page 20 displays the E-LINE service topology for this example. The two E-LINES are shown using the default path created through the MSTP configuration. The active paths shown in the topology are based on the MSTP configuration in the PBBN core network and the resulting paths for all traffic through the network. A PBBN provides services for provider bridged networks in BEB1, BEB2, and BEB3.

Figure 3: Network Topology for E-LINE Service in a Provider Bridged Network

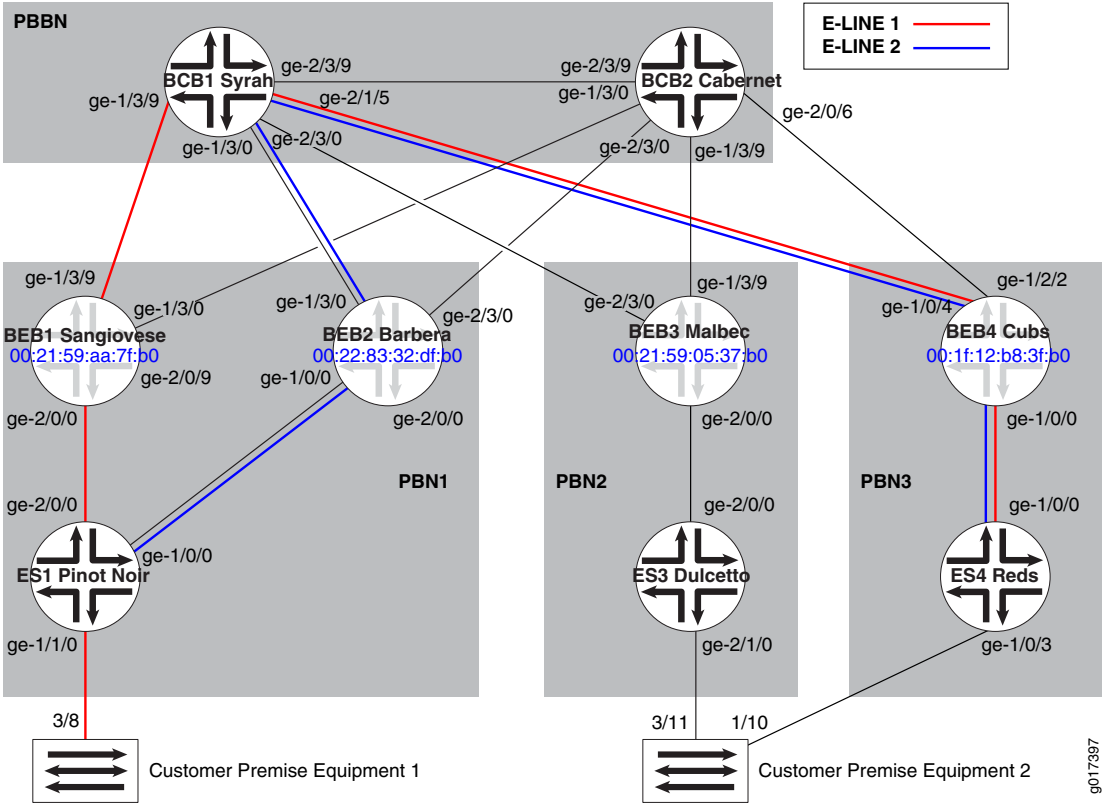


Table 1 on page 20 shows the different properties that will be configured for E-LINE and E-LAN services on the MX Series routers in the topology.

Table 1: Components of the Topology for Configuring E-LINE and E-LAN Service on MX Series Routers

Property	Settings
Backbone edge bridges	<div>PBN1 contains:<ul style="list-style-type: none">■ BEB1■ BEB2</div> <div>PBN2 contains:<ul style="list-style-type: none">■ BEB3</div> <div>PBN3 contains:<ul style="list-style-type: none">■ BEB4</div>
Backbone core bridges	<div>The PBBN contains the following BCBs:<ul style="list-style-type: none">■ BCB1■ BCB2</div>

Table 1: Components of the Topology for Configuring E-LINE and E-LAN Service on MX Series Routers *(continued)*

Property	Settings
Edge switches	<p>The edge switches are connected to the following BEBs:</p> <ul style="list-style-type: none"> ■ ES1–Connected to BEB1 and BEB2. ■ ES3–Connected to BEB3. ■ ES4–Connected to BEB4.
Backbone core bridges	<p>The PBBN contains the following BCBs:</p> <ul style="list-style-type: none"> ■ BCB1 ■ BCB2
BEB1 (Sangiovese) configuration	<p>BEB1 is physically connected to BCB1 and BCB2 in the following manner:</p> <ul style="list-style-type: none"> ■ Connected to BCB1 through interface ge-1/3/9 ■ Connected to BCB2 through interface ge-1/3/0 <p>The following routing instance is configured for the B-component (PBBN):</p> <ul style="list-style-type: none"> ■ The routing instance name is pbbn-1. ■ The pseudo-logical interface is cbp0.0. ■ The logical interfaces ge-1/3/0.0 and ge-1/3/9.0 are associated with pbbn-1. ■ MSTP is configured for the routing instance. ■ The routing instance has the bridging domains eline-bvlan and elan-bvlan. <p>The following routing instance is configured for the I-component (PBN) for E-LAN services:</p> <ul style="list-style-type: none"> ■ The routing instance name is pbn-1-for-elan. ■ The pseudo-logical interface is pip0.1. ■ The logical interfaces ge-2/0/0.3 and ge-2/0/0.4 are associated with the routing instance pbn-1-for-elan. ■ The bridging domain is elan-svlans. ■ The service groups are elan1 and elan2. ■ The peer PBBN routing instance is pbbn-1. <p>The following routing instance is configured for the I-component (PBN):</p> <ul style="list-style-type: none"> ■ The routing instance name is pbn-1-for-eline. ■ The pseudo-logical interface is pip0.0. ■ The logical interfaces ge-2/0/0.1 and ge-2/0/0.2 are associated with the routing instance pbn-1-for-eline. ■ The bridging domains are bd1 and eline-svlans. ■ The service group is eline1. ■ The peer PBBN routing instance is pbbn-1.

Table 1: Components of the Topology for Configuring E-LINE and E-LAN Service on MX Series Routers *(continued)*

Property	Settings
BEB2 (Barbera) configuration	<p>BEB2 is physically connected to BCB1 and BCB2 in the following manner:</p> <ul style="list-style-type: none"> ■ Connected to BCB1 through interface ge-1/3/0 ■ Connected to BCB2 through interface ge-2/3/0 <p>The following routing instance is configured for the B-component (PBBN):</p> <ul style="list-style-type: none"> ■ The routing instance name is pbbn-1. ■ The pseudo-logical interface is cbp0.0. ■ The logical interfaces ge-1/3/0.0 and ge-1/3/9.0 are associated with pbbn-1. ■ MSTP is configured for the routing instance. ■ The routing instance has the bridging domains eline-bvlan and elan-bvlan. <p>The following routing instance for E-LINE service is configured for the I-component (PBN):</p> <ul style="list-style-type: none"> ■ The routing instance name is pbn-1-for-eline. ■ The pseudo-logical interface is pip0.0. ■ The logical interfaces ge-1/0/0.1 and ge-1/0/0.2 are associated with the routing instance pbn-1-for-eline. ■ The bridging domains are bd1 and eline-svlans. ■ The service group is eline2. ■ The peer PBBN routing instance is pbbn-1.
BEB3 (Malbec) configuration	<p>BEB3 is physically connected to BCB2 through interface ge-1/3/9.</p> <p>The following routing instance is configured for the B-component (PBBN):</p> <ul style="list-style-type: none"> ■ The routing instance name is pbbn-1. ■ The pseudo-logical interface is cbp0.0. ■ The logical interfaces ge-1/3/9.0 and ge-2/3/0.0 are associated with pbbn-1. ■ MSTP is configured for the routing instance. ■ The routing instance has the bridging domain elan-bvlan. <p>The following routing instance is configured for the I-component (PBN) for E-LAN services:</p> <ul style="list-style-type: none"> ■ The routing instance name is pbn-2-for-elan. ■ The pseudo-logical interface is pip0.1. ■ The logical interfaces ge-2/0/0.3 and ge-2/0/0.4 are associated with routing instance pbn-2for-elan. ■ The bridging domain is elan-svlans. ■ The service groups are elan1 and elan2. ■ The peer PBBN routing instance is pbbn-1.

Table 1: Components of the Topology for Configuring E-LINE and E-LAN Service on MX Series Routers *(continued)*

Property	Settings
BEB 4 (Cubs) configuration	<p>BEB4 is physically connected to BCB1 and BCB2 in the following manner:</p> <ul style="list-style-type: none"> ■ Connected to BCB1 through interfaces ge-2/0/5 and ge-2/1/5 ■ Connected to BCB2 through interfaces ge-2/0/5 and ge-2/0/6 <p>The following routing instance is configured for the B-component (PBBN):</p> <ul style="list-style-type: none"> ■ The routing instance name is pbbn-1. ■ The pseudo-logical interface is cbp0.0. ■ The logical interfaces ge-1/0/4.0 and ge-1/2/2.0 are associated with pbbn-1. ■ MSTP is configured for the routing instance. ■ The routing instance has the bridging domains eline-bvlan and elan-bvlan. <p>The following routing instance is configured for the I-component (PBN) for E-LAN services:</p> <ul style="list-style-type: none"> ■ The routing instance name is pbn3-for-elan. ■ The pseudo-logical interface is pip0.1. ■ The logical interfaces ge-1/0/0.3 and ge-1/0/0.4 are associated with routing instance pbn-3-for-elan. ■ The bridging domain is elan-svlans. ■ The service groups are elan1 and elan2. ■ The peer PBBN routing instance is pbbn-1. <p>The following routing instance is configured for the I-component (PBN):</p> <ul style="list-style-type: none"> ■ The routing instance name is pbn-3-for-eline. ■ The pseudo-logical interface is pip0.0. ■ The logical interfaces ge-2/0/0.1 and ge-2/0/0.2 are associated with the routing instance pbn-1-for-eline. ■ The bridging domain is eline-svlans. ■ The service groups are eline1 and eline2. ■ The peer PBBN routing instance is pbbn-1.
BCB 1 (Syrah) configuration	<p>BCB1 is physically connected to the BEBs in the following manner:</p> <ul style="list-style-type: none"> ■ Connected to BEB1 through interface ge-1/3/9 ■ Connected to BEB2 through interface ge-1/3/0 ■ Connected to BEB3 through interface ge-2/3/0 ■ Connected to BEB4 through interface ge-1/0/4 <p>The following routing instance is configured for the PBBN:</p> <ul style="list-style-type: none"> ■ The routing instance name is pbbn-1. ■ The logical interfaces ge-1/3/0.0, ge-1/3/9.0, ge-2/1/5.0, ge-2/3/0.0, and ge-2/3/9.0 are associated with pbbn-1. ■ MSTP is configured for the routing instance. ■ The routing instance has the bridging domains eline-bvlan and elan-bvlan.

Table 1: Components of the Topology for Configuring E-LINE and E-LAN Service on MX Series Routers *(continued)*

Property	Settings
BCB 2 (Cabernet) configuration	<p>BCB2 is physically connected to the BEBs in the following manner:</p> <ul style="list-style-type: none"> ■ Connected to BEB1 through interface ge-1/3/0 ■ Connected to BEB2 through interface ge-2/3/0 ■ Connected to BEB3 through interface ge-1/3/9 <p>The following routing instance is configured for the PBBN:</p> <ul style="list-style-type: none"> ■ The routing instance name is pbbn-1. ■ The logical interfaces ge-1/3/0.0, ge-1/3/9.0, ge-2/0/6.0, ge-2/3/0.0, and ge-2/3/9.0 are associated with pbbn-1. ■ MSTP is configured for the routing instance. ■ The routing instance has the bridging domains eline-bvlan and elan-bvlan.
ES1 (Pinot Noir) configuration	<p>ES1, ES3, and ES4 are physically connected to the BEBs in the following manner:</p> <ul style="list-style-type: none"> ■ ES1 is connected to BEB1 through interface ge-2/0/0 and BEB2 through interface ge-1/0/0 ■ ES3 is connected to BEB3 through interface ge-2/0/0 ■ ES4 is connected to BEB4 through interface ge-1/0/0
ES3 (Dolcetto) configuration	
ES4 (Reds) configuration	

To configure services, configure separate routing instances for the PBBN (B-component) and PBN (I-component) on the BEB1, BEB2, BEB3, and BEB4. BCB1 and BCB2 require only a routing instance for the B-component. ES1, ES2, ES3, and ES4 require a routing instance, but not for the B-component.

Multiple Spanning Tree Protocol (MSTP) is configured to provide fast failover and load-balancing benefits to VLANs in the PBBN.

Configuring E-LINE and E-LAN Services on BEB1 (Sangiovese)

Table 2 on page 24 contains the services configured for BEB1 as well as the correlating service virtual local area networks (S-VLANs), service identifiers (I-SIDs), and backbone virtual local area networks (B-VLANs).

Table 2: BEB1 Mapping

Service	S-VLAN	I-SID	B-VLAN
elan1	1300	10300	3350
elan2	1400	10400	3350
eline1	2100	10100	3150

To configure E-LINE and E-LAN services on the MX Series router BEB1 in a PBBN, perform these tasks:

- Configuring a Routing Instance for E-LINE Services on BEB1 on page 25
- Configuring a PBN Routing Instance for E-LAN Services on BEB1 on page 26
- Configuring a PBBN Routing Instance on BEB1 on page 28
- Configuring the Interfaces on BEB1 on page 30

Configuring a Routing Instance for E-LINE Services on BEB1

CLI Quick Configuration

To quickly configure the PBN (I-component) routing instance for E-LINE services, copy the following commands and paste them into the router terminal window:

```
[edit]
set routing-instances pbn-1-for-eline instance-type virtual-switch
set routing-instances pbn-1-for-eline interface ge-2/0/0.1
set routing-instances pbn-1-for-eline interface pip0.0
set routing-instances pbn-1-for-eline bridge-domains bd1 vlan-id 10
set routing-instances pbn-1-for-eline bridge-domains eline-svlans vlan-id-list
2100
set routing-instances pbn-1-for-eline pbb-options peer-instance pbbn-1
set routing-instances pbn-1-for-eline service-groups elinel service-type eline
set routing-instances pbn-1-for-eline service-groups elinel pbb-service-options
isid 10100 interface ge-2/0/0.1
```

Step-by-Step Procedure

To configure the PBN (I-component) routing instance for E-LINE service:

1. Configure the PBN routing instance **pbn-1-for-eline** and specify the instance type as **virtual-switch** to provide support for Layer 2 bridging:

```
[edit routing-instances]
user@beb1# set pbn-1-for-eline instance-type virtual-switch
```

2. Configure the logical interfaces for the PBN routing instance:

```
[edit routing-instances]
user@beb1# set pbn-1-for-eline interface ge-2/0/0.1
```

3. Configure a provider instance port (PIP) pseudo-logical interface to provide a connection between customer routing instances (PBN I-component) and the provider routing instance (PBBN B-component):

```
[edit routing-instances]
user@beb1# set pbn-1-for-eline interface pip0.0
```

4. Configure the provider bridge domain **bd1** and **eline-svlans** for E-LINE services:

```
[edit routing-instances]
user@beb1# set pbn-1-for-eline bridge-domains bd1 vlan-id 10
user@beb1# set pbn-1-for-eline bridge-domains eline-svlans vlan-id-list
2100
```

5. Configure the peer PBBN routing instance (here, the peer PBBN is **pbbn-1**):

```
[edit routing-instances]
user@beb1# set pbn-1-for-eline pbb-options peer-instance pbbn-1
```

6. Configure service groups and the type of service they will provide for the routing instance (here, service groups eline1 and eline2 are configured for eline service):

```
[edit routing-instances ]
user@beb1# set pbn-1-for-eline service-groups eline1 service-type eline
user@beb1# set pbn-1-for-eline service-groups eline1 pbb-service-options
isid 10100 interface ge-2/0/0.1
```

Results Check the results of the configuration:

```
user@beb1> show configuration
routing-instances {
  pbn-1-for-eline {
    instance-type virtual-switch;
    interface ge-2/0/0.1;
    interface pip0.0;
    bridge-domains {
      bd1 {
        vlan-id 10;
      }
      eline-svlans {
        vlan-id-list [ 2100 ];
      }
    }
    pbb-options {
      peer-instance pbbn-1;
    }
    service-groups {
      eline1 {
        service-type eline;
        pbb-service-options {
          isid 10100 interface ge-2/0/0.1;
        }
      }
    }
  }
}
```

Configuring a PBN Routing Instance for E-LAN Services on BEB1

CLI Quick Configuration To quickly configure a PBN (I-component) routing instance for E-LAN services, copy the following commands and paste them into the router terminal window:

```
[edit]
set routing-instances pbn-1-for-elan instance-type virtual-switch
set routing-instances pbn-1-for-elan interface ge-2/0/0.3
set routing-instances pbn-1-for-elan interface ge-2/0/0.4
set routing-instances pbn-1-for-elan interface pip0.1
```



```

set routing-instances pbn-1-for-elan bridge-domains elan-svlans vlan-id-list 1300
set routing-instances pbn-1-for-elan bridge-domains elan-svlans vlan-id-list 1400
set routing-instances pbn-1-for-elan pbb-options peer-instance pbbn-1
set routing-instances pbn-1-for-elan service-groups elan1 service-type elan
set routing-instances pbn-1-for-elan service-groups elan1 pbb-service-options
isid 10300 vlan-id-list 1300
set routing-instances pbn-1-for-elan service-groups elan2 service-type elan
set routing-instances pbn-1-for-elan service-groups elan2 pbb-service-options
isid 10400 vlan-id-list 1400

```

Step-by-Step Procedure

To configure the PBN (I-component) routing instance for E-LAN service:

1. Configure the PBN routing instance `pbn-1-for-elan` and specify the instance type as virtual-switch to provide support for Layer 2 bridging:

```

[edit routing-instances]
user@beb1# set pbn-1-for-elan instance-type virtual-switch

```

2. Configure the logical interfaces for the PBN routing instance:

```

[edit routing-instances]
user@beb1# set pbn-1-for-elan interface ge-2/0/0.3
user@beb1# set pbn-1-for-elan interface ge-2/0/0.4

```

3. Configure a provider instance port (PIP) pseudo-logical interface to provide a connection between customer routing instances (PBN I-component) and the provider routing instance (PBBN B-component):

```

[edit routing-instances]
user@beb1# set pbn-1-for-elan interface pip0.1

```

4. Configure the provider bridge domain `elan-svlans` for E-LAN services:

```

[edit routing-instances]
user@beb1# set pbn-1-for-elan bridge-domains elan-svlans vlan-id-list 1300
user@beb1# set pbn-1-for-elan bridge-domains elan-svlans vlan-id-list 1400

```

5. Configure the peer PBBN routing instance (here, the peer PBBN is `pbbn-1`):

```

[edit routing-instances]
user@beb1# set pbn-1-for-elan pbb-options peer-instance pbbn-1

```

6. Configure service groups and the type of service they will provide for the routing instance (here, service groups `elan1` and `elan2` are configured for `elan` service):

```

[edit routing-instances ]
user@beb1# set pbn-1-for-elan service-groups elan1 service-type elan
user@beb1# set pbn-1-for-elan service-groups elan1 pbb-service-options
isid 10300 vlan-id-list 1300
user@beb1# set pbn-1-for-elan service-groups elan2 service-type elan
user@beb1# set pbn-1-for-elan service-groups elan2 pbb-service-options
isid 10400 vlan-id-list 1400

```

Results Check the results of the configuration:

```
user@beb1> show configuration
routing-instances {
  pbn-1-for-elan {
    instance-type virtual-switch;
    interface ge-2/0/0.3;
    interface ge-2/0/0.4;
    interface pip0.1;
    bridge-domains {
      elan-svlans {
        vlan-id-list [ 1300 1400 ];
      }
    }
  }
  pbb-options {
    peer-instance pbbn-1;
  }
  service-groups {
    elan1 {
      service-type elan;
      pbb-service-options {
        isid 10300 vlan-id-list 1300;
      }
    }
    elan2 {
      service-type elan;
      pbb-service-options {
        isid 10400 vlan-id-list 1400;
      }
    }
  }
}
```

Configuring a PBBN Routing Instance on BEB1

CLI Quick Configuration To quickly configure a routing instance for a PBBN, copy the following commands and paste them into the router terminal window:

```
[edit]
set routing-instances pbbn-1 instance-type virtual-switch
set routing-instances pbbn-1 interface ge-1/3/0.0
set routing-instances pbbn-1 interface ge-1/3/9.0
set routing-instances pbbn-1 interface cbp0.0
set routing-instances pbbn-1 protocols mstp configuration-name pbbn-1
set routing-instances pbbn-1 protocols mstp interface ge-1/3/0
set routing-instances pbbn-1 protocols mstp interface ge-1/3/9
set routing-instances pbbn-1 bridge-domains elan-bvlan vlan-id 3350
set routing instances pbbn-1 pbb-options vlan-id 3350 isid-list 10300
set routing instances pbbn-1 pbb-options vlan-id 3350 isid-list 10400
set routing instances pbbn-1 pbb-options vlan-id 3150 isid-list 10100
```

Step-by-Step Procedure To configure the PBBN (B-component) routing instance:

1. Configure the PBBN routing instance **pbbn-1** and specify the instance type as **virtual-switch** to provide support for Layer 2 bridging:

```
[edit routing-instances]
user@beb1# set pbbn-1 instance-type virtual-switch
```

2. Configure the logical interfaces for the PBBN routing instance:

```
[edit routing-instances]
user@beb1# set pbbn-1 interface ge-1/3/0.0
user@beb1# set pbbn-1 interface ge-1/3/9.0
```

3. Configure a customer backbone port (CBP) pseudo-logical interface to provide a connection between customer routing instances (PBN I-component) and the provider routing instance (PBBN B-component):

```
[edit routing-instances]
user@beb1# set pbbn-1 interface cbp0.0
```

4. Configure Multiple Spanning Tree Protocol (MSTP) for the PBBN routing instance to ensure a loop-free topology:

```
[edit routing-instances]
user@beb1# set pbbn-1 protocols mstp configuration-name pbbn-1
user@beb1# set pbbn-1 protocols mstp interface ge-1/3/0
user@beb1# set pbbn-1 protocols mstp interface ge-1/3/9
```

5. Configure the provider bridge domains **elan-bvlan** and **eline-bvlan** for E-LINE and E-LAN services:

```
[edit routing-instances]
user@beb1# set pbbn-1 bridge-domains elan-bvlan vlan-id 3350
```

6. Configure PBB options to provide the PBBN with B-VLAN to I-SID mapping information in the bridge-domain:

```
[edit routing-instances]
user@beb1# set pbbn-1 pbb-options vlan-id 3350 isid-list 10300
user@beb1# set pbbn-1 pbb-options vlan-id 3350 isid-list 10400
user@beb1# set pbbn-1 pbb-options vlan-id 3150 isid-list 10100
```

Results Check the results of the configuration:

```
user@beb1> show configuration
routing-instances {
  pbbn-1 {
    instance-type virtual-switch;
    interface ge-1/3/0.0;
    interface ge-1/3/9.0;
    interface cbp0.0;
```

```

protocols {
  mstp {
    configuration-name pbbn-1;
    interface ge-1/3/0;
    interface ge-1/3/9;
  }
}
bridge-domains {
  elan-bvlan {
    vlan-id 3350;
  }
  eline-bvlan {
    vlan-id 3150;
    bridge-options {
    }
  }
}
pbb-options {
  vlan-id 3350 isid-list [ 10300 10400 ];
  vlan-id 3150 isid-list [ 10100 ];
}
}

```

Configuring the Interfaces on BEB1

CLI Quick Configuration

To quickly configure the interfaces on BEB1, copy the following commands and paste them into the router terminal window:

```

[edit]
set interfaces ge-1/3/0 description "Connected to BCB2 cabernet ge-1/3/0"
set interfaces ge-1/3/0 unit 0 family bridge interface-mode trunk
set interfaces ge-1/3/0 unit 0 family bridge vlan-id-list 3000-4000
set interfaces ge-1/3/9 description "Connected to BCB1 syrah ge-1/3/9"
set interfaces ge-1/3/9 unit 0 family bridge interface-mode trunk
set interfaces ge-1/3/9 unit 0 family bridge vlan-id-list 3000-4000
set interfaces ge-2/0/0 description "Connected to pinotnoir ge-2/0/0"
set interfaces ge-2/0/0 flexible-vlan-tagging
set interfaces ge-2/0/0 unit 1 family bridge interface-mode trunk
set interfaces ge-2/0/0 unit 1 family bridge vlan-id-list 2100
set interfaces ge-2/0/0 unit 3 family bridge interface-mode trunk
set interfaces ge-2/0/0 unit 3 family bridge vlan-id-list 1300
set interfaces ge-2/0/0 unit 4 family bridge interface-mode trunk
set interfaces ge-2/0/0 unit 4 family bridge vlan-id-list 1400
set interfaces cbp0 unit 0 family bridge interface-mode trunk
set interfaces cbp0 unit 0 family bridge bridge-domain-type bvlan
set interfaces cbp0 unit 0 family bridge isid-list all
set interfaces pip0 unit 0 family bridge interface-mode trunk
set interfaces pip0 unit 0 family bridge bridge-domain-type svlan
set interfaces pip0 unit 0 family bridge isid-list all-service-groups
set interfaces pip0 unit 1 family bridge interface-mode trunk
set interfaces pip0 unit 1 family bridge bridge-domain-type svlan
set interfaces pip0 unit 1 family bridge isid-list all-service-groups

```

Step-by-Step Procedure To configure interfaces on BEB1:

1. Configure interface ge-1/3/0:

```
[edit interfaces]
user@beb1# set ge-1/3/0 description "Connected to BCB2 cabernet ge-1/3/0"
user@beb1# set ge-1/3/0 unit 0 family bridge interface-mode trunk
user@beb1# set ge-1/3/0 unit 0 family bridge vlan-id-list 3000-4000
```

2. Configure interface ge-1/3/9:

set interfaces

```
[edit interfaces]
user@beb1# set ge-1/3/9 description "Connected to BCB1 syrah ge-1/3/9"
user@beb1# set ge-1/3/9 unit 0 family bridge interface-mode trunk
user@beb1# set ge-1/3/9 unit 0 family bridge vlan-id-list 3000-4000
```

3. Configure interface ge-2/0/0:

```
[edit interfaces]
user@beb1# set ge-2/0/0 description "Connected to pinotnoir ge-2/0/0"
user@beb1# set ge-2/0/0 flexible-vlan-tagging
user@beb1# set ge-2/0/0 unit 1 family bridge interface-mode trunk
user@beb1# set ge-2/0/0 unit 1 family bridge vlan-id-list 2100
user@beb1# set ge-2/0/0 unit 3 family bridge interface-mode trunk
user@beb1# set ge-2/0/0 unit 3 family bridge vlan-id-list 1300
user@beb1# set ge-2/0/0 unit 4 family bridge interface-mode trunk
user@beb1# set ge-2/0/0 unit 4 family bridge vlan-id-list 1400
```

4. Configure interface cbp0:

```
[edit interfaces]
user@beb1# set cbp0 unit 0 family bridge interface-mode trunk
user@beb1# set cbp0 unit 0 family bridge bridge-domain-type bvlan
user@beb1# set cbp0 unit 0 family bridge isid-list all
```

5. Configure interface pip0:

```
[edit interfaces]
user@beb1# set pip0 unit 0 family bridge interface-mode trunk
user@beb1# set pip0 unit 0 family bridge bridge-domain-type svlan
user@beb1# set pip0 unit 0 family bridge isid-list all-service-groups
user@beb1# set pip0 unit 1 family bridge interface-mode trunk
user@beb1# set pip0 unit 1 family bridge bridge-domain-type svlan
user@beb1# set pip0 unit 1 family bridge isid-list all-service-groups
```

Results Check the results of the configuration:

```
user@beb1> show configuration
interfaces {
  ge-1/0/5 {
    unit 0 {
      family bridge {
```

```

        interface-mode trunk;
        vlan-id-list 3150;
    }
}
ge-1/3/0 {
    description "Connected to BCB2 cabernet ge-1/3/0";
    unit 0 {
        family bridge {
            interface-mode trunk;
            vlan-id-list 3000-4000;
        }
    }
}
ge-1/3/9 {
    description "Connected to BCB1 syrah ge-1/3/9";
    unit 0 {
        family bridge {
            interface-mode trunk;
            vlan-id-list 3000-4000;
        }
    }
}
ge-2/0/0 {
    description "Connected to ES1 pinot noir ge-2/0/0";
    flexible-vlan-tagging;
    unit 1 {
        family bridge {
            interface-mode trunk;
            vlan-id-list 2100;
        }
    }
    unit 3 {
        family bridge {
            interface-mode trunk;
            vlan-id-list 1300;
        }
    }
    unit 4 {
        family bridge {
            interface-mode trunk;
            vlan-id-list 1400;
        }
    }
}
cbp0 {
    unit 0 {
        family bridge {
            interface-mode trunk;
            bridge-domain-type bvlan;
            isid-list all;
        }
    }
}
pip0 {
    unit 0 {

```

```

        family bridge {
            interface-mode trunk;
            bridge-domain-type svlan;
            isid-list all-service-groups;
        }
    }
    unit 1 {
        family bridge {
            interface-mode trunk;
            bridge-domain-type svlan;
            isid-list all-service-groups;
        }
    }
}

```

Configuring E-LINE Service on BEB2 (Barbera)

Table 3 on page 33 contains the service configured for BEB2 as well as the correlating S-VLAN, I-SID, and B-VLAN.

Table 3: BEB2 Mapping

Service	S-VLAN	I-SID	B-VLAN
eline2	1200	10200	3150

To configure E-LINE service on the MX Series router BEB2 in a PBBN, perform these tasks:

- Configuring a PBN Routing Instance for E-LINE Services on BEB2 on page 33
- Configuring a PBBN Routing Instance on BEB2 on page 35
- Configuring the Interfaces on BEB2 on page 36

Configuring a PBN Routing Instance for E-LINE Services on BEB2

CLI Quick Configuration

To quickly configure the PBN (I-component) routing instance for E-LINE services, copy the following commands and paste them into the router terminal window:

```

[edit]
set routing-instances pbn-1-for-eline instance-type virtual-switch
set routing-instances pbn-1-for-eline interface ge-1/0/0.2
set routing-instances pbn-1-for-eline interface pip0.0
set routing-instances pbn-1-for-eline bridge-domains eline-svlans
set routing-instances pbn-1-for-eline bridge-domains eline-svlans vlan-id-list
1200
set routing-instances pbn-1-for-eline pbb-options peer-instance pbbn-1
set routing-instances pbn-1-for-eline service-groups eline2 service-type eline
set routing-instances pbn-1-for-eline service-groups eline2 pbb-service-options
isid 10200 interface ge-1/0/0.2

```

Step-by-Step Procedure To configure the PBN (I-component) routing instance for E-LINE service:

1. Configure the PBN routing instance **pbn-1-for-eline** and specify the instance type as **virtual-switch** to provide support for Layer 2 bridging:

```
[edit routing-instances]
user@beb2# set pbn-1-for-eline instance-type virtual-switch
```

2. Configure the logical interfaces for the PBN routing instance:

```
[edit routing-instances]
user@beb2# set pbn-1-for-eline interface ge-1/0/0.1
```

3. Configure a provider instance port (PIP) pseudo-logical interface to provide a connection between customer routing instances (PBN I-component) and the provider routing instance (PBBN B-component):

```
[edit routing-instances]
user@beb2# set pbn-1-for-eline interface pip0.0
```

4. Configure the provider bridge domain **eline-svlans** for E-LINE services:

```
[edit routing-instances]
user@beb2# set pbn-1-for-eline bridge-domains eline-svlans
user@beb2# set pbn-1-for-eline bridge-domains eline-svlans vlan-id-list
1200
```

5. Configure the peer PBBN routing instance (here, the peer PBBN is **pbbn-1**):

```
[edit routing-instances]
user@beb1# set pbn-1-for-eline pbb-options peer-instance pbbn-1
```

6. Configure service groups and the type of service they will provide for the routing instance (here, service groups **eline1** and **eline2** are configured for **eline** service):

```
[edit routing-instances ]
user@beb2# set pbn-1-for-eline service-groups eline2 service-type eline
user@beb2# set pbn-1-for-eline service-groups eline2 pbb-service-options
isis 10200 interface ge-1/0/0.2
```

Results Check the results of the configuration:

```
user@beb2> show configuration
routing-instances {
  pbn-1-for-eline {
    instance-type virtual-switch;
    interface ge-1/0/0.2;
    interface pip0.0;
    bridge-domains {
      eline-svlans {
        vlan-id-list [ 1200 ];
      }
    }
  }
}
```



```

    }
    pbb-options {
        peer-instance pbbn-1;
    }
    service-groups {
        eline2 {
            service-type eline;
            pbb-service-options {
                isid 10200 interface ge-1/0/0.2;
            }
        }
    }
}

```

Configuring a PBBN Routing Instance on BEB2

CLI Quick Configuration To quickly configure a routing instance for a PBBN, copy the following commands and paste them into the router terminal window:

```

[edit]
set routing-instances pbbn-1 instance-type virtual-switch
set routing-instances pbbn-1 interface ge-1/3/0.0
set routing-instances pbbn-1 interface ge-2/3/0.0
set routing-instances pbbn-1 interface cbp0.0
set routing-instances pbbn-1 protocols mstp configuration-name pbbn-1
set routing-instances pbbn-1 protocols mstp interface ge-1/3/0
set routing-instances pbbn-1 protocols mstp interface ge-2/3/0
set routing-instances pbbn-1 bridge-domains eline-bvlan vlan-id 3150
set routing-instances pbbn-1 pbb-options vlan-id 3150 isid-list 10200

```

Step-by-Step Procedure To configure the PBBN (B-component) routing instance:

1. Configure the PBBN routing instance **pbbn-1** and specify the instance type as **virtual-switch** to provide support for Layer 2 bridging:

```

[edit routing-instances]
user@beb2# set pbbn-1 instance-type virtual-switch

```

2. Configure the logical interfaces for the PBBN routing instance:

```

[edit routing-instances]
user@beb2# set pbbn-1 interface ge-1/3/0.0
user@beb2# set pbbn-1 interface ge-2/3/0.0

```

3. Configure a customer backbone port (CBP) pseudo-logical interface to provide a connection between customer routing instances (PBN I-component) and the provider routing instance (PBBN B-component):

```

[edit routing-instances]
user@beb2# set pbbn-1 interface cbp0.0

```

4. Configure Multiple Spanning Tree Protocol (MSTP) for the PBBN routing instance to ensure a loop-free topology:

```
[edit routing-instances]
user@beb2# set pbbn-1 protocols mstp configuration-name pbbn-1
user@beb2# set pbbn-1 protocols mstp interface ge-1/3/0
user@beb2# set pbbn-1 protocols mstp interface ge-2/3/0
```

5. Configure the provider bridge domain eline-bvlan for E-LINE services:

```
[edit routing-instances]
user@beb2# set pbbn-1 bridge-domains eline-bvlan vlan-id 3150
```

6. Configure PBB options to provide the PBBN with B-VLAN to I-SID mapping information in the bridge-domain:

```
[edit routing-instances]
user@beb2# set pbbn-1 pbb-options vlan-id 3150 isid-list 10200
```

Results Check the results of the configuration:

```
user@beb2> show configuration
routing-instances {
  pbbn-1 {
    instance-type virtual-switch;
    interface ge-1/3/0.0;
    interface ge-2/3/0.0;
    interface cbp0.0;
    protocols {
      mstp {
        configuration-name pbbn-1;
        interface ge-1/3/0;
        interface ge-2/3/0;
      }
    }
  }
  bridge-domains {
    eline-bvlan {
      vlan-id 3150;
      bridge-options {
      }
    }
  }
  pbb-options {
    vlan-id 3150 isid-list [ 10200 ];
  }
}
}
```

Configuring the Interfaces on BEB2

CLI Quick Configuration To quickly configure the interfaces on BEB2, copy the following commands and paste them into the router terminal window:

```
[edit]
set interfaces ge-1/0/0 description "Connected to ES1 pinotnoir ge-1/0/0"
```

```

set interfaces ge-1/0/0 flexible-vlan-tagging
set interfaces ge-1/0/0 unit 2 family bridge interface-mode trunk
set interfaces ge-1/0/0 unit 2 family bridge vlan-id-list 1200
set interfaces ge-1/3/0 description "Connected to BCB1 syrah ge-1/3/0"
set interfaces ge-1/3/0 unit 0 family bridge interface-mode trunk
set interfaces ge-1/3/0 unit 3 family bridge vlan-id-list 3000-4000
set interfaces ge-2/3/0 description "Connected to BCB2 cabernet ge-2/3/0"
set interfaces ge-2/3/0 unit 0 family bridge interface-mode trunk
set interfaces ge-2/3/0 unit 0 family bridge vlan-id-list 3000-4000
set interfaces cbp0 unit 0 family bridge interface-mode trunk
set interfaces cbp0 unit 0 family bridge bridge-domain-type bvlan
set interfaces cbp0 unit 0 family bridge isid-list all
set interfaces pip0 unit 0 family bridge interface-mode trunk
set interfaces pip0 unit 0 family bridge bridge-domain-type svlan
set interfaces pip0 unit 1 family bridge interface-mode trunk
set interfaces pip0 unit 1 family bridge bridge-domain-type svlan
set interfaces pip0 unit 1 family bridge isid-list all-service-groups

```

Step-by-Step Procedure To configure interfaces on BEB2:

1. Configure interface ge-1/0/0:

```

[edit interfaces]
user@beb2# set ge-1/0/0 description "Connected to ES1 pinotnoir ge-1/0/0"
user@beb2# set ge-1/0/0 flexible-vlan-tagging
user@beb2# set ge-1/0/0 unit 2 family bridge interface-mode trunk
user@beb2# set ge-1/0/0 unit 2 family bridge vlan-id-list 1200

```

2. Configure interface ge-1/3/0:

```

[edit interfaces]
user@beb2# set ge-1/3/0 description "Connected to BCB1 syrah ge-1/3/0"
user@beb2# set ge-1/3/0 unit 0 family bridge interface-mode trunk
user@beb2# set ge-1/3/0 unit 3 family bridge vlan-id-list 3000-4000

```

3. Configure interface ge-2/3/0:

```

[edit interfaces]
user@beb2# set ge-2/3/0 description "Connected to BCB2 cabernet ge-2/3/0"
user@beb2# set ge-2/3/0 unit 0 family bridge interface-mode trunk
user@beb2# set ge-2/3/0 unit 0 family bridge vlan-id-list 3000-4000

```

4. Configure interface cbp0:

```

[edit interfaces]
user@beb2# set cbp0 unit 0 family bridge interface-mode trunk
user@beb2# set cbp0 unit 0 family bridge bridge-domain-type bvlan
user@beb2# set cbp0 unit 0 family bridge isid-list all

```

5. Configure interface pip0:

```

[edit interfaces]
user@beb2# set pip0 unit 0 family bridge interface-mode trunk
user@beb2# set pip0 unit 0 family bridge bridge-domain-type svlan
user@beb2# set pip0 unit 0 family bridge isid-list all-service-groups

```

```

user@beb2# set pip0 unit 1 family bridge interface-mode trunk
user@beb2# set pip0 unit 1 family bridge bridge-domain-type svlan
user@beb2# set pip0 unit 1 family bridge isid-list all-service-groups

```

Results Check the results of the configuration:

```

user@beb2> show configuration
interfaces {
  ge-1/0/0 {
    description "Connected to ES1 pinot noir ge-1/0/0";
    flexible-vlan-tagging;
    unit 2 {
      family bridge {
        interface-mode trunk;
        vlan-id-list 1200;
      }
    }
  }
  ge-1/3/0 {
    description "Connected to CS1 syrah ge-1/3/0";
    unit 0 {
      family bridge {
        interface-mode trunk;
        vlan-id-list 3000-4000;
      }
    }
  }
  ge-2/3/0 {
    description "Connected to CS2 cabernet ge-2/3/0";
    unit 0 {
      family bridge {
        interface-mode trunk;
        vlan-id-list 3000-4000;
      }
    }
  }
  cbp0 {
    unit 0 {
      family bridge {
        interface-mode trunk;
        bridge-domain-type bvlan;
        isid-list all;
      }
    }
  }
  pip0 {
    unit 0 {
      family bridge {
        interface-mode trunk;
        bridge-domain-type svlan;
        isid-list all-service-groups;
      }
    }
  }
}

```

```

    unit 1 {
      family bridge {
        interface-mode trunk;
        bridge-domain-type svlan;
        isid-list all-service-groups;
      }
    }
  }
}

```

Configuring E-LAN Services on BEB3 (Malbec)

Table 4 on page 39 contains the services configured for BEB3 as well as the correlating S-VLANs, I-SIDs, and B-VLANs.

Table 4: BEB2 Mapping

Service	S-VLAN	I-SID	B-VLAN
elan1	1300	10300	3350
elan2	1400	10400	3350

To configure E-LAN services on the MX Series router BEB3 in a PBBN, perform these tasks:

- Configuring a PBN Routing Instance for E-LAN Services on BEB3 on page 39
- Configuring a PBBN Routing Instance on BEB3 (Malbec) on page 41
- Configuring the Interfaces on BEB3 on page 43

Configuring a PBN Routing Instance for E-LAN Services on BEB3

CLI Quick Configuration To quickly configure a PBN (I-component) routing instance for E-LAN services, copy the following commands and paste them into the router terminal window:

```

[edit]
set routing-instances pbn-2-for-elan instance-type virtual-switch
set routing-instances pbn-2-for-elan interface ge-2/0/0.3
set routing-instances pbn-2-for-elan interface ge-2/0/0.4
set routing-instances pbn-2-for-elan interface pip0.1
set routing-instances pbn-2-for-elan bridge-domains elan-svlans vlan-id-list 1300
set routing-instances pbn-2-for-elan bridge-domains elan-svlans vlan-id-list 1400
set routing-instances pbn-2-for-elan pbb-options peer-instance pbbn-1
set routing-instances pbn-2-for-elan service-groups elan1 service-type elan
set routing-instances pbn-2-for-elan service-groups elan1 pbb-service-options
isid 10300 vlan-id-list 1300
set routing-instances pbn-2-for-elan service-groups elan2 service-type elan
set routing-instances pbn-2-for-elan service-groups elan2 pbb-service-options
isid 10400 vlan-id-list 1400

```

Step-by-Step Procedure To configure the PBN (I-component) routing instance for E-LAN service:

1. Configure the PBN routing instance **pbn-2-for-elan** and specify the instance type as **virtual-switch** to provide support for Layer 2 bridging:

```
[edit routing-instances]
user@beb3# set pbn-2-for-elan instance-type virtual-switch
```

2. Configure the logical interfaces for the PBN routing instance:

```
[edit routing-instances]
user@beb3# set pbn-2-for-elan interface ge-2/0/0.3
user@beb3# set pbn-2-for-elan interface ge-2/0/0.4
```

3. Configure a provider instance port (PIP) pseudo-logical interface to provide a connection between customer routing instances (PBN I-component) and the provider routing instance (PBBN B-component):

```
[edit routing-instances]
user@beb3# set pbn-2-for-elan interface pip0.1
```

4. Configure the provider bridge domain **elan-svlans** for E-LAN services:

```
[edit routing-instances]
user@beb3# set pbn-2-for-elan bridge-domains elan-svlans vlan-id-list 1300
user@beb3# set pbn-2-for-elan bridge-domains elan-svlans vlan-id-list 1400
```

5. Configure the peer PBBN routing instance (here, the peer PBBN is **pbbn-1**):

```
[edit routing-instances]
user@beb3# set pbn-2-for-elan pbb-options peer-instance pbbn-1
```

6. Configure service groups and the type of service they will provide for the routing instance (here, service groups **elan1** and **elan2** are configured for **elan** service):

```
[edit routing-instances ]
user@beb3# set pbn-2-for-elan service-groups elan1 service-type elan
user@beb3# set pbn-2-for-elan service-groups elan1 pbb-service-options
isis 10300 vlan-id-list 1300
user@beb3# set pbn-2-for-elan service-groups elan2 service-type elan
user@beb3# set pbn-2-for-elan service-groups elan2 pbb-service-options
isis 10400 vlan-id-list 1400
```

Results Check the results of the configuration:

```
user@beb3> show configuration
pbn-2-for-elan {
  instance-type virtual-switch;
  interface ge-2/0/0.3;
  interface ge-2/0/0.4;
  interface pip0.1;
  bridge-domains {
```

```

    elan1-svlan {
        vlan-id 1300;
    }
    elan2-svlan {
        vlan-id 1400;
    }
}
pbb-options {
    peer-instance pbbn-1;
}
service-groups {
    inactive: elan1 {
        service-type elan;
        pbb-service-options {
            isid 10300 vlan-id-list 1300;
        }
    }
    elan2 {
        service-type elan;
        pbb-service-options {
            isid 10400 vlan-id-list 1400;
        }
    }
}
}
}
}

```

Configuring a PBBN Routing Instance on BEB3 (Malbec)

CLI Quick Configuration To quickly configure a routing instance for a PBBN, copy the following commands and paste them into the router terminal window:

```

[edit]
set routing-instances pbbn-1 instance-type virtual-switch
set routing-instances pbbn-1 interface ge-1/3/9.0
set routing-instances pbbn-1 interface ge-2/3/0.0
set routing-instances pbbn-1 interface cbp0.0
set routing-instances pbbn-1 protocols mstp configuration-name pbbn-1
set routing-instances pbbn-1 protocols mstp interface ge-1/3/9
set routing-instances pbbn-1 protocols mstp interface ge-2/3/0
set routing-instances pbbn-1 pbb-options vlan-id 3350 isid-list 10300
set routing-instances pbbn-1 pbb-options vlan-id 3350 isid-list 10400

```

Step-by-Step Procedure To configure the PBBN (B-component) routing instance:

1. Configure the PBBN routing instance `pbbn-1` and specify the instance type as `virtual-switch` to provide support for Layer 2 bridging:

```

[edit routing-instances]
user@beb3# set pbbn-1 instance-type virtual-switch

```

2. Configure the logical interfaces for the PBBN routing instance:

```

[edit routing-instances]

```

```
user@beb3# set pbbn-1 interface ge-1/3/9.0
user@beb3# set pbbn-1 interface ge-2/3/0.0
```

3. Configure a customer backbone port (CBP) pseudo-logical interface to provide a connection between customer routing instances (PBN I-component) and the provider routing instance (PBBN B-component):

```
[edit routing-instances]
user@beb3# set pbbn-1 interface cbp0.0
```

4. Configure Multiple Spanning Tree Protocol (MSTP) for the PBBN routing instance to ensure a loop-free topology:

```
[edit routing-instances]
user@beb3# set pbbn-1 protocols mstp configuration-name pbbn-1
user@beb3# set pbbn-1 protocols mstp interface ge-1/3/9
user@beb3# set pbbn-1 protocols mstp interface ge-2/3/0
```

5. Configure the provider bridge domain elan-bvlan for E-LAN services:

```
[edit routing-instances]
user@beb3# set pbbn-1 bridge-domains elan-bvlan vlan-id 3350
```

6. Configure PBB options to provide the PBBN with B-VLAN to I-SID mapping information in the bridge-domain:

```
[edit routing-instances]
user@beb3# set pbbn-1 pbb-options vlan-id 3350 isid-list 10300
user@beb3# set pbbn-1 pbb-options vlan-id 3350 isid-list 10400
```

Results Check the results of the configuration:

```
user@beb3> show configuration
routing-instances {
  pbbn-1 {
    instance-type virtual-switch;
    interface ge-1/3/9.0;
    interface ge-2/3/0.0;
    interface cbp0.0;
    protocols {
      mstp {
        configuration-name pbbn-1;
        interface ge-1/3/9;
        interface ge-2/3/0;
      }
    }
  }
  bridge-domains {
    elan-bvlan {
      vlan-id 3350;
    }
  }
  pbb-options {
```



```

        vlan-id 3350 isid-list [ 10300 10400 ];
    }
}

```

Configuring the Interfaces on BEB3

CLI Quick Configuration To quickly configure the interfaces on BEB3, copy the following commands and paste them into the router terminal window:

```

[edit]
set interfaces ge-1/3/9 description "Connected to BCB2 cabernet ge-1/3/9"
set interfaces ge-1/3/9 unit 0 family bridge interface-mode trunk
set interfaces ge-1/3/9 unit 0 family bridge vlan-id-list 3000-4000
set interfaces ge-2/0/0 description "Connected to ES3 dolcetto ge-2/0/0"
set interfaces ge-2/0/0 flexible-vlan-tagging
set interfaces ge-2/0/0 unit 3 family bridge interface-mode trunk
set interfaces ge-2/0/0 unit 3 family bridge vlan-id-list 1300
set interfaces ge-2/0/0 unit 4 family bridge interface-mode trunk
set interfaces ge-2/0/0 unit 4 family bridge vlan-id-list 1400
set interfaces ge-2/3/0 description "Connected to BCB1 syrah ge-2/3/0"
set interfaces ge-2/3/0 unit 0 family bridge interface-mode trunk
set interfaces ge-2/3/0 unit 0 family bridge vlan-id-list 3000-4000
set interfaces cbp0 unit 0 family bridge interface-mode trunk
set interfaces cbp0 unit 0 family bridge bridge-domain-type bvlan
set interfaces cbp0 unit 0 family bridge isid-list all
set interfaces pip0 unit 0 family bridge interface-mode trunk
set interfaces pip0 unit 0 family bridge bridge-domain-type svlan
set interfaces pip0 unit 0 family bridge isid-list all-service-groups
set interfaces pip0 unit 1 family bridge interface-mode trunk
set interfaces pip0 unit 1 family bridge bridge-domain-type svlan
set interfaces pip0 unit 1 family bridge isid-list all-service-groups

```

Step-by-Step Procedure To configure interfaces on BEB3:

1. Configure interface ge-1/3/9:

```

[edit interfaces]
user@beb3# set ge-1/3/9 description "Connected to CS2 cabernet ge-1/3/9"
user@beb3# set ge-1/3/9 unit 0 family bridge interface-mode trunk
user@beb3# set ge-1/3/9 unit 0 family bridge vlan-id-list 3000-4000

```

2. Configure interface ge-2/0/0:

```

[edit interfaces]
user@beb3# set ge-2/0/0 description "Connected to ES3 dolcetto ge-2/0/0"
user@beb3# set ge-2/0/0 flexible-vlan-tagging
user@beb3# set ge-2/0/0 unit 3 family bridge interface-mode trunk
user@beb3# set ge-2/0/0 unit 3 family bridge vlan-id-list 1300
user@beb3# set ge-2/0/0 unit 4 family bridge interface-mode trunk
user@beb3# set ge-2/0/0 unit 4 family bridge vlan-id-list 1400

```

3. Configure interface ge-2/3/0:

```

[edit interfaces]
user@beb3# set ge-2/3/0 description "Connected to BCB1 syrah ge-2/3/0"
user@beb3# set ge-2/3/0 unit 0 family bridge interface-mode trunk

```

```
user@beb3# set ge-2/3/0 unit 0 family bridge vlan-id-list 3000-4000
```

4. Configure interface cpb0:

```
[edit interfaces]
user@beb3# set cbp0 unit 0 family bridge interface-mode trunk
user@beb3# set cbp0 unit 0 family bridge bridge-domain-type bvlan
user@beb3# set cbp0 unit 0 family bridge isid-list all
```

5. Configure interface pip0:

```
[edit interfaces]
user@beb3# set pip0 unit 0 family bridge interface-mode trunk
user@beb3# set pip0 unit 0 family bridge bridge-domain-type svlan
user@beb3# set pip0 unit 0 family bridge isid-list all-service-groups
user@beb3# set pip0 unit 1 family bridge interface-mode trunk
user@beb3# set pip0 unit 1 family bridge bridge-domain-type svlan
user@beb3# set pip0 unit 1 family bridge isid-list all-service-groups
```

Results Check the results of the configuration:

```
user@beb3> show configuration
interfaces {
  ge-1/3/9 {
    description "Connected to BCB2 cabernet ge-1/3/9";
    unit 0 {
      family bridge {
        interface-mode trunk;
        vlan-id-list 3000-4000;
      }
    }
  }
  ge-2/0/0 {
    description "Connected to ES3 dolcetto ge-2/0/0";
    flexible-vlan-tagging;
    unit 3 {
      family bridge {
        interface-mode trunk;
        vlan-id-list 1300;
      }
    }
    unit 4 {
      family bridge {
        interface-mode trunk;
        vlan-id-list 1400;
      }
    }
  }
  ge-2/3/0 {
    description "Connected to BCB1 syrah ge-2/3/0";
    unit 0 {
      family bridge {
        interface-mode trunk;
```

```

        vlan-id-list 3000-4000;
    }
}
cbp0 {
    unit 0 {
        family bridge {
            interface-mode trunk;
            bridge-domain-type bvlan;
            isid-list all;
        }
    }
}
pip0 {
    unit 0 {
        family bridge {
            interface-mode trunk;
            bridge-domain-type svlan;
            isid-list all-service-groups;
        }
    }
    unit 1 {
        family bridge {
            interface-mode trunk;
            bridge-domain-type svlan;
            isid-list all-service-groups;
        }
    }
}
}

```

Configuring E-LINE and E-LAN Services on BEB4 (Cubs)

Table 5 on page 45 contains the services configured for BEB4 as well as the correlating S-VLANs, I-SIDs, and B-VLANs.

Table 5: BEB4 Mapping

Service	S-VLAN	I-SID	B-VLAN
eline1	1100 translated to 2100	10100	3150
eline2	1200	10200	3150
elan1	1300	10300	3350
elan2	1400	10400	3350

To configure E-LINE and E-LAN services on the MX Series router BEB4 in a PBBN, perform these tasks:

- Configuring a Routing Instance for E-LINE Services on BEB4 on page 46
- Configuring a PBN Routing Instance for E-LAN Services on BEB4 on page 48
- Configuring a PBBN Routing Instance on BEB4 on page 49
- Configuring the Interfaces on BEB4 on page 51

Configuring a Routing Instance for E-LINE Services on BEB4

CLI Quick Configuration

To quickly configure the PBN (I-component) routing instance for E-LINE services, copy the following commands and paste them into the router terminal window:

```
[edit]
set routing-instances pbn-3-for-eline instance-type virtual-switch
set routing-instances pbn-3-for-eline interface ge-1/0/0.1
set routing-instances pbn-3-for-eline interface ge-1/0/0.2
set routing-instances pbn-3-for-eline interface pip0.0
set routing-instances pbn-3-for-eline bridge-domains eline-svlans vlan-id-list
1200
set routing-instances pbn-3-for-eline bridge-domains eline-svlans vlan-id-list
2100
set routing-instances pbn-3-for-eline pbb-options peer-instance pbbn-1
set routing-instances pbn-3-for-eline service-groups eline1 service-type eline
set routing-instances pbn-3-for-eline service-groups eline1 pbb-service-options
isid 10100 interface ge-1/0/0.1
set routing-instances pbn-3-for-eline service-groups eline2 service-type eline
set routing-instances pbn-3-for-eline service-groups eline2 pbb-service-options
isid 10200 interface ge-1/0/0.2
```

Step-by-Step Procedure

To configure the PBN (I-component) routing instance for E-LINE service:

1. Configure the PBN routing instance `pbn3-for-eline` and specify the instance type as `virtual-switch` to provide support for Layer 2 bridging:

```
[edit routing-instances]
user@beb4# set pbn-3-for-eline instance-type virtual-switch
```

2. Configure the logical interfaces for the PBN routing instance:

```
[edit routing-instances]
user@beb4# set pbn-3-for-eline interface ge-1/0/0.1
user@beb4# set pbn-3-for-eline interface ge-1/0/0.2
```

3. Configure a provider instance port (PIP) pseudo-logical interface to provide a connection between customer routing instances (PBN I-component) and the provider routing instance (PBBN B-component):

```
[edit routing-instances]
user@beb4# set pbn-3-for-eline interface pip0.0
```

4. Configure the provider bridge domain `eline-svlans` for E-LINE services:

```
[edit routing-instances]
user@beb4# set pbn-3-for-eline bridge-domains eline-svlans vlan-id-list
1200
user@beb4# set pbn-3-for-eline bridge-domains eline-svlans vlan-id-list
2100
```

5. Configure the peer PBBN routing instance (here, the peer PBBN is pbbn-1):

```
[edit routing-instances]
user@beb4# set pbn-3-for-eline pbb-options peer-instance pbbn-1
```

6. Configure service groups and the type of service they will provide for the routing instance (here, service groups eline1 and eline2 are configured for eline service):

```
[edit routing-instances ]
user@beb4# set pbn-3-for-eline service-groups eline1 service-type eline
user@beb4# set pbn-3-for-eline service-groups eline1 pbb-service-options
isid 10100 interface ge-1/0/0.1
user@beb4# set pbn-3-for-eline service-groups eline2 service-type eline
user@beb4# set pbn-3-for-eline service-groups eline2 pbb-service-options
isid 10200 interface ge-1/0/0.2
```

Results Check the results of the configuration:

```
user@beb4> show configuration
routing-instances {
  pbn-3-for-eline {
    instance-type virtual-switch;
    interface ge-1/0/0.1;
    interface ge-1/0/0.2;
    interface pip0.0;
    bridge-domains {
      eline-svlans {
        vlan-id-list [ 1200 2100 ];
      }
    }
  }
  pbb-options {
    peer-instance pbbn-1;
  }
  service-groups {
    eline1 {
      service-type eline;
      pbb-service-options {
        isid 10100 interface ge-1/0/0.1;
      }
    }
    eline2 {
      service-type eline;
      pbb-service-options {
        isid 10200 interface ge-1/0/0.2;
      }
    }
  }
}
```

```
}
}
```

Configuring a PBN Routing Instance for E-LAN Services on BEB4

CLI Quick Configuration To quickly configure a PBN (I-component) routing instance for E-LAN services, copy the following commands and paste them into the router terminal window:

```
[edit]
set routing-instances pbn-3-for-elan instance-type virtual-switch
set routing-instances pbn-3-for-elan interface ge-1/0/0.3
set routing-instances pbn-3-for-elan interface ge-1/0/0.4
set routing-instances pbn-3-for-elan interface pip0.1
set routing-instances pbn-3-for-elan bridge-domains elan-svlans vlan-id-list 1300
set routing-instances pbn-3-for-elan bridge-domains elan-svlans vlan-id-list 1400
set routing-instances pbn-3-for-elan pbb-options peer-instance pbbn-1
set routing-instances pbn-3-for-elan service-groups elan1 service-type elan
set routing-instances pbn-3-for-elan service-groups elan1 pbb-service-options
isid 10300 vlan-id-list 1300
set routing-instances pbn-3-for-elan service-groups elan2 service-type elan
set routing-instances pbn-3-for-elan service-groups elan2 pbb-service-options
isid 10400 vlan-id-list 1400
```

Step-by-Step Procedure To configure the PBN (I-component) routing instance for E-LAN service:

1. Configure the PBN routing instance `pbn3-for-elan` and specify the instance type as `virtual-switch` to provide support for Layer 2 bridging:

```
[edit routing-instances]
user@beb4# set pbn-3-for-elan instance-type virtual-switch
```

2. Configure the logical interfaces for the PBN routing instance:

```
[edit routing-instances]
user@beb4# set pbn-3-for-elan interface ge-1/0/0.3
user@beb4# set pbn-3-for-elan interface ge-1/0/0.4
```

3. Configure a provider instance port (PIP) pseudo-logical interface to provide a connection between customer routing instances (PBN I-component) and the provider routing instance (PBBN B-component):

```
[edit routing-instances]
user@beb4# set pbn-3-for-elan interface pip0.1
```

4. Configure the provider bridge domain `elan-svlans` for E-LAN services:

```
[edit routing-instances]
user@beb4# set pbn-3-for-elan bridge-domains elan-svlans vlan-id-list 1300
user@beb4# set pbn-3-for-elan bridge-domains elan-svlans vlan-id-list 1400
```

5. Configure the peer PBBN routing instance (here, the peer PBBN is `pbbn-1`):

```
[edit routing-instances]
```

```
user@beb4# set pbn-3-for-elan pbb-options peer-instance pbbn-1
```

6. Configure service groups and the type of service they will provide for the routing instance (here, service groups `elan1` and `elan2` are configured for `elan` service):

```
[edit routing-instances ]
user@beb4# set pbn-3-for-elan service-groups elan1 service-type elan
user@beb4# set pbn-3-for-elan service-groups elan1 pbb-service-options
isid 10300 vlan-id-list 1300
user@beb4# set pbn-3-for-elan service-groups elan2 service-type elan
user@beb4# set pbn-3-for-elan service-groups elan2 pbb-service-options
isid 10400 vlan-id-list 1400
```

Results Check the results of the configuration:

```
user@beb4> show configuration
routing-instances {
  pbn-3-for-elan {
    instance-type virtual-switch;
    interface ge-1/0/0.3;
    interface ge-1/0/0.4;
    interface pip0.1;
    bridge-domains {
      elan-svlans {
        vlan-id-list [ 1300 1400 ];
      }
    }
  }
  pbb-options {
    peer-instance pbbn-1;
  }
  service-groups {
    elan1 {
      service-type elan;
      pbb-service-options {
        isid 10300 vlan-id-list 1300;
      }
    }
    elan2 {
      service-type elan;
      pbb-service-options {
        isid 10400 vlan-id-list 1400;
      }
    }
  }
}
```

Configuring a PBBN Routing Instance on BEB4

CLI Quick Configuration To quickly configure a routing instance for a PBBN, copy the following commands and paste them into the router terminal window:

```
[edit]
set routing-instances pbbn-1 instance-type virtual-switch
set routing-instances pbbn-1 interface ge-1/0/4.0
set routing-instances pbbn-1 interface ge-1/2/2.0
set routing-instances pbbn-1 interface cbp0.0
set routing-instances pbbn-1 protocols mstp configuration-name pbbn-1
set routing-instances pbbn-1 protocols mstp interface ge-1/0/4
set routing-instances pbbn-1 protocols mstp interface ge-1/2/2
set routing-instances pbbn-1 bridge-domains elan-bvlan vlan-id 3350
set routing-instances pbbn-1 bridge-domains eline-bvlan vlan-id 3150
set routing-instances pbbn-1 pbb-options vlan-id 3350 isid-list 10300
set routing-instances pbbn-1 pbb-options vlan-id 3350 isid-list 10400
set routing-instances pbbn-1 pbb-options vlan-id 3150 isid-list 10100
set routing-instances pbbn-1 pbb-options vlan-id 3150 isid-list 10200
```

Step-by-Step Procedure To configure the PBBN (B-component) routing instance:

1. Configure the PBBN routing instance **pbbn-1** and specify the instance type as **virtual-switch** to provide support for Layer 2 bridging:

```
[edit routing-instances]
user@beb4# set pbbn-1 instance-type virtual-switch
```

2. Configure the logical interfaces for the PBBN routing instance:

```
[edit routing-instances]
user@beb4# set pbbn-1 interface ge-1/0/4.0
user@beb4# set pbbn-1 interface ge-1/2/2.0
```

3. Configure a customer backbone port (CBP) pseudo-logical interface to provide a connection between customer routing instances (PBN I-component) and the provider routing instance (PBBN B-component):

```
[edit routing-instances]
user@beb4# set pbbn-1 interface cbp0.0
```

4. Configure Multiple Spanning Tree Protocol (MSTP) for the PBBN routing instance to ensure a loop-free topology:

```
[edit routing-instances]
user@beb4# set pbbn-1 protocols mstp configuration-name pbbn-1
user@beb4# set pbbn-1 protocols mstp interface ge-1/0/4
user@beb4# set pbbn-1 protocols mstp interface ge-1/2/2
```

5. Configure the provider bridge domains **elan-bvlan** and **eline-bvlan** for E-LINE and E-LAN services:

```
[edit routing-instances]
user@beb4# set pbbn-1 bridge-domains elan-bvlan vlan-id 3350
user@beb4# set pbbn-1 bridge-domains eline-bvlan vlan-id 3150
```

6. Configure PBB options to provide the PBBN with B-VLAN to I-SID mapping information in the bridge-domain:


```
[edit routing-instances]
user@beb4# set pbbn-1 pbb-options vlan-id 3350 isid-list 10300
user@beb4# set pbbn-1 pbb-options vlan-id 3350 isid-list 10400
user@beb4# set pbbn-1 pbb-options vlan-id 3150 isid-list 10100
user@beb4# set pbbn-1 pbb-options vlan-id 3150 isid-list 10200
```

Results Check the results of the configuration:

```
user@beb4> show configuration
routing-instances {
  pbbn-1 {
    instance-type virtual-switch;
    interface ge-1/0/4.0;
    interface ge-1/2/2.0;
    interface cbp0.0;
    protocols {
      mstp {
        configuration-name pbbn-1;
        interface ge-1/0/4;
        interface ge-1/2/2;
      }
    }
  }
  bridge-domains {
    elan-bvlan {
      vlan-id 3350;
    }
    eline-bvlan {
      vlan-id 3150;
    }
  }
  pbb-options {
    vlan-id 3350 isid-list [ 10300 10400 ];
    vlan-id 3150 isid-list [ 10100 10200 ];
  }
}
```

Configuring the Interfaces on BEB4

CLI Quick Configuration To quickly configure the interfaces on BEB4, copy the following commands and paste them into the router terminal window:

```
[edit]
set interfaces ge-1/0/0 description "Connected to ES4 Reds ge-1/0/0"
set interfaces ge-1/0/0 flexible-vlan-tagging
set interfaces ge-1/0/0 encapsulation flexible-ethernet-services
set interfaces ge-1/0/0 unit 1 family bridge interface-mode trunk
set interfaces ge-1/0/0 unit 1 family bridge vlan-id-list 2100
set interfaces ge-1/0/0 unit 1 family bridge vlan-rewrite translate 1100 2100
set interfaces ge-1/0/0 unit 2 family bridge interface-mode trunk
set interfaces ge-1/0/0 unit 2 family bridge vlan-id-list 1200
set interfaces ge-1/0/0 unit 3 family bridge interface-mode trunk
```

```

set interfaces ge-1/0/0 unit 3 family bridge vlan-id-list 1300
set interfaces ge-1/0/0 unit 4 family bridge interface-mode trunk
set interfaces ge-1/0/0 unit 4 family bridge vlan-id-list 1400
set interfaces ge-1/0/4 description "Connected to BCB1 Syrah ge-2/1/5"
set interfaces ge-1/0/4 unit 0 family bridge interface-mode trunk
set interfaces ge-1/0/4 unit 0 family bridge vlan-id-list 3000-4000
set interfaces ge-1/2/2 description "Connected to BCB2 Cabernet ge-2/0/6"
set interfaces ge-1/2/2 unit 0 family bridge interface-mode trunk
set interfaces ge-1/2/2 unit 0 family bridge vlan-id-list 3000-4000
set interfaces cbp0 unit 0 family bridge interface-mode trunk
set interfaces cbp0 unit 0 family bridge bridge-domain-type bvlan
set interfaces cbp0 unit 0 family bridge isid-list all
set interfaces pip0 unit 0 family bridge interface-mode trunk
set interfaces pip0 unit 0 family bridge bridge-domain-type svlan
set interfaces pip0 unit 1 family bridge interface-mode trunk
set interfaces pip0 unit 1 family bridge bridge-domain-type svlan
set interfaces pip0 unit 1 family bridge isid-list all-service-groups

```

Step-by-Step Procedure

To configure interfaces on BEB4:NOTE:Traffic from ES4 on interface ge-1/0/0 is translated from VLAN 1100 to VLAN 2100 by including the statement vlan-rewrite.

1. Configure interface ge-1/0/0:



NOTE: Traffic from ES4 on interface ge-1/0/0 is translated from VLAN 1100 to VLAN 2100 by including the statement vlan-rewrite.

```

[edit interfaces]
user@beb4# set ge-1/0/0 description "Connected to ES4 Reds ge-1/0/0"
user@beb4# set ge-1/0/0 flexible-vlan-tagging
user@beb4# set ge-1/0/0 encapsulation flexible-ethernet-services
user@beb4# set ge-1/0/0 unit 1 family bridge interface-mode trunk
user@beb4# set ge-1/0/0 unit 1 family bridge vlan-id-list 2100
user@beb4# set ge-1/0/0 unit 1 family bridge vlan-rewrite translate 1100
2100
user@beb4# set ge-1/0/0 unit 2 family bridge interface-mode trunk
user@beb4# set ge-1/0/0 unit 2 family bridge vlan-id-list 1200
user@beb4# set ge-1/0/0 unit 3 family bridge interface-mode trunk
user@beb4# set ge-1/0/0 unit 3 family bridge vlan-id-list 1300
user@beb4# set ge-1/0/0 unit 4 family bridge interface-mode trunk
user@beb4# set ge-1/0/0 unit 4 family bridge vlan-id-list 1400

```

2. Configure interface ge-1/0/4:

```

[edit interfaces]
user@beb4# set ge-1/0/4 description "Connected to BCB1 Syrah ge-2/1/5"
user@beb4# set ge-1/0/4 unit 0 family bridge interface-mode trunk
user@beb4# set ge-1/0/4 unit 0 family bridge vlan-id-list 3000-4000

```

3. Configure interface ge-1/2/2:

```

[edit interfaces]
user@beb4# set ge-1/2/2 description "Connected to BCB2 Cabernet ge-2/0/6"
user@beb4# set ge-1/2/2 unit 0 family bridge interface-mode trunk

```

```
user@beb4# set ge-1/2/2 unit 0 family bridge vlan-id-list 3000-4000
```

4. Configure interface cpb0:

```
[edit interfaces]
user@beb3# set cbp0 unit 0 family bridge interface-mode trunk
user@beb3# set cbp0 unit 0 family bridge bridge-domain-type bvlan
user@beb3# set cbp0 unit 0 family bridge isid-list all
```

5. Configure interface pip0:

```
[edit interfaces]
user@beb3# set pip0 unit 0 family bridge interface-mode trunk
user@beb3# set pip0 unit 0 family bridge bridge-domain-type svlan
user@beb3# set pip0 unit 0 family bridge isid-list all-service-groups
user@beb3# set pip0 unit 1 family bridge interface-mode trunk
user@beb3# set pip0 unit 1 family bridge bridge-domain-type svlan
user@beb3# set pip0 unit 1 family bridge isid-list all-service-groups
```

Results Check the results of the configuration:

```
user@beb4> show configuration
interfaces {
  ge-1/0/0 {
    description "Connected to ES4 Reds ge-1/0/0";
    flexible-vlan-tagging;
    encapsulation flexible-ethernet-services;
    unit 1 {
      family bridge {
        interface-mode trunk;
        vlan-id-list 2100;
        vlan-rewrite {
          translate 1100 2100;
          # trunk port VLAN translation from vlan1100 to vlan2100
        }
      }
    }
  }
  unit 2 {
    family bridge {
      interface-mode trunk;
      vlan-id-list 1200;
    }
  }
  unit 3 {
    family bridge {
      interface-mode trunk;
      vlan-id-list 1300;
    }
  }
  unit 4 {
    family bridge {
      interface-mode trunk;
      vlan-id-list 1400;
    }
  }
}
```

```

    }
  }
}
ge-1/0/4 {
  description "Connected to BCB1 Syrah ge-2/1/5";
  unit 0 {
    family bridge {
      interface-mode trunk;
      vlan-id-list 3000-4000;
    }
  }
}
ge-1/2/2 {
  description "Connected to BCB2 Cabernet ge-2/0/6";
  unit 0 {
    family bridge {
      interface-mode trunk;
      vlan-id-list 3000-4000;
    }
  }
}
cbp0 {
  unit 0 {
    family bridge {
      interface-mode trunk;
      bridge-domain-type bvlan;
      isid-list all;
    }
  }
}
pip0 {
  unit 0 {
    family bridge {
      interface-mode trunk;
      bridge-domain-type svlan;
      isid-list all-service-groups;
    }
  }
  unit 1 {
    family bridge {
      interface-mode trunk;
      bridge-domain-type svlan;
      isid-list all-service-groups;
    }
  }
}
}

```

Configuring Routing Instances and Interfaces on ES1 (Pinot Noir)

Table 6 on page 55 contains the information about how the customer VLAN (C-VLAN) is mapped to the services VLAN (S-VLAN) on ES1.

Table 6: ES1 C-VLAN to S-VLAN Mapping

Service	C-VLAN	S-VLAN
E-LINE	100	1100
E-LINE	200	1200
E-LAN	300	1300
E-LAN	400	1400

To configure routing instances and interfaces on the MX Series router called ES1 in a PBBN in the topology shown in Figure 2 on page 19, perform these tasks:

- Configuring a Routing Instance for ES1 on page 55
- Configuring the Interfaces on ES1 on page 56

Configuring a Routing Instance for ES1

CLI Quick Configuration

To quickly configure a routing instance for ES1, copy the following commands and paste them into the router terminal window:

```
[edit]
set routing-instances cust-1 instance-type virtual-switch
set routing-instances cust-1 interface ge-1/0/0.1
set routing-instances cust-1 interface ge-1/0/0.2
set routing-instances cust-1 interface ge-1/0/0.3
set routing-instances cust-1 interface ge-1/0/0.4
set routing-instances cust-1 interface ge-1/1/0.0
set routing-instances cust-1 interface ge-2/0/0.1
set routing-instances cust-1 interface ge-2/0/0.2
set routing-instances cust-1 interface ge-2/0/0.3
set routing-instances cust-1 interface ge-2/0/0.4
set routing-instances cust-1 bridge-domains bds vlan-id-list 100
set routing-instances cust-1 bridge-domains bds vlan-id-list 200
set routing-instances cust-1 bridge-domains bds vlan-id-list 300
set routing-instances cust-1 bridge-domains bds vlan-id-list 400
```

Step-by-Step Procedure

To configure the routing instance for ES1:

1. Configure the routing instance `cust-1` and specify the instance type as `virtual-switch` to provide support for Layer 2 bridging:

```
[edit routing-instances]
user@es1# set cust-1 instance-type virtual-switch
```

2. Configure the logical interfaces for the PBN routing instance:

```
[edit routing-instances]
user@es1# set cust-1 interface ge-1/0/0.1
user@es1# set cust-1 interface ge-1/0/0.2
user@es1# set cust-1 interface ge-1/0/0.3
user@es1# set cust-1 interface ge-1/0/0.4
user@es1# set cust-1 interface ge-1/1/0.0
```

```

user@es1# set cust-1 interface ge-2/0/0.1
user@es1# set cust-1 interface ge-2/0/0.2
user@es1# set cust-1 interface ge-2/0/0.3
user@es1# set cust-1 interface ge-2/0/0.4

```

3. Configure the bridge domain bds:

```

[edit routing-instances]
user@es1# set cust-1 bridge-domains bds vlan-id-list 100
user@es1# set cust-1 bridge-domains bds vlan-id-list 200
user@es1# set cust-1 bridge-domains bds vlan-id-list 300
user@es1# set cust-1 bridge-domains bds vlan-id-list 400

```

Results Check the results of the configuration:

```

user@beb4> show configuration
routing-instances {
  cust-1 {
    instance-type virtual-switch;
    interface ge-1/0/0.1;
    interface ge-1/0/0.2;
    interface ge-1/0/0.3;
    interface ge-1/0/0.4;
    interface ge-1/1/0.0;
    interface ge-2/0/0.1;
    interface ge-2/0/0.2;
    interface ge-2/0/0.3;
    interface ge-2/0/0.4;
    bridge-domains {
      bds {
        vlan-id-list [ 100 200 300 400 ];
      }
    }
  }
}

```

Configuring the Interfaces on ES1

CLI Quick Configuration To quickly configure the interfaces on ES1, copy the following commands and paste them into the router terminal window:

```

[edit]
set interfaces ge-1/0/0 description "Connected to BEB2 barbera ge-1/0/0"
set interfaces ge-1/0/0 flexible-vlan-tagging
set interfaces ge-1/0/0 unit 2 vlan-id 1200
set interfaces ge-1/0/0 unit 2 family bridge interface-mode trunk
set interfaces ge-1/0/0 unit 2 family bridge inner-vlan-id-list 200
set interfaces ge-1/1/0 unit 0 family bridge interface-mode trunk
set interfaces ge-1/1/0 unit 0 family bridge vlan-id-list 100
set interfaces ge-1/1/0 unit 0 family bridge vlan-id-list 200
set interfaces ge-1/1/0 unit 0 family bridge vlan-id-list 300
set interfaces ge-1/1/0 unit 0 family bridge vlan-id-list 400
set interfaces ge-2/0/0 description "Connected to AS1 sangiovese ge-2/0/0"

```

```

set interfaces ge-2/0/0 flexible-vlan-tagging
set interfaces ge-2/0/0 unit 1 vlan-id 2100
set interfaces ge-2/0/0 unit 1 family bridge interface-mode trunk
set interfaces ge-2/0/0 unit 1 family bridge inner-vlan-id-list 100
set interfaces ge-2/0/0 unit 3 vlan-id 1300
set interfaces ge-2/0/0 unit 3 family bridge interface-mode trunk
set interfaces ge-2/0/0 unit 3 family bridge inner-vlan-id-list 300
set interfaces ge-2/0/0 unit 4 vlan-id 1400
set interfaces ge-2/0/0 unit 4 family bridge interface-mode trunk
set interfaces ge-2/0/0 unit 4 family bridge inner-vlan-id-list 400

```

Step-by-Step Procedure To configure interfaces on ES1:

1. Configure interface ge-1/0/0:

```

[edit interfaces]
user@es1# set ge-1/0/0 description "Connected to BEB2 barbera ge-1/0/0"
user@es1# set ge-1/0/0 flexible-vlan-tagging
user@es1# set ge-1/0/0 unit 2 vlan-id 1200
user@es1# set ge-1/0/0 unit 2 family bridge interface-mode trunk
user@es1# set ge-1/0/0 unit 2 family bridge inner-vlan-id-list 200

```

2. Configure interface ge-1/1/0:

```

[edit interfaces]
user@es1# set ge-1/1/0 unit 0 family bridge interface-mode trunk
user@es1# set ge-1/1/0 unit 0 family bridge vlan-id-list 100
user@es1# set ge-1/1/0 unit 0 family bridge vlan-id-list 200
user@es1# set ge-1/1/0 unit 0 family bridge vlan-id-list 300
user@es1# set ge-1/1/0 unit 0 family bridge vlan-id-list 400

```

3. Configure interface ge-2/0/0:

```

[edit interfaces]
user@es1# set ge-2/0/0 description "Connected to BEB1 sangiovese ge-2/0/0"
user@es1# set ge-2/0/0 flexible-vlan-tagging
user@es1# set ge-2/0/0 unit 1 vlan-id 2100
user@es1# set ge-2/0/0 unit 1 family bridge interface-mode trunk
user@es1# set ge-2/0/0 unit 1 family bridge inner-vlan-id-list 100
user@es1# set ge-2/0/0 unit 3 vlan-id 1300
user@es1# set ge-2/0/0 unit 3 family bridge interface-mode trunk
user@es1# set ge-2/0/0 unit 3 family bridge inner-vlan-id-list 300
user@es1# set ge-2/0/0 unit 4 vlan-id 1400
user@es1# set ge-2/0/0 unit 4 family bridge interface-mode trunk
user@es1# set ge-2/0/0 unit 4 family bridge inner-vlan-id-list 400

```

Results Check the results of the configuration:

```

user@es1> show configuration
interfaces {
  ge-1/0/0 {
    description "Connected to BEB2 barbera ge-1/0/0";
    flexible-vlan-tagging;
    unit 2 {
      vlan-id 1200;

```

```

        family bridge {
            interface-mode trunk;
            inner-vlan-id-list [ 200 ];
        }
    }
}
ge-1/1/0 {
    unit 0 {
        family bridge {
            interface-mode trunk;
            vlan-id-list [ 100 200 300 400 ];
        }
    }
}
ge-2/0/0 {
    description "Connected to BEB1 sangiovese ge-2/0/0";
    flexible-vlan-tagging;
    unit 1 {
        vlan-id 2100;
        family bridge {
            interface-mode trunk;
            inner-vlan-id-list [ 100 ];
        }
    }
    unit 3 {
        vlan-id 1300;
        family bridge {
            interface-mode trunk;
            inner-vlan-id-list 300;
        }
    }
    unit 4 {
        vlan-id 1400;
        family bridge {
            interface-mode trunk;
            inner-vlan-id-list 400;
        }
    }
}
}
}

```

Configuring a Routing Instance and Interfaces on ES3 (Dolcetto)

Table 7 on page 58 contains the information about how the customer VLAN (C-VLAN) is mapped to the services VLAN (S-VLAN) on ES3.

Table 7: ES3 C-VLAN to S-VLAN Mapping

Service	C-VLAN	S-VLAN
E-LAN	300	1300
E-LAN	400	1400

To configure routing instances and interfaces on the MX Series router called ES3 in a PBBN in the topology shown in Figure 2 on page 19, perform these tasks:

- Configuring a Routing Instance for ES3 on page 59
- Configuring the Interfaces on ES3 on page 60

Configuring a Routing Instance for ES3

CLI Quick Configuration To quickly configure a routing instance for ES3, copy the following commands and paste them into the router terminal window:

```
[edit]
set routing-instances cust-1 instance-type virtual-switch
set routing-instances cust-1 interface ge-2/0/0.3
set routing-instances cust-1 interface ge-2/0/0.4
set routing-instances cust-1 interface ge-2/1/0.0
set routing-instances cust-1 bridge-domains bds vlan-id-list 300
set routing-instances cust-1 bridge-domains bds vlan-id-list 400
```

Step-by-Step Procedure To configure the routing instance for ES3:

1. Configure the routing instance `cust-1` and specify the instance type as `virtual-switch` to provide support for Layer 2 bridging:

```
[edit routing-instances]
user@es3# set cust-1 instance-type virtual-switch
```

2. Configure the logical interfaces for the PBN routing instance:

```
[edit routing-instances]
user@es3# set cust-1 interface ge-2/0/0.3
user@es3# set cust-1 interface ge-2/0/0.4
user@es3# set cust-1 interface ge-2/1/0.0
```

3. Configure the bridge domain `bds`:

```
[edit routing-instances]
user@es3# set cust-1 bridge-domains bds vlan-id-list 300
user@es3# set cust-1 bridge-domains bds vlan-id-list 400
```

Results Check the results of the configuration:

```
user@es3> show configuration
routing-instances {
  cust-1 {
    instance-type virtual-switch;
    interface ge-2/0/0.3;
    interface ge-2/0/0.4;
    interface ge-2/1/0.0;
    bridge-domains {
      bds {
        vlan-id-list [ 300 400 ];
      }
    }
  }
}
```

```

    }
  }
}

```

Configuring the Interfaces on ES3

CLI Quick Configuration To quickly configure the interfaces on ES3, copy the following commands and paste them into the router terminal window:

```

[edit]
set interfaces ge-1/1/0 unit 0 family bridge interface-mode trunk
set interfaces ge-1/1/0 unit 0 family bridge vlan-id-list 300
set interfaces ge-1/1/0 unit 0 family bridge vlan-id-list 400
set interfaces ge-2/0/0 description "Connected to BEB3 malbec ge-2/0/0"
set interfaces ge-2/0/0 flexible-vlan-tagging
set interfaces ge-2/0/0 unit 3 vlan-id 1300
set interfaces ge-2/0/0 unit 3 family bridge interface-mode trunk
set interfaces ge-2/0/0 unit 3 family bridge inner-vlan-id-list 300
set interfaces ge-2/0/0 unit 4 vlan-id 1400
set interfaces ge-2/0/0 unit 4 family bridge interface-mode trunk
set interfaces ge-2/0/0 unit 4 family bridge inner-vlan-id-list 400

```

Step-by-Step Procedure To configure interfaces on ES3:

1. Configure interface ge-1/1/0:

```

[edit interfaces]
user@es3# set ge-1/1/0 unit 0 family bridge interface-mode trunk
user@es3# set ge-1/1/0 unit 0 family bridge vlan-id-list 300
user@es3# set ge-1/1/0 unit 0 family bridge vlan-id-list 400

```

2. Configure interface ge-2/0/0:

```

[edit interfaces]
user@es3# set ge-2/0/0 description "Connected to BEB3 malbec ge-2/0/0"
user@es3# set ge-2/0/0 flexible-vlan-tagging
user@es3# set ge-2/0/0 unit 3 vlan-id 1300
user@es3# set ge-2/0/0 unit 3 family bridge interface-mode trunk
user@es3# set ge-2/0/0 unit 3 family bridge inner-vlan-id-list 300
user@es3# set ge-2/0/0 unit 4 vlan-id 1400
user@es3# set ge-2/0/0 unit 4 family bridge interface-mode trunk
user@es3# set ge-2/0/0 unit 4 family bridge inner-vlan-id-list 400

```

Results Check the results of the configuration:

```

user@es3> show configuration
interfaces {
  ge-1/1/0 {
    unit 0 {
      family bridge {
        interface-mode trunk;
        vlan-id-list [ 300 400 ];
      }
    }
  }
}

```

```

}
ge-2/0/0 {
  description "Connected to BEB3 malbec ge-2/0/0";
  flexible-vlan-tagging;
  unit 3 {
    vlan-id 1300;
    family bridge {
      interface-mode trunk;
      inner-vlan-id-list 300;
    }
  }
  unit 4 {
    vlan-id 1400;
    family bridge {
      interface-mode trunk;
      inner-vlan-id-list 400;
    }
  }
}
}

```

Configuring a Routing Instance and Interfaces on ES4 (Reds)

Table 8 on page 61 contains the information about how the customer VLAN (C-VLAN) is mapped to the services VLAN (S-VLAN) on ES4.

Table 8: ES4 C-VLAN to S-VLAN Mapping

Service	C-VLAN	S-VLAN
E-LINE	100	1100
E-LINE	200	1200
E-LAN	300	1300
E-LAN	400	1400

To configure routing instances and interfaces on the MX Series router called ES4 in a PBBN in the topology shown in Figure 2 on page 19, perform these tasks:

- Configuring a Routing Instance for ES4 on page 61
- Configuring the Interfaces on ES4 on page 63

Configuring a Routing Instance for ES4

CLI Quick Configuration

To quickly configure a routing instance for ES4, copy the following commands and paste them into the router terminal window:

```

[edit]
set routing-instances cust-1 instance-type virtual-switch
set routing-instances cust-1 interface ge-1/0/0.1

```

```

set routing-instances cust-1 interface ge-1/0/0.2
set routing-instances cust-1 interface ge-1/0/0.3
set routing-instances cust-1 interface ge-1/0/0.4
set routing-instances cust-1 interface ge-1/0/3.1
set routing-instances cust-1 interface ge-1/0/3.2
set routing-instances cust-1 interface ge-1/0/3.3
set routing-instances cust-1 interface ge-1/0/3.4
set routing-instances cust-1 bridge-domains bds vlan-id-list 100
set routing-instances cust-1 bridge-domains bds vlan-id-list 200
set routing-instances cust-1 bridge-domains bds vlan-id-list 300
set routing-instances cust-1 bridge-domains bds vlan-id-list 400

```

Step-by-Step Procedure To configure the routing instance for ES4:

1. Configure the routing instance `cust-1` and specify the instance type as `virtual-switch` to provide support for Layer 2 bridging:

```

[edit routing-instances]
user@es4# set cust-1 instance-type virtual-switch

```

2. Configure the logical interfaces for the PBN routing instance:

```

[edit routing-instances]
user@es4# set cust-1 interface ge-1/0/0.1
user@es4# set cust-1 interface ge-1/0/0.2
user@es4# set cust-1 interface ge-1/0/0.3
user@es4# set cust-1 interface ge-1/0/0.4
user@es4# set cust-1 interface ge-1/0/3.1
user@es4# set cust-1 interface ge-1/0/3.2
user@es4# set cust-1 interface ge-1/0/3.3
user@es4# set cust-1 interface ge-1/0/3.4

```

3. Configure the bridge domain `bds`:

```

[edit routing-instances]
user@es4# set cust-1 bridge-domains bds vlan-id-list 100
user@es4# set cust-1 bridge-domains bds vlan-id-list 200
user@es4# set cust-1 bridge-domains bds vlan-id-list 300
user@es4# set cust-1 bridge-domains bds vlan-id-list 400

```

Results Check the results of the configuration:

```

user@es4> show configuration
routing-instances {
  cust-1 {
    instance-type virtual-switch;
    interface ge-1/0/0.1;
    interface ge-1/0/0.2;
    interface ge-1/0/0.3;
    interface ge-1/0/0.4;
    interface ge-1/0/3.1;
    interface ge-1/0/3.2;
    interface ge-1/0/3.3;
    interface ge-1/0/3.4;
    bridge-domains {

```

```

        bds {
            vlan-id-list [ 100 200 300 400 ];
        }
    }
}

```

Configuring the Interfaces on ES4

CLI Quick Configuration To quickly configure the interfaces on ES4, copy the following commands and paste them into the router terminal window:

```

[edit]
set interfaces interface-set vuni-set1 interface ge-1/0/3 unit 1
set interfaces interface-set vuni-set1 interface ge-1/0/3 unit 3
set interfaces interface-set vuni-set1 interface ge-1/0/3 unit 4
set interfaces interface-set vuni-set2 interface ge-1/0/3 unit 2
set interfaces ge-1/0/0 description "Connected to ES4 Reds ge-1/0/0"
set interfaces ge-1/0/0 flexible-vlan-tagging
set interfaces ge-1/0/0 unit 1 vlan-id 1100
set interfaces ge-1/0/0 unit 1 family bridge interface-mode trunk
set interfaces ge-1/0/0 unit 1 family bridge inner-vlan-id-list 100
set interfaces ge-1/0/0 unit 2 vlan-id 1200
set interfaces ge-1/0/0 unit 2 family bridge interface-mode trunk
set interfaces ge-1/0/0 unit 2 family bridge inner-vlan-id-list 200
set interfaces ge-1/0/0 unit 3 vlan-id 1300
set interfaces ge-1/0/0 unit 3 family bridge interface-mode trunk
set interfaces ge-1/0/0 unit 3 family bridge inner-vlan-id-list 300
set interfaces ge-1/0/0 unit 4 vlan-id 1400
set interfaces ge-1/0/0 unit 4 family bridge interface-mode trunk
set interfaces ge-1/0/0 unit 4 family bridge inner-vlan-id-list 400
set interfaces ge-1/0/3 flexible-vlan-tagging
set interfaces ge-1/0/3 unit 1 vlan-id 1100
set interfaces ge-1/0/3 unit 1 family bridge interface-mode trunk
set interfaces ge-1/0/3 unit 1 family bridge inner-vlan-id-list 100
set interfaces ge-1/0/3 unit 2 vlan-id 1200
set interfaces ge-1/0/3 unit 2 family bridge interface-mode trunk
set interfaces ge-1/0/3 unit 2 family bridge inner-vlan-id-list 200
set interfaces ge-1/0/3 unit 3 vlan-id 1300
set interfaces ge-1/0/3 unit 3 family bridge interface-mode trunk
set interfaces ge-1/0/3 unit 3 family bridge inner-vlan-id-list 300
set interfaces ge-1/0/3 unit 4 vlan-id 1400
set interfaces ge-1/0/3 unit 4 family bridge interface-mode trunk
set interfaces ge-1/0/3 unit 4 family bridge inner-vlan-id-list 400

```

Step-by-Step Procedure To configure interfaces on ES4:

1. Configure the interface sets vuni-set1 and vuni-set2:

```

[edit interfaces]
user@es4# set interface-set vuni-set1 interface ge-1/0/3 unit 1
user@es4# set interface-set vuni-set1 interface ge-1/0/3 unit 3
user@es4# set interface-set vuni-set1 interface ge-1/0/3 unit 4
user@es4# set interface-set vuni-set2 interface ge-1/0/3 unit 2

```

2. Configure interface ge-1/0/0:

```
[edit interfaces]
user@es4# set ge-1/0/0 description "Connected to BEB4 Cubs ge-1/0/0"
user@es4# set ge-1/0/0 flexible-vlan-tagging
user@es4# set ge-1/0/0 unit 1 vlan-id 1100
user@es4# set ge-1/0/0 unit 1 family bridge interface-mode trunk
user@es4# set ge-1/0/0 unit 1 family bridge inner-vlan-id-list 100
user@es4# set ge-1/0/0 unit 2 vlan-id 1200
user@es4# set ge-1/0/0 unit 2 family bridge interface-mode trunk
user@es4# set ge-1/0/0 unit 2 family bridge inner-vlan-id-list 200
user@es4# set ge-1/0/0 unit 3 vlan-id 1300
user@es4# set ge-1/0/0 unit 3 family bridge interface-mode trunk
user@es4# set ge-1/0/0 unit 3 family bridge inner-vlan-id-list 300
user@es4# set ge-1/0/0 unit 4 vlan-id 1400
user@es4# set ge-1/0/0 unit 4 family bridge interface-mode trunk
user@es4# set ge-1/0/0 unit 4 family bridge inner-vlan-id-list 400
```

3. Configure interface ge-1/0/3:

```
[edit interfaces]
user@es4# set ge-1/0/3 description "Connected to Gigabit switch"
user@es4# set ge-1/0/3 flexible-vlan-tagging
user@es4# set ge-1/0/3 unit 1 vlan-id 1100
user@es4# set ge-1/0/3 unit 1 family bridge interface-mode trunk
user@es4# set ge-1/0/3 unit 1 family bridge inner-vlan-id-list 100
user@es4# set ge-1/0/3 unit 2 vlan-id 1200
user@es4# set ge-1/0/3 unit 2 family bridge interface-mode trunk
user@es4# set ge-1/0/3 unit 2 family bridge inner-vlan-id-list 200
user@es4# set ge-1/0/3 unit 3 vlan-id 1300
user@es4# set ge-1/0/3 unit 3 family bridge interface-mode trunk
user@es4# set ge-1/0/3 unit 3 family bridge inner-vlan-id-list 300
user@es4# set ge-1/0/3 unit 4 vlan-id 1400
user@es4# set ge-1/0/3 unit 4 family bridge interface-mode trunk
user@es4# set ge-1/0/3 unit 4 family bridge inner-vlan-id-list 400
```

Results Check the results of the configuration:

```
user@es4> show configuration
interfaces {
  interface-set vuni-set1 {
    interface ge-1/0/3 {
      unit 1;
      unit 3;
      unit 4;
    }
  }
  interface-set vuni-set2 {
    interface ge-1/0/3 {
      unit 2;
    }
  }
}
ge-1/0/0 {
  description "Connected to BEB4 Cubs ge-1/0/0";
  flexible-vlan-tagging;
  # each unit
  unit 1 {
```

```

        vlan-id 1100;
        family bridge {
            interface-mode trunk;
            inner-vlan-id-list [ 100 ];
        }
    }
    unit 2 {
        vlan-id 1200;
        family bridge {
            interface-mode trunk;
            inner-vlan-id-list [ 200 ];
        }
    }
    unit 3 {
        vlan-id 1300;
        family bridge {
            interface-mode trunk;
            inner-vlan-id-list 300;
        }
    }
    unit 4 {
        vlan-id 1400;
        family bridge {
            interface-mode trunk;
            inner-vlan-id-list 400;
        }
    }
}
ge-1/0/3 {
    flexible-vlan-tagging;
# interface-set and port level
    unit 1 {
        vlan-id 1100;
        family bridge {
            interface-mode trunk;
            inner-vlan-id-list 100;
        }
    }
    unit 2 {
        vlan-id 1200;
        family bridge {
            interface-mode trunk;
            inner-vlan-id-list 200;
        }
    }
    unit 3 {
        vlan-id 1300;
        family bridge {
            interface-mode trunk;
            inner-vlan-id-list 300;
        }
    }
    unit 4 {
        vlan-id 1400;
        family bridge {
            interface-mode trunk;

```

```

        inner-vlan-id-list 400;
    }
}

```

Configuring a Routing Instance and Interfaces on BCB1 (Syrah)

To configure routing instances and interfaces on the MX Series router called BCB1 in a PBBN in the topology shown in Figure 2 on page 19, perform these tasks:

- Configuring a Routing Instance for BCB1 on page 66
- Configuring the Interfaces on BCB1 on page 67

Configuring a Routing Instance for BCB1

CLI Quick Configuration To quickly configure a routing instance for BCB1, copy the following commands and paste them into the router terminal window:

```

[edit]
set routing-instances pbbn-1 instance-type virtual-switch
set routing-instances pbbn-1 interface ge-1/3/0.0
set routing-instances pbbn-1 interface ge-1/3/9.0
set routing-instances pbbn-1 interface ge-2/1/5.0
set routing-instances pbbn-1 interface ge-2/3/0.0
set routing-instances pbbn-1 interface ge-2/3/9.0
set routing-instances pbbn-1 protocols mstp configuration-name pbbn-1
set routing-instances pbbn-1 protocols mstp bridge-priority 4k
set routing-instances pbbn-1 protocols mstp interface ge-1/3/0
set routing-instances pbbn-1 protocols mstp interface ge-1/3/9
set routing-instances pbbn-1 protocols mstp interface ge-2/1/5
set routing-instances pbbn-1 protocols mstp interface ge-2/3/0
set routing-instances pbbn-1 protocols mstp interface ge-2/3/9
set routing-instances pbbn-1 bridge-domains elan-bvlan vlan-id 3350
set routing-instances pbbn-1 bridge-domains eline-bvlan vlan-id-list 3150

```

Step-by-Step Procedure To configure the routing instance for BCB1:

1. Configure the routing instance `pbbn-1` and specify the instance type as `virtual-switch` to provide support for Layer 2 bridging:

```

[edit routing-instances]
user@bcb1# set pbbn-1 instance-type virtual-switch

```

2. Configure the logical interfaces for the PBN routing instance:

```

[edit routing-instances]
user@bcb1# set pbbn-1 interface ge-1/3/0.0
user@bcb1# set pbbn-1 interface ge-1/3/9.0
user@bcb1# set pbbn-1 interface ge-2/1/5.0
user@bcb1# set pbbn-1 interface ge-2/3/0.0
user@bcb1# set pbbn-1 interface ge-2/3/9.0

```

3. Configure MSTP:

```

[edit routing-instances]

```



```

user@bcb1# set pbbn-1 protocols mstp configuration-name pbbn-1
user@bcb1# set pbbn-1 protocols mstp bridge-priority 4k
user@bcb1# set pbbn-1 protocols mstp interface ge-1/3/0
user@bcb1# set pbbn-1 protocols mstp interface ge-1/3/9
user@bcb1# set pbbn-1 protocols mstp interface ge-2/1/5
user@bcb1# set pbbn-1 protocols mstp interface ge-2/3/0
user@bcb1# set pbbn-1 protocols mstp interface ge-2/3/9

```

4. Configure the bridge domain bds:

```

[edit routing-instances]
user@bcb1# set pbbn-1 bridge-domains elan-bvlan vlan-id 3350
user@bcb1# set pbbn-1 bridge-domains eline-bvlan vlan-id-list 3150

```

Results Check the results of the configuration:

```

user@ebcb1> show configuration
routing-instances {
  pbbn-1 {
    instance-type virtual-switch;
    interface ge-1/3/0.0;
    interface ge-1/3/9.0;
    interface ge-2/1/5.0;
    interface ge-2/3/0.0;
    interface ge-2/3/9.0;
    protocols {
      mstp {
        configuration-name pbbn-1;
        bridge-priority 4k;
        interface ge-1/3/0;
        interface ge-1/3/9;
        interface ge-2/1/5;
        interface ge-2/3/0;
        interface ge-2/3/9;
      }
    }
  }
  bridge-domains {
    elan-bvlan {
      vlan-id 3350;
    }
    eline-bvlan {
      vlan-id 3150;
    }
  }
}

```

Configuring the Interfaces on BCB1

CLI Quick Configuration

To quickly configure the interfaces on BCB1, copy the following commands and paste them into the router terminal window:

```
[edit]
set interfaces ge-1/3/0 description "Connected to BEB2 barbera ge-1/3/0"
set interfaces ge-1/3/0 enable
set interfaces ge-1/3/0 unit 0 family bridge interface-mode trunk
set interfaces ge-1/3/0 unit 0 family bridge vlan-id-list 3000-4000
set interfaces ge-1/3/9 description "Connected to BEB1 sangiovese ge-1/3/9"
set interfaces ge-1/3/9 unit 0 family bridge interface-mode trunk
set interfaces ge-1/3/9 unit 0 family bridge vlan-id-list 3000-4000
set interfaces ge-2/1/5 description "Connected to BEB4 Cubs ge-1/0/4"
set interfaces ge-2/1/5 unit 0 family bridge interface-mode trunk
set interfaces ge-2/1/5 unit 0 family bridge vlan-id-list 3000-4000
set interfaces ge-2/3/0 description "Connected to BEB3 malbec ge-2/3/0"
set interfaces ge-2/3/0 unit 0 family bridge interface-mode trunk
set interfaces ge-2/3/0 unit 0 family bridge vlan-id-list 3000-4000
set interfaces ge-2/3/9 description "Connected to BCB2 cabernet ge-2/3/9"
set interfaces ge-2/3/9 unit 0 family bridge interface-mode trunk
set interfaces ge-2/3/9 unit 0 family bridge vlan-id-list 3000-4000
```

Step-by-Step Procedure To configure interfaces on BCB1:

1. Configure interface ge-1/3/0:

```
[edit interfaces]
user@bcb1# set ge-1/3/0 description "Connected to BEB2 barbera ge-1/3/0"
user@bcb1# set ge-1/3/0 enable
user@bcb1# set ge-1/3/0 unit 0 family bridge interface-mode trunk
user@bcb1# set ge-1/3/0 unit 0 family bridge vlan-id-list 3000-4000
```

2. Configure interface ge-1/3/9:

```
set interfaces ge-1/3/9 description "Connected to BEB1 sangiovese ge-1/3/9"

[edit interfaces]
user@bcb1# set ge-1/3/9 unit 0 family bridge interface-mode trunk
user@bcb1# set ge-1/3/9 unit 0 family bridge vlan-id-list 3000-4000
```

3. Configure interface ge-2/1/5:

```
[edit interfaces]
user@bcb1# set ge-2/1/5 description "Connected to BEB4 Cubs ge-1/0/4"
user@bcb1# set ge-2/1/5 unit 0 family bridge interface-mode trunk
user@bcb1# set ge-2/1/5 unit 0 family bridge vlan-id-list 3000-4000
```

4. Configure interface ge-2/3/0:

```
[edit interfaces]
user@bcb1# set ge-2/3/0 description "Connected to BEB3 malbec ge-2/3/0"
user@bcb1# set ge-2/3/0 unit 0 family bridge interface-mode trunk
user@bcb1# set ge-2/3/0 unit 0 family bridge vlan-id-list 3000-4000
```

5. Configure interface ge-2/3/9:

```
[edit interfaces]
user@bcb1# set ge-2/3/9 description "Connected to BCB2 cabernet ge-2/3/9"
user@bcb1# set ge-2/3/9 unit 0 family bridge interface-mode trunk
```

```
user@bcb1# set ge-2/3/9 unit 0 family bridge vlan-id-list 3000-4000
```

Results Check the results of the configuration:

```
user@bcb1> show configuration
interfaces {
  ge-1/3/0 {
    description "Connected to BEB2 barbera ge-1/3/0";
    enable;
    unit 0 {
      family bridge {
        interface-mode trunk;
        vlan-id-list 3000-4000;
      }
    }
  }
  ge-1/3/9 {
    description "Connected to BEB1 sangiovese ge-1/3/9";
    unit 0 {
      family bridge {
        interface-mode trunk;
        vlan-id-list 3000-4000;
      }
    }
  }
  ge-2/1/5 {
    description "Connected to BEB4 Cubs ge-1/0/4";
    unit 0 {
      family bridge {
        interface-mode trunk;
        vlan-id-list 3000-4000;
      }
    }
  }
  ge-2/3/0 {
    description "Connected to BEB3 malbec ge-2/3/0";
    unit 0 {
      family bridge {
        interface-mode trunk;
        vlan-id-list 3000-4000;
      }
    }
  }
  ge-2/3/9 {
    description "Connected to BCB2 cabernet ge-2/3/9";
    unit 0 {
      family bridge {
        interface-mode trunk;
        vlan-id-list 3000-4000;
      }
    }
  }
}
```

Configuring a Routing Instance and Interfaces on BCB2 (Cabernet)

To configure routing instances and interfaces on the MX Series router called BCB2 in a PBBN in the topology shown in Figure 2 on page 19, perform these tasks:

- Configuring a Routing Instance for BCB2 on page 70
- Configuring the Interfaces on BCB2 on page 71

Configuring a Routing Instance for BCB2

CLI Quick Configuration To quickly configure a routing instance for BCB2, copy the following commands and paste them into the router terminal window:

```
[edit]
set routing-instances pbbn-1 instance-type virtual-switch
set routing-instances pbbn-1 interface ge-1/3/0.0
set routing-instances pbbn-1 interface ge-1/3/9.0
set routing-instances pbbn-1 interface ge-2/1/5.0
set routing-instances pbbn-1 interface ge-2/3/0.0
set routing-instances pbbn-1 interface ge-2/3/9.0
set routing-instances pbbn-1 protocols mstp configuration-name pbbn-1
set routing-instances pbbn-1 protocols mstp bridge-priority 4k
set routing-instances pbbn-1 protocols mstp interface ge-1/3/0
set routing-instances pbbn-1 protocols mstp interface ge-1/3/9
set routing-instances pbbn-1 protocols mstp interface ge-2/1/5
set routing-instances pbbn-1 protocols mstp interface ge-2/3/0
set routing-instances pbbn-1 protocols mstp interface ge-2/3/9
set routing-instances pbbn-1 bridge-domains elan-bvlan vlan-id 3350
set routing-instances pbbn-1 bridge-domains eline-bvlan vlan-id-list 3150
```

Step-by-Step Procedure To configure the routing instance for BCB2:

1. Configure the routing instance `pbbn-1` and specify the instance type as `virtual-switch` to provide support for Layer 2 bridging:

```
[edit routing-instances]
user@bcb2# set pbbn-1 instance-type virtual-switch
```

2. Configure the logical interfaces for the PBN routing instance:

```
[edit routing-instances]
user@bc21# set pbbn-1 interface ge-1/3/0.0
user@bcb2# set pbbn-1 interface ge-1/3/9.0
user@bcb2# set pbbn-1 interface ge-2/1/5.0
user@bcb2# set pbbn-1 interface ge-2/3/0.0
user@bcb2# set pbbn-1 interface ge-2/3/9.0
```

3. Configure MSTP:

```
[edit routing-instances]
user@bcb2# set pbbn-1 protocols mstp configuration-name pbbn-1
user@bcb2# set pbbn-1 protocols mstp bridge-priority 4k
user@bcb2# set pbbn-1 protocols mstp interface ge-1/3/0
user@bcb2# set pbbn-1 protocols mstp interface ge-1/3/9
```

```

user@bcb2# set pbbn-1 protocols mstp interface ge-2/1/5
user@bcb2# set pbbn-1 protocols mstp interface ge-2/3/0
user@bcb2# set pbbn-1 protocols mstp interface ge-2/3/9

```

4. Configure the bridge domain bds:

```

[edit routing-instances]
user@bcb2# set pbbn-1 bridge-domains elan-bvlan vlan-id 3350
user@bcb2# set pbbn-1 bridge-domains eline-bvlan vlan-id-list 3150

```

Results Check the results of the configuration:

```

user@bcb2> show configuration
routing-instances {
  pbbn-1 {
    instance-type virtual-switch;
    interface ge-1/3/0.0;
    interface ge-1/3/9.0;
    interface ge-2/0/6.0;
    interface ge-2/3/0.0;
    interface ge-2/3/9.0;
    protocols {
      mstp {
        configuration-name pbbn-1;
        bridge-priority 4k;
        interface ge-1/3/0;
        interface ge-1/3/9;
        interface ge-2/0/6;
        interface ge-2/3/0;
        interface ge-2/3/9;
      }
    }
    bridge-domains {
      elan-bvlan {
        vlan-id 3350;
      }
      eline-bvlan {
        vlan-id-list 3150;
      }
    }
  }
}

```

Configuring the Interfaces on BCB2

CLI Quick Configuration To quickly configure the interfaces on BCB2, copy the following commands and paste them into the router terminal window:

```

[edit]
set interfaces ge-1/3/0 description "Connected to BEB2 barbera ge-1/3/0"
set interfaces ge-1/3/0 enable
set interfaces ge-1/3/0 unit 0 family bridge interface-mode trunk

```

```

set interfaces ge-1/3/0 unit 0 family bridge vlan-id-list 3000-4000
set interfaces ge-1/3/9 description "Connected to BEB1 sangiovese ge-1/3/9"
set interfaces ge-1/3/9 unit 0 family bridge interface-mode trunk
set interfaces ge-1/3/9 unit 0 family bridge vlan-id-list 3000-4000
set interfaces ge-2/1/5 description "Connected to BEB4 Cubs ge-1/0/4"
set interfaces ge-2/1/5 unit 0 family bridge interface-mode trunk
set interfaces ge-2/1/5 unit 0 family bridge vlan-id-list 3000-4000
set interfaces ge-2/3/0 description "Connected to BEB3 malbec ge-2/3/0"
set interfaces ge-2/3/0 unit 0 family bridge interface-mode trunk
set interfaces ge-2/3/0 unit 0 family bridge vlan-id-list 3000-4000
set interfaces ge-2/3/9 description "Connected to BCB1 syrah ge-2/3/9"
set interfaces ge-2/3/9 unit 0 family bridge interface-mode trunk
set interfaces ge-2/3/9 unit 0 family bridge vlan-id-list 3000-4000

```

Step-by-Step Procedure To configure interfaces on BCB2:

1. Configure interface ge-1/3/0:

```

[edit interfaces]
user@bcb2# set ge-1/3/0 description "Connected to BEB2 barbera ge-1/3/0"
user@bcb2# set ge-1/3/0 enable
user@bcb2# set ge-1/3/0 unit 0 family bridge interface-mode trunk
user@bcb2# set ge-1/3/0 unit 0 family bridge vlan-id-list 3000-4000

```

2. Configure interface ge-1/3/9:

```

set interfaces ge-1/3/9 description "Connected to BEB1 sangiovese ge-1/3/9"

[edit interfaces]
user@bcb2# set ge-1/3/9 unit 0 family bridge interface-mode trunk
user@bcb2# set ge-1/3/9 unit 0 family bridge vlan-id-list 3000-4000

```

3. Configure interface ge-2/1/5:

```

[edit interfaces]
user@bcb2# set ge-2/1/5 description "Connected to BEB4 Cubs ge-1/0/4"
user@bcb2# set ge-2/1/5 unit 0 family bridge interface-mode trunk
user@bcb2# set ge-2/1/5 unit 0 family bridge vlan-id-list 3000-4000

```

4. Configure interface ge-2/3/0:

```

[edit interfaces]
user@bcb2# set ge-2/3/0 description "Connected to BEB3 malbec ge-2/3/0"
user@bcb2# set ge-2/3/0 unit 0 family bridge interface-mode trunk
user@bcb2# set ge-2/3/0 unit 0 family bridge vlan-id-list 3000-4000

```

5. Configure interface ge-2/3/9:

```

[edit interfaces]
user@bcb2# set ge-2/3/9 description "Connected to BCB1 syrah ge-2/3/9"
user@bcb2# set ge-2/3/9 unit 0 family bridge interface-mode trunk
user@bcb2# set ge-2/3/9 unit 0 family bridge vlan-id-list 3000-4000

```

Results Check the results of the configuration:

```

user@bcb2> show configuration
interfaces {
  ge-1/3/0 {
    description "Connected to BEB1 sangiovese ge-1/3/0";
    unit 0 {
      family bridge {
        interface-mode trunk;
        vlan-id-list 3000-4000;
      }
    }
  }
  ge-1/3/9 {
    description "Connected to BEB3 malbec ge-1/3/9";
    unit 0 {
      family bridge {
        interface-mode trunk;
        vlan-id-list 3000-4000;
      }
    }
  }
  ge-2/0/6 {
    unit 0 {
      family bridge {
        interface-mode trunk;
        vlan-id-list 3000-4000;
      }
    }
  }
  ge-2/3/0 {
    description "Connected to BEB2 barbera ge-2/3/0";
    unit 0 {
      family bridge {
        interface-mode trunk;
        vlan-id-list 3000-4000;
      }
    }
  }
  ge-2/3/9 {
    description "Connected to BCB1 syrah ge-2/3/9";
    unit 0 {
      family bridge {
        interface-mode trunk;
        vlan-id-list 3000-4000;
      }
    }
  }
}

```

Verification

To confirm that the configuration is working properly, perform these tasks:

- Verifying E-LINE and E-LAN Service on BEB1 on page 74
- Verifying E-LINE and E-LAN Service on BEB2 on page 76

- Verifying E-LINE and E-LAN Service on BEB3 on page 77
- Verifying E-LINE and E-LAN Service on BEB4 on page 79
- Verifying E-LINE and E-LAN Service on BCB1 on page 81
- Verifying E-LINE and E-LAN Service on BCB2 on page 82
- Verifying E-LINE and E-LAN Service on ES1 on page 82
- Verifying E-LINE and E-LAN Service on ES3 on page 83
- Verifying E-LINE and E-LAN Service on ES4 on page 84

Verifying E-LINE and E-LAN Service on BEB1

Purpose Verify the E-LINE and E-LAN service configuration in the backbone instance (B-component) on BEB1 and in the remote backbone edge bridge (PBBN).

Action Use the following operational mode commands:

```
user@beb1> show l2-learning backbone-instance
Backbone Routing Instance : pbbn-1, PBBN-ID: 0
Backbone Bridging domain : elan-bvlan, VLAN-ID : 3350

Flags (P2P -ELINE service,          MP -ELAN service)
      M1 -Many svlans to 1 isid, 01 -One svlan to 1 isid)

ISID      PBN          Provider          S-VLAN  Flags  Backbone
Routing   Instance    Bridging          S-VLAN  Flags  Destination
Instance
10400     pbn-1-for-elan    elan-svlans-vlan-1400 1400 M1,MP  01:1e:86:00:28:a0
10300     pbn-1-for-elan    elan-svlans-vlan-1300 1300 M1,MP  01:1e:86:00:28:3c

Backbone Routing Instance : pbbn-1, PBBN-ID: 0
Backbone Bridging domain : eline-bvlan, VLAN-ID : 3150

Flags (P2P -ELINE service,          MP -ELAN service)
      M1 -Many svlans to 1 isid, 01 -One svlan to 1 isid)

ISID      PBN          Provider          S-VLAN  Flags  Backbone
Routing   Instance    Bridging          S-VLAN  Flags  Destination
Instance
10100     pbn-1-for-eline    eline-svlans-vlan-2100 2100 M1,P2P 01:1e:86:00:27:74

user@beb1> show l2-learning provider-instance
PBN Routing Instance: pbn-1-for-elan
Flags (P2P -ELINE service,          MP -ELAN service,
      M1 -Many svlans to 1 isid, 01 -One svlan to 1 isid)

PBN          S-VLAN  ISID      PBBN          B-VLAN  Flags
Bridging
Domain
elan-svlans-vlan-1300 1300 10300     elan-bvlan    3350     M1,MP
elan-svlans-vlan-1400 1400 10400     elan-bvlan    3350     M1,MP

PBN Routing Instance: pbn-1-for-eline
Flags (P2P -ELINE service,          MP -ELAN service,
      M1 -Many svlans to 1 isid, 01 -One svlan to 1 isid)

PBN          S-VLAN  ISID      PBBN          B-VLAN  Flags
Bridging
```



```

Domain
eline-svlans-vlan-2100 2100 10100
Domain
eline-bvlan          3150    M1,P2P

user@beb1> show l2-learning remote-backbone-edge-bridge
Remote backbone edge bridge information per provider backbone bridge network
(PBBN)

RBEB flags (S -Static)

PBBN Routing instance : pbbn-1

RBEB MAC          Time before      Flags
Address           expiry (SS:MS)
00:1f:12:b8:3f:b0 :

user@beb1> show bridge mac-table
MAC flags (S -static MAC, D -dynamic MAC,
SE -Statistics enabled, NM -Non configured MAC)

Routing instance : pbbn-1
Bridging domain : elan-bvlan, VLAN : 3350
MAC          MAC          Logical
address      flags      interface
00:1f:12:b8:38:11 D      ge-1/3/9.0
00:1f:12:b8:3a:99 D      ge-1/3/9.0
00:21:59:05:37:19 D      ge-1/3/9.0
00:21:59:aa:74:8d D      ge-1/3/9.0
00:22:83:32:ef:22 D      ge-1/3/9.0

MAC flags (S -static MAC, D -dynamic MAC,
SE -Statistics enabled, NM -Non configured MAC)

Routing instance : pbbn-1
Bridging domain : eline-bvlan, VLAN : 3150
MAC          MAC          Logical
address      flags      interface
00:1f:12:b8:38:11 D      ge-1/3/9.0
00:1f:12:b8:3f:b0 D      ge-1/3/9.0
00:22:83:32:d8:11 D      ge-1/3/9.0

MAC flags (S -static MAC, D -dynamic MAC,
SE -Statistics enabled, NM -Non configured MAC)

Routing instance : pbn-1-for-elan
Bridging domain : elan-svlans-vlan-1300, ISID : 10300, VLAN : 1300

MAC          MAC          Logical          Remote
address      flags      interface      MAC address
00:00:00:00:00:01 D      ge-2/0/0.3
00:00:00:00:00:02 D      pip0.1          00:21:59:05:37:b0
00:00:02:00:09:01 D      pip0.1          00:21:59:05:37:b0

Routing instance : pbn-1-for-elan
Bridging domain : elan-svlans-vlan-1400, ISID : 10400, VLAN : 1400

MAC          MAC          Logical          Remote
address      flags      interface      MAC address
00:00:00:00:00:02 D      pip0.1          00:16:47:e3:5a:9b
00:00:05:00:00:01 D      ge-2/0/0.4

```

Meaning Both operational mode commands `show l2-learning backbone-instance` and `show l2-learning provider-instance` show the B-component and I-component routing instances configured. The command `show l2-learning backbone-instance` also shows all the mappings from the B-component routing instance to the I-component routing instances. Likewise, the command `show l2-learning provider-instance` shows the mapping from the I-component routing instance to the corresponding B-component routing instance. PBBN routing instance `pbbn-1` contains the bridging domains `elan-bvlan` and `eline-bvlan`. The command `show l2-learning remote-backbone-edge-bridge` shows all remote BEB MACs.

The field **Time before expiry** shows the expiring timer:

- If a timer value is displayed, it means that C-MACS are not learned behind this remote BEB.
- If a timer value is *not* displayed, it means that C-MACS are learned behind this remote BEB.

To display the learned CMACs behind the remote BEB, issue the command `show bridge mac-table`. The command will also show that for routing instance `pbn-1-for-elan`, learning is occurs through the pseudo-logical interface `pip0.1`.

Verifying E-LINE and E-LAN Service on BEB2

Purpose Verify the E-LINE and E-LAN service configuration in the backbone instance (B-component) on BEB2 and in the remote backbone edge bridge (PBBN).

Action Use the following operational mode commands:

```
user@beb2> show l2-learning backbone-instance
Backbone Routing Instance : pbbn-1, PBBN-ID: 0
Backbone Bridging domain : eline-bvlan, VLAN-ID : 3150

Flags (P2P -ELINE service,          MP -ELAN service)
      M1 -Many svlans to 1 isid, 01 -One svlan to 1 isid)

ISID      PBN          Provider          S-VLAN  Flags    Backbone
          Routing      Bridging
          Instance     Domain
          pbn-1-for-eline eline-svlans-vlan-1200 1200 M1,P2P 01:1e:86:00:27:d8

user@beb2> show l2-learning provider-instance
PBN Routing Instance: pbn-1-for-eline
Flags (P2P -ELINE service,          MP -ELAN service,
      M1 -Many svlans to 1 isid, 01 -One svlan to 1 isid)

PBN          S-VLAN  ISID      PBBN          B-VLAN  Flags
Bridging
Domain
eline-svlans-vlan-1200 1200 10200    eline-bvlan    3150    M1,P2P

user@beb2> show l2-learning remote-backbone-edge-bridge
Remote backbone edge bridge information per provider backbone bridge network
(PBBN)

RBEB flags (S -Static)
```

PBBN Routing instance : pbbn-1

RBE MAC Address	Time before expiry (SS:MS)	Flags
00:21:59:aa:7f:b0	:	
00:22:83:32:df:b0	:	

Meaning Both operational mode commands `show l2-learning backbone-instance` and `show l2-learning provider-instance` show the B-component and I-Component routing instances configured. The command `show l2-learning backbone-instance` also shows all the mappings from the B-component routing instance to the I-component routing instances. Likewise, the command `show l2-learning provider-instance` shows the mapping from the I-component routing instance to the corresponding B-component routing instance. PBBN routing instance `pbbn-1` contains the bridging domain `eline-bvlan`. The command `show l2-learning remote-backbone-edge-bridge` shows all remote BEB MACs.

The field **Time before expiry** shows the expiring timer:

- If a timer value is displayed, it means that C-MACS are not learned behind this remote BEB.
- If a timer value is *not* displayed, it means that C-MACS are learned behind this remote BEB.

To display the learned CMACs behind the remote BEB, issue the command `show bridge mac-table`. The command will also show that for routing instance `pbn-1-for-eline`, learning occurs through the pseudo-logical interface `pip0.1`.

Verifying E-LINE and E-LAN Service on BEB3

Purpose Verify the E-LINE and E-LAN service configuration in the backbone instance (B-component) on BEB3 and in the remote backbone edge bridge (PBBN).

Action Use the following operational mode commands:

```
user@beb3> show l2-learning backbone-instance
Backbone Routing Instance : pbbn-1, PBBN-ID: 0
Backbone Bridging domain : elan-bvlan, VLAN-ID : 3350
```

```
Flags (P2P -ELINE service, MP -ELAN service)
M1 -Many svlans to 1 isid, O1 -One svlan to 1 isid)
```

ISID	PBN Routing Instance	Provider Bridging Domain	S-VLAN	Flags	Backbone Destination MAC
10400	pbn-2-for-elan	elan-svlans-vlan-1400	1400	M1,MP	01:1e:86:00:28:a0
10300	pbn-2-for-elan	elan-svlans-vlan-1300	1300	M1,MP	01:1e:86:00:28:3c

```
user@beb3> show l2-learning provider-instance
PBN Routing Instance: pbn-2-for-elan
Flags (P2P -ELINE service, MP -ELAN service,
M1 -Many svlans to 1 isid, O1 -One svlan to 1 isid)
```

PBN Bridging	S-VLAN	ISID	PBBN Bridging	B-VLAN	Flags
--------------	--------	------	---------------	--------	-------

```

Domain
elan1-svlan      1300      10300
elan2-svlan      1400      10400
Domain
elan-bvlan       3350      M1,MP

user@beb3> show l2-learning remote-backbone-edge-bridge
Remote backbone edge bridge information per provider backbone bridge network
(PBBN)

RBEB flags (S -Static)

PBBN Routing instance : pbbn-1

RBEB MAC          Time before      Flags
Address           expiry (SS:MS)
00:1f:12:b8:3f:b0  770 :502
00:21:59:aa:7f:b0  180 :503

user@beb3> show bridge mac-table

MAC flags (S -static MAC, D -dynamic MAC,
SE -Statistics enabled, NM -Non configured MAC)

Routing instance : pbbn-1
Bridging domain : elan-bvlan, VLAN : 3350
MAC          MAC          Logical
address      flags      interface
00:1f:12:b8:38:11 D        ge-2/3/0.0
00:21:59:aa:77:19 D        ge-2/3/0.0
00:21:59:aa:78:11 D        ge-2/3/0.0

MAC flags (S -static MAC, D -dynamic MAC,
SE -Statistics enabled, NM -Non configured MAC)

Routing instance : pbn-2-for-elan
Bridging domain : elan1-svlan, ISID : 10300, VLAN : 1300

MAC          MAC          Logical          Remote
address      flags      interface      MAC address
00:00:00:00:00:01 D        pip0.1        00:21:59:aa:7f:b0
00:00:00:00:00:02 D        ge-2/0/0.3
00:00:02:00:09:01 D        ge-2/0/0.3

Routing instance : pbn-2-for-elan
Bridging domain : elan2-svlan, ISID : 10400, VLAN : 1400

MAC          MAC          Logical          Remote
address      flags      interface      MAC address
00:00:00:00:00:02 D        ge-2/0/0.4
00:00:05:00:00:01 D        pip0.1        00:21:59:aa:7f:b0

```

Meaning Both operational mode commands `show l2-learning backbone-instance` and `show l2-learning provider-instance` show the B-component and I-component routing instances configured. The command `show l2-learning backbone-instance` also shows all the mappings from the B-component routing instance to the I-component routing instances. Likewise, the command `show l2-learning provider-instance` shows the mapping from the I-component routing instance to the corresponding B-component routing instance. PBBN routing instance `pbbn-1` contains the bridging domain `elan-bvlan`. The command `show l2-learning remote-backbone-edge-bridge` shows all remote BEB MACs.

The field **Time before expiry** shows the expiring timer:

- If a timer value is displayed, it means that C-MACS are not learned behind this remote BEB.
- If a timer value is *not* displayed, it means that C-MACS are learned behind this remote BEB.

To display the learned C-MACs behind the remote BEB, issue the command **show bridge mac-table**. The command will also show that for routing instance **ppbn-2-for-elan**, learning occurs through the pseudo-logical interface **pip0.1**.

Verifying E-LINE and E-LAN Service on BEB4

Purpose Verify the E-LINE and E-LAN service configuration in the backbone instance (B-component) on BEB4 and in the remote backbone edge bridge (PBBN).

Action Use the following operational mode commands:

```
user@beb4> show l2-learning backbone-instance
Backbone Routing Instance : pbbn-1, PBBN-ID: 0
Backbone Bridging domain : elan-bvlan, VLAN-ID : 3350

Flags (P2P -ELINE service,          MP -ELAN service)
      M1 -Many svlans to 1 isid, 01 -One svlan to 1 isid)

ISID      PBN          Provider          S-VLAN  Flags  Backbone
          Routing      Bridging          S-VLAN  Flags  Destination
          Instance     Domain
10400     pbn-3-for-elan  elan-svlans-vlan-1400 1400 01,MP  01:1e:86:00:28:a0
10300     pbn-3-for-elan  elan-svlans-vlan-1300 1300 M1,MP  01:1e:86:00:28:3c

Backbone Routing Instance : pbbn-1, PBBN-ID: 0
Backbone Bridging domain : eline-bvlan, VLAN-ID : 3150

Flags (P2P -ELINE service,          MP -ELAN service)
      M1 -Many svlans to 1 isid, 01 -One svlan to 1 isid)

ISID      PBN          Provider          S-VLAN  Flags  Backbone
          Routing      Bridging          S-VLAN  Flags  Destination
          Instance     Domain
10200     pbn-3-for-eline  eline-svlans-vlan-1200 1200 M1,P2P 01:1e:86:00:27:d8
10100     pbn-3-for-eline  eline-svlans-vlan-2100 2100 M1,P2P 01:1e:86:00:27:74
user@beb4> show l2-learning provider-instance
PBN Routing Instance: pbn-3-for-elan
Flags (P2P -ELINE service,          MP -ELAN service,
      M1 -Many svlans to 1 isid, 01 -One svlan to 1 isid)

PBN          S-VLAN  ISID      PBBN          B-VLAN  Flags
Bridging
Domain
elan-svlans-vlan-1300 1300 10300     elan-bvlan    3350     M1,MP
elan-svlans-vlan-1400 1400 10400     elan-bvlan    3350     01,MP

PBN Routing Instance: pbn-3-for-eline
Flags (P2P -ELINE service,          MP -ELAN service,
      M1 -Many svlans to 1 isid, 01 -One svlan to 1 isid)
```

```

PBN          S-VLAN  ISID      PBBN          B-VLAN  Flags
Bridging
Domain
eline-svlans-vlan-1200 1200 10200  eline-bvlan   3150   M1,P2P
eline-svlans-vlan-2100 2100 10100  eline-bvlan   3150   M1,P2P
user@beb4> show l2-learning remote-backbone-edge-bridge

```

Remote backbone edge bridge information per provider backbone bridge network (PBBN)

RBEB flags (S -Static)

PBBN Routing instance : pbbn-1

```

RBEB MAC          Time before      Flags
Address           expiry (SS:MS)
00:21:59:aa:7f:b0 :
00:22:83:32:df:b0 :

```

user@beb4> show bridge mac-table

MAC flags (S -static MAC, D -dynamic MAC,
SE -Statistics enabled, NM -Non configured MAC)

Routing instance : pbbn-1

Bridging domain : elan-bvlan, VLAN : 3350

```

MAC          MAC      Logical
address      flags    interface
00:21:59:aa:75:d4 D      ge-1/0/4.0
00:21:59:aa:78:11 D      ge-1/0/4.0

```

MAC flags (S -static MAC, D -dynamic MAC,
SE -Statistics enabled, NM -Non configured MAC)

Routing instance : pbbn-1

Bridging domain : eline-bvlan, VLAN : 3150

```

MAC          MAC      Logical
address      flags    interface
00:21:59:aa:75:d4 D      ge-1/0/4.0
00:21:59:aa:78:11 D      ge-1/0/4.0
00:21:59:aa:7f:b0 D      ge-1/0/4.0
00:22:83:32:d8:11 D      ge-1/0/4.0
00:22:83:32:df:b0 D      ge-1/0/4.0

```

MAC flags (S -static MAC, D -dynamic MAC,
SE -Statistics enabled, NM -Non configured MAC)

Routing instance : pbn-1-for-elan

Bridging domain : elan-svlans-vlan-1300, ISID : 10300, VLAN : 1300

```

MAC          MAC      Logical      Remote
address      flags    interface  MAC address
00:00:00:00:00:01 D      pip0.1    00:21:59:aa:7f:b0
00:00:00:00:00:02 D      pip0.1    00:21:59:05:37:b0
00:00:02:00:09:01 D      pip0.1    00:21:59:05:37:b0

```

Routing instance : pbn-1-for-elan

Bridging domain : elan-svlans-vlan-1400, ISID : 10400, VLAN : 1400

```

MAC          MAC      Logical      Remote
address      flags    interface  MAC address
00:00:00:00:00:02 D      pip0.1    00:16:47:e3:5a:9b

```

00:00:05:00:00:01 D pip0.1 00:21:59:aa:7f:b0

Meaning Both operational mode commands `show l2-learning backbone-instance` and `show l2-learning provider-instance` show the B-component and I-Component routing instances configured. The command `show l2-learning backbone-instance` also shows all the mappings from the B-component routing instance to the I-component routing instances. Likewise, the command `show l2-learning provider-instance` shows the mapping from the I-component routing instance to the corresponding B-component routing instance. PBBN routing instance `pbbn-1` contains the bridging domain `elan-bvlan`. The command `show l2-learning remote-backbone-edge-bridge` shows all remote BEB MACs.

The field **Time before expiry** shows the expiring timer:

- If a timer value is displayed, it means that C-MACS are not learned behind this remote BEB.
- If a timer value is *not* displayed, it means that C-MACS are learned behind this remote BEB.

To display the learned CMACs behind the remote BEB, issue the command `show bridge mac-table`. The command will also show that for routing instance `pbn-3-for-eline`, learning is occurs through the pseudo-logical interface `pip0.0`.

Verifying E-LINE and E-LAN Service on BCB1

Purpose Verify the E-LINE and E-LAN service configuration on BCB1.

Action Use the following operational mode commands:

```
user@bcb1> show bridge mac-table
```

MAC flags (S -static MAC, D -dynamic MAC,
SE -Statistics enabled, NM -Non configured MAC)

```
Routing instance : pbbn-1
Bridging domain : elan-bvlan, VLAN : 3350
  MAC          MAC      Logical
  address      flags    interface
00:1f:12:b8:38:11 D      ge-2/1/5.0
00:1f:12:b8:3a:99 D      ge-2/1/5.0
00:21:59:05:37:19 D      ge-2/3/0.0
00:21:59:aa:78:11 D      ge-1/3/9.0
00:21:59:aa:7c:8d D      ge-1/3/9.0
00:22:83:32:ef:22 D      ge-2/3/9.0
```

MAC flags (S -static MAC, D -dynamic MAC,
SE -Statistics enabled, NM -Non configured MAC)

```
Routing instance : pbbn-1
Bridging domain : eline-bvlan-vlan-3150, VLAN : 3150
  MAC          MAC      Logical
  address      flags    interface
00:1f:12:b8:38:11 D      ge-2/1/5.0
00:1f:12:b8:3f:b0 D      ge-2/1/5.0
```

```

00:21:59:aa:78:11  D      ge-1/3/9.0
00:21:59:aa:7f:b0  D      ge-1/3/9.0
00:22:83:32:d8:11  D      ge-1/3/0.0
00:22:83:32:df:b0  D      ge-1/3/0.0

```

Meaning The operational mode command `show bridge mac-table` displays the learned backbone MACs in the PBBN transport network. It also shows the two bridging domains `elan-bvlan` and `eline-bvlan` under the `pbbn-1` routing instance. Notice that C-MACs are not learned on BCB1.

Verifying E-LINE and E-LAN Service on BCB2

Purpose Verify the E-LINE and E-LAN service configuration on BCB2.

Action Use the following operational mode commands:

```
user@bcbl> show bridge mac-table
```

```
MAC flags (S -static MAC, D -dynamic MAC,
           SE -Statistics enabled, NM -Non configured MAC)
```

```
Routing instance : pbbn-1
Bridging domain : elan-bvlan, VLAN : 3350
MAC              MAC      Logical
address          flags    interface
00:1f:12:b8:38:11 D      ge-2/3/9.0
00:21:59:aa:77:22 D      ge-2/3/9.0
```

```
MAC flags (S -static MAC, D -dynamic MAC,
           SE -Statistics enabled, NM -Non configured MAC)
```

```
Routing instance : pbbn-1
Bridging domain : eline-bvlan-vlan-3150, VLAN : 3150
MAC              MAC      Logical
address          flags    interface
00:1f:12:b8:38:11 D      ge-2/3/9.0
00:1f:12:b8:3f:b0 D      ge-2/3/9.0
00:22:83:32:d8:11 D      ge-2/3/9.0
00:22:83:32:df:b0 D      ge-2/3/9.0
```

Meaning The operational mode command `show bridge mac-table` displays the learned backbone MACs in the PBBN transport network. It also shows the two bridging domains `elan-bvlan` and `eline-bvlan` under the `pbbn-1` routing instance. Notice that C-MACs are not learned on BCB2.

Verifying E-LINE and E-LAN Service on ES1

Purpose Verify the E-LINE and E-LAN service configuration on ES1.

Action Use the following operational mode commands:

```
user@es1> show bridge mac-table
```

```
Routing instance : cust-1
Bridging domain : bds-vlan-0200, VLAN : 200
```


MAC address	MAC flags	Logical interface
00:EE:01:00:02:00	D	ge-1/1/0.0
00:EE:04:00:02:00	D	ge-2/0/0.2

Routing instance : cust-1
 Bridging domain : bds-vlan-0300, VLAN : 300

MAC address	MAC flags	Logical interface
00:00:00:00:00:01	D	ge-1/1/0.0
00:00:00:00:00:02	D	ge-2/0/0.3
00:00:02:00:09:01	D	ge-2/0/0.3

Routing instance : cust-1
 Bridging domain : bds-vlan-0400, VLAN : 400

MAC address	MAC flags	Logical interface
00:00:00:00:00:02	D	ge-2/0/0.4
00:00:05:00:00:01	D	ge-1/1/0.0

Meaning The operational mode command `show bridge mac-table` displays the routing instance `cust-1` and the associated bridging domains and MAC addresses learned in the bridging domain.

Verifying E-LINE and E-LAN Service on ES3

Purpose Verify the E-LINE and E-LAN service configuration on ES3.

Action Use the following operational mode commands:

```
user@es3> show bridge mac-table
```

Routing instance : cust-1
 Bridging domain : bds-vlan-0300, VLAN : 300

MAC address	MAC flags	Logical interface
00:00:00:00:00:01	D	ge-2/0/0.3
00:00:00:00:00:02	D	ge-1/1/0.0
00:00:02:00:09:01	D	ge-1/1/0.0

Routing instance : cust-1
 Bridging domain : bds-vlan-0400, VLAN : 400

MAC address	MAC flags	Logical interface
00:00:00:00:00:02	D	ge-1/1/0.0
00:00:05:00:00:01	D	ge-2/0/0.4

Meaning The operational mode command `show bridge mac-table` displays the routing instance `cust-1` and the associated bridging domain and MAC addresses learned in the bridging domain.

Verifying E-LINE and E-LAN Service on ES4

Purpose Verify the E-LINE and E-LAN service configuration on ES4.

Action Use the following operational mode commands:

```
user@es4> show bridge mac-table
```

```
Routing instance : cust-1
```

```
Bridging domain : bds-vlan-0200, VLAN : 200
```

MAC address	MAC flags	Logical interface
00:EE:01:00:02:00	D	ge-1/0/0.2
00:EE:04:00:02:00	D	ge-1/0/3.0

```
Routing instance : cust-1
```

```
Bridging domain : bds-vlan-0300, VLAN : 300
```

MAC address	MAC flags	Logical interface
00:00:00:00:00:01	D	ge-1/0/0.3
00:00:00:00:00:02	D	ge-1/0/0.3
00:00:02:00:09:01	D	ge-1/0/0.3

```
Routing instance : cust-1
```

```
Bridging domain : bds-vlan-0400, VLAN : 400
```

MAC address	MAC flags	Logical interface
00:00:00:00:00:02	D	ge-1/0/0.4
00:00:05:00:00:01	D	ge-1/0/0.4

Meaning The operational mode command `show bridge mac-table` displays the routing instance `cust-1` and the associated bridging domains and MAC addresses learned in each bridging domain.

- Related Topics**
- Understanding Provider Backbone Bridging on MX Series Routers on page 3
 - Example: Configuring CoS for a PBB Network on MX Series Routers on page 84
 - Example: Configuring Connectivity Fault Management for a PBB Network on MX series Routers

Example: Configuring CoS for a PBB Network on MX Series Routers

The IEEE 802.1ah provider backbone bridge (PBB) is a new standard for connecting and interoperating with provider backbone networks. Configure class-of-service (CoS) on your PBB to manage traffic to assure that service-level agreements (SLAs) are supported with the correct amount of bandwidth and quality of service. Using CoS, you can categorize traffic into classes and provide various levels of throughput and packet loss. This is especially important for traffic that is sensitive to jitter and delay, such as voice traffic.

This example describes how to configure and apply a basic CoS configuration to manage customer traffic:

- Requirements on page 85
- Overview and Topology on page 85
- Configuring CoS on an MX Series Router on page 89
- Verification on page 102

Requirements

This example uses the following hardware and software components:

- JUNOS Release 10.0 or later for MX Series routers
- One MX Series router in a PBB configuration

Before you configure the switch for CoS, be sure you have:

- Installed your MX Series router.
- Performed the initial router configuration.
- Configured basic PBB in the topology, and verified that traffic is flowing in the topology. For information about configuring PBB, see ““Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX series Routers” on page 17.”

Overview and Topology

Figure 4 on page 86 displays the network topology for this example. Four service paths (**eline1**, **eline2**, **elan1**, and **elan2**) are configured on ES4. Ingress traffic is entering ES4 through interface **ge-1/0/3** and egressing through interface **ge-1/0/0**. Class of service is applied only to ES4 since it is at the edge.

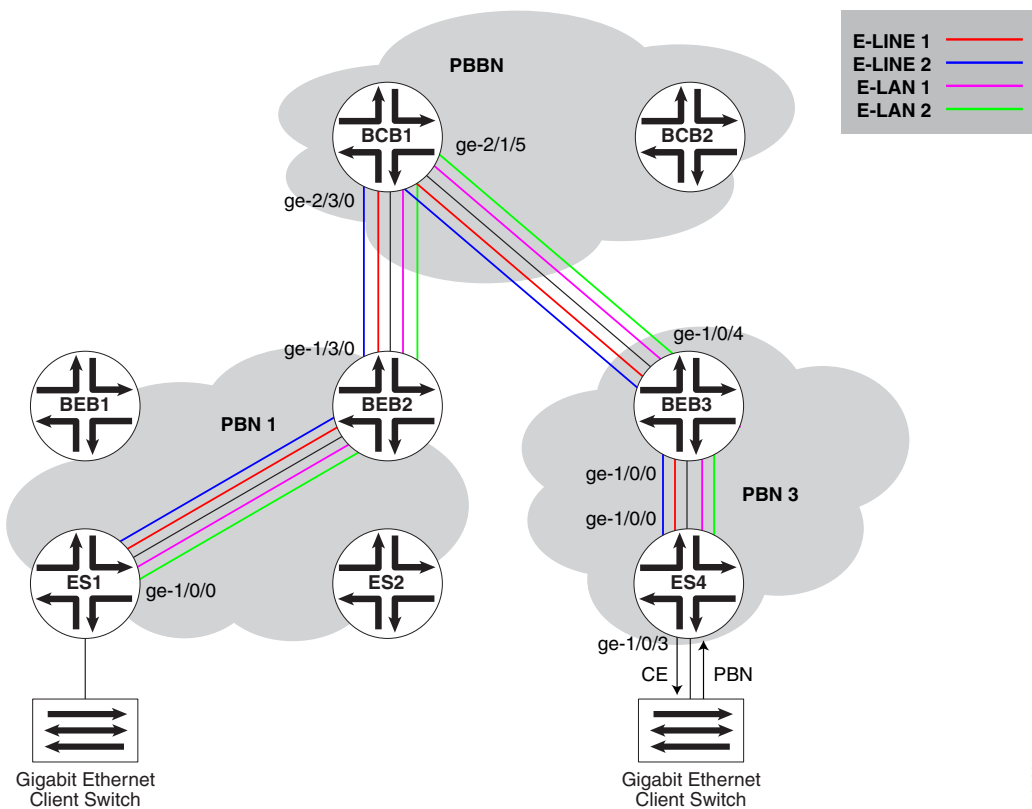
Figure 4: Network Topology for CoS for Provider Backbone Bridging

Figure 1 on page 6 shows the relationship of the forwarding classes that are used in this example. The three forwarding classes are Voice-EF, VPN-PR-DATA, and INET-BEST-EFFORT. These forwarding classes are associated with E-LINE 1, E-LINE 2, E-LAN 1, and E-LAN 2.

E-LINE 1 and E-LINE 2 are bundled into interface set **vuni-set1**. E-LAN 1 and E-LAN 2 are bundled into interface set **vuni-set2**. Interface sets provide the same function as a virtual UNI in the carrier Ethernet world. An interface set is used to group a set of logical interfaces under a port and then transport packets through the member logical interface.

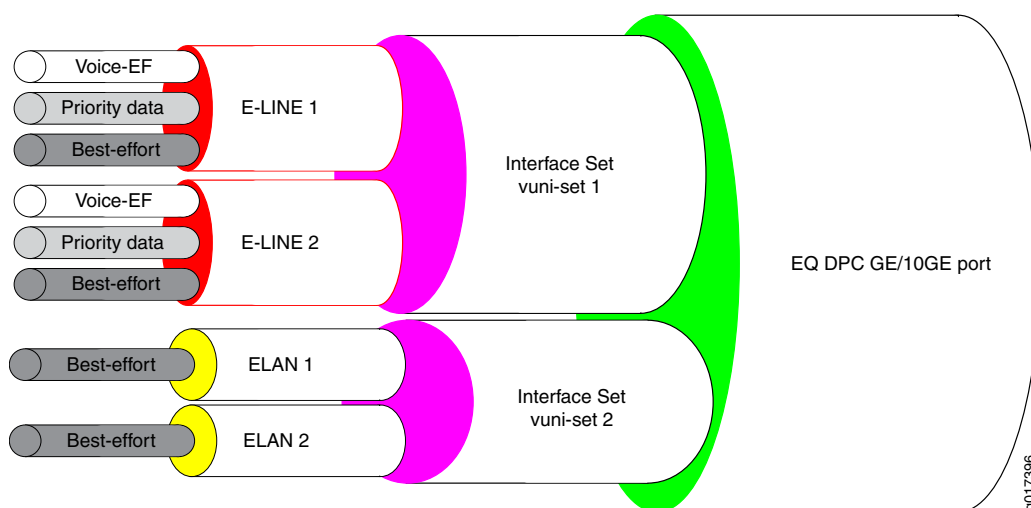
Figure 5: Egress Shaping

Table 9 on page 87 shows the services, traffic rates, and the egress SLA that are configured in this example.

Table 9: Egress SLA Enforcement

Service	Traffic Rate Applied for Example	Egress SLA
eline1 from ES1 —> ES4	Physical interface <code>ge-1/0/3</code> and interface sets <code>vuni-set1</code> and <code>interface-set2</code>	At egress, shaping (using schedulers) is configured at the <code>[edit interfaces interface-set]</code> hierarchy level. The scheduler ensures that voice and data traffic is given a higher priority to protect these traffic classes during congestion.
<ul style="list-style-type: none"> VOICE-EF forwarding class is used for voice VPN-PR-DATA forwarding class is used for priority data VOICE-EF forwarding class 	<ul style="list-style-type: none"> 10 Mbps for voice 40 Mbps for priority 40 Mbps for best effort 	<ul style="list-style-type: none"> 10 Mbps for voice 40 Mbps for priority 25 Mbps for best effort <p>NOTE: Traffic is limited to 100 Mbps due to the physical restrictions of the interface on which it travels.</p>
eline2 from ES1 —> ES4	60 Mbps	25 Mbps
<ul style="list-style-type: none"> INET-BEST-EFFORT forwarding class 		<p>NOTE: After scheduling voice and data traffic, the remaining 50 Mbps is shared by the best effort traffic in <code>eline1</code> and <code>eline2</code>.</p>

Ingress traffic travels into the ES4 router and through the network to the ES1 router. Figure 6 on page 88 shows the three levels of service that will be entering E-LINE 1 on ES4. Voice, priority data, and best-effort traffic will be policed in different ways. Voice traffic can receive 15 Mbps, priority data can receive 50 Mbps, and best-effort

traffic isn't policed at all—it operates on what bandwidth is left after servicing voice and priority traffic.

Figure 6: Achieving Ingress SLA by Applying Policers for Each Traffic Class

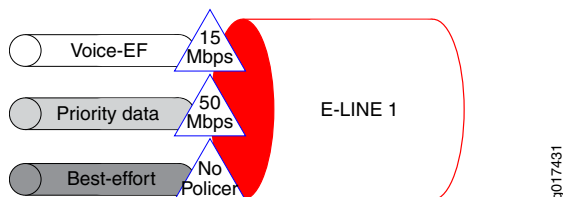


Table 10 on page 88 provides more information about the services, traffic rates, and the ingress SLA that are configured in this example.

Table 10: Ingress SLA Enforcement

Service	Traffic Rate Applied for Example	Ingress SLA
eline1 to ES4 —> ES1	Traffic is entering the topology at the following rates:	Traffic will be policed at the following rates:
<ul style="list-style-type: none"> VOICE-EF forwarding class is used for voice and uses the IEEE 802.1P classifier P-Bit 7 VPN-PR-DATA forwarding class is used for priority data the IEEE 802.1P classifier P-Bit 4 INET-BEST-EFFORT forwarding class is used for best effort traffic and uses the IEEE 802.1P classifier P-Bit 0 	<ul style="list-style-type: none"> 10 Mbps for voice 70 Mbps for priority 40 Mbps for best effort 	<ul style="list-style-type: none"> 15 Mbps for voice 50 Mbps for priority No policer for best effort—all 40 Mbps traffic is accepted
eline2 to ES4 —> ES1	60 Mbps	No policer—all 60 Mbps traffic is accepted
<ul style="list-style-type: none"> INET-BEST-EFFORT forwarding class and uses the IEEE 802.1P classifier P-Bit 0 		

Table 11 on page 88 shows the different properties that will be configured for CoS on MX Series router ES4.

Table 11: Components of the Topology for Configuring CoS on MX Series Routers

Property	Settings
Interface sets	<p>The following interface sets are configured to transport customer traffic:</p> <ul style="list-style-type: none"> Interface set vuni-set1 carries eline1 on logical interface ge-1/0/3.1 and eline2 on logical interface ge-1/0/3.2. Interface set vuni-set2 carries elan1 on logical interface ge-1/0/3.3 and elan2 on logical interface ge-1/0/3.4.

Table 11: Components of the Topology for Configuring CoS on MX Series Routers *(continued)*

Property	Settings
Forwarding classes	<p>The following forwarding classes are configured:</p> <ul style="list-style-type: none"> ■ INET-BEST-EFFORT, queue number 0 ■ VPN-PR-DATA, 50 Mbps limit, queue number 1 ■ VOICE-EF, 15 Mbps limit, queue number 2
Firewall filters	<p>The following firewall filters are configured:</p> <ul style="list-style-type: none"> ■ SERVICE1 ■ SERVICE2 ■ SERVICE3
Schedule map and schedulers	<p>The schedule map EVC contains the following schedulers:</p> <ul style="list-style-type: none"> ■ BE is used for the forwarding class INET-BEST-EFFORT ■ PD is used for the forwarding class VPN-PR-DATA ■ EF is used for the forwarding class VOICE-EF <p>The schedulers are markings that can be used by the next router to reprioritize traffic.</p>
Rewrite rules	<p>Rewrite rules (one for 802.1p class packets and one for 802.1ad class packets) are used for conforming and non-conforming traffic. If low, it goes out code-point 010. If high (which means it violated the SLA of the service provider), it goes out code-point 110.</p>

In provider backbone networks, CoS information is mapped and carried across the network using behavior aggregate (BA) classifiers; specifically, 3 bits of priority code point (PCP) and 1 bit of DEI (drop eligibility indicator). Classifiers provide the capability to classify, map, and rewrite (mark) the PCP + DEI bits from one tag to another across the carrier Ethernet network.

In the following example, you will configure and apply basic CoS features to customer traffic entering interface **ge-1/0/3** and exiting interface **ge-1/0/0** on the ES4 router. Traffic is mapped to forwarding classes **INET-BEST-EFFORT**, **VPN-PR-DATA**, or **VOICE-EF**. Bandwidth is limited to 50 Mbps for forwarding classes **INET-BEST-EFFORT** and **VPN-PR-DATA**. Bandwidth is limited to 15 Mbps for forwarding class **VOICE-EF**. Rewrite rules are configured for each E-LINE to add marking that can be used by the next router (here, BEB3) to reprioritize traffic from a particular code point. The forwarding classes are marked with code points so that they all “agree” to a specific CoS policy.

CoS is only applied on the ES4 because it is located at the customer edge.

Configuring CoS on an MX Series Router

- Configuring CoS on ES4 on page 90

Configuring CoS on ES4

CLI Quick Configuration To quickly configure CoS, copy the following commands and paste them into the router terminal window:

```
[edit]
set class-of-service forwarding-classes class INET-BEST-EFFORT queue-num 0
set class-of-service forwarding-classes class VPN-PR-DATA queue-num 1
set class-of-service forwarding-classes class VOICE-EF queue-num 2
set class-of-service forwarding-classes class UNUSED queue-num 3
set class-of-service classifiers ieee-802.1 802p_class forwarding-class
INET-BEST-EFFORT loss-priority low code-points 000
set class-of-service classifiers ieee-802.1 802p_class forwarding-class
INET-BEST-EFFORT loss-priority low code-points 001
set class-of-service classifiers ieee-802.1 802p_class forwarding-class
INET-BEST-EFFORT loss-priority high code-points 010
set class-of-service classifiers ieee-802.1 802p_class forwarding-class
INET-BEST-EFFORT loss-priority high code-points 011
set class-of-service classifiers ieee-802.1 802p_class forwarding-class VPN-PR-DATA
loss-priority low code-points 100
set class-of-service classifiers ieee-802.1 802p_class forwarding-class VPN-PR-DATA
loss-priority high code-points 101
set class-of-service classifiers ieee-802.1 802p_class forwarding-class VOICE-EF
loss-priority low code-points 111
set class-of-service classifiers ieee-802.1 802p_class forwarding-class VOICE-EF
loss-priority high code-points 110
set class-of-service traffic-control-profiles EVC:SERVICE scheduler-map EVC
set class-of-service traffic-control-profiles EVC:SERVICE shaping-rate 20m
set class-of-service traffic-control-profiles VUNI:SERVICE scheduler-map EVC
set class-of-service traffic-control-profiles VUNI:SERVICE shaping-rate 100m
set class-of-service traffic-control-profiles VUNI:SERVICE guaranteed-rate 100m
set class-of-service interfaces interface-set vuni-set1
output-traffic-control-profile VUNI:SERVICE
set class-of-service interfaces interface-set vuni-set2
output-traffic-control-profile VUNI:SERVICE
set class-of-service interfaces ge-1/0/0 unit 1 classifiers ieee-802.1 802p_class
set class-of-service interfaces ge-1/0/0 unit 1 rewrite-rules ieee-802.1
802p_rerule
set class-of-service interfaces ge-1/0/0 unit 2 classifiers ieee-802.1 802p_class
set ge-1/0/0 unit 2 rewrite-rules ieee-802.1 802p_rerule
set class-of-service interfaces ge-1/0/0 unit 3 forwarding-class INET-BEST-EFFORT
set class-of-service interfaces ge-1/0/0 unit 4 forwarding-class INET-BEST-EFFORT
set class-of-service interfaces ge-1/0/3 unit 1 output-traffic-control-profile
EVC:SERVICE
set class-of-service interfaces ge-1/0/3 unit 1 classifiers ieee-802.1 802p_class
set class-of-service interfaces ge-1/0/3 unit 1 rewrite-rules ieee-802.1
802p_rerule
set class-of-service interfaces ge-1/0/3 unit 2 classifiers ieee-802.1 802p_class
set class-of-service interfaces ge-1/0/3 unit 2 rewrite-rules ieee-802.1
802p_rerule
set class-of-service interfaces ge-1/0/3 unit 3 forwarding-class INET-BEST-EFFORT
set class-of-service interfaces ge-1/0/3 unit 4 forwarding-class INET-BEST-EFFORT
set class-of-service rewrite-rules ieee-802.1 802p_rerule forwarding-class
VPN-PR-DATA loss-priority low code-point 010
set class-of-service rewrite-rules ieee-802.1 802p_rerule forwarding-class
VPN-PR-DATA loss-priority high code-point 110
set class-of-service rewrite-rules ieee-802.1 802p_rerule forwarding-class VOICE-EF
loss-priority low code-point 011
```



```

set class-of-service rewrite-rules ieee-802.1 802p_rwrule forwarding-class VOICE-EF
loss-priority high code-point 111
set class-of-service rewrite-rules ieee-802.1 802p_rwrule forwarding-class
INET-BEST-EFFORT loss-priority low code-point 100
set class-of-service rewrite-rules ieee-802.1 802p_rwrule forwarding-class
INET-BEST-EFFORT loss-priority high code-point 000
set class-of-service scheduler-maps EVC forwarding-class INET-BEST-EFFORT scheduler
BE
set class-of-service scheduler-maps EVC forwarding-class VPN-PR-DATA scheduler
PD
set class-of-service scheduler-maps EVC forwarding-class VOICE-EF scheduler EF
set class-of-service schedulers BE transmit-rate percent 30
set class-of-service schedulers BE buffer-size percent 30
set class-of-service schedulers BE priority low set PD transmit-rate percent 40
set class-of-service schedulers PD buffer-size percent 40
set class-of-service schedulers PD priority high
set class-of-service schedulers EF transmit-rate percent 10
set class-of-service schedulers EF buffer-size percent 10
set class-of-service schedulers EF priority strict-high deactivate class-of-service
set firewall policer 15m-pol if-exceeding bandwidth-limit 15m set policer 15m-pol
if-exceeding burst-size-limit 60k
set firewall policer 15m-pol then discard set policer 50m-pol if-exceeding
bandwidth-limit 50m
set firewall relative set policer 50m-pol if-exceeding burst-size-limit 150k set
policer 50m-pol then discard
set firewall policer 30m-pol if-exceeding bandwidth-limit 30m
set firewall policer 30m-pol if-exceeding burst-size-limit 45k
set firewall policer 30m-pol then discard
set firewall policer 40m-pol if-exceeding bandwidth-limit 40m
set firewall policer 40m-pol if-exceeding burst-size-limit 45k
set firewall policer 40m-pol then discard
set firewall family bridge filter SERVICE1 interface-specific
set firewall family bridge filter SERVICE1 term Voice_bw_prof from forwarding-class
VOICE-EF
set firewall family bridge filter SERVICE1 term Voice_bw_prof then policer 15m-pol
set firewall family bridge filter SERVICE1 term Voice_bw_prof then count
srv1_voice_cnt
set firewall family bridge filter SERVICE1 term VPN_pd_bw_prof from
forwarding-class VPN-PR-DATA
set firewall family bridge filter SERVICE1 term VPN_pd_bw_prof then policer 50m-pol
set firewall family bridge filter SERVICE1 term VPN_pd_bw_prof then count
srv1_vpn_cnt
set firewall family bridge filter SERVICE1 term ANY then count srv1_inet_cnt
set firewall family bridge filter SERVICE2 term Voice_sw_prof from forwarding-class
VOICE-EF
set firewall family bridge filter SERVICE2 term Voice_sw_prof then policer 40m-pol
set firewall family bridge filter SERVICE2 term Voice_sw_prof then count
srv2_ef_cnt
set firewall family bridge filter SERVICE2 term PR_DATA_policer from
forwarding-class VPN-PR-DATA
set firewall family bridge filter SERVICE2 term PR_DATA_policer then policer
30m-pol
set firewall family bridge filter SERVICE2 term PR_DATA_policer then count
srv2_pr_data_cnt
set firewall family bridge filter SERVICE2 term ANY then count srv2_be_cnt
set firewall family bridge filter SERVICE3 term ANY then count srv3_cnt
set firewall family bridge filter SERVICE3 term ANY then forwarding-class
INET-BEST-EFFORT

```

Step-by-Step Procedure To configure and apply CoS:

1. Configure one-to-one mapping between forwarding classes and queues:

```
[edit class-of-service forwarding-classes]
user@es4# set class INET-BEST-EFFORT queue-num 0
user@es4# set class VPN-PR-DATA queue-num 1
user@es4# set class VOICE-EF queue-num 2
user@es4# set class VOICE-EF priority high
user@es4# set class UNUSED queue-num 3
```

2. Define the firewall filter SERVICE1 and use the statement interface-specific to create a specific SLA so that the ELINE or EVC will receive its own policy and each interface will have its own copy of the rule—without this, the rule is shared:

```
[edit firewall family bridge]
user@es4# set filter SERVICE1 interface-specific
```

3. Define the terms Voice_bw_prof, Voice_pd_bw_prof, Voice_bw_prof, VPN_pd_bw_prof, and ANY for the SERVICE1 filter:

```
[edit firewall family bridge filter SERVICE1]
user@es4# set term Voice_bw_prof then policer 15m-pol
user@es4# set term Voice_bw_prof then count srv1_voice_cnt
user@es4# set term VPN_pd_bw_prof from forwarding-class VPN-PR-DATA
user@es4# set term Voice_bw_prof from forwarding-class VOICE-EF
user@es4# set term VPN_pd_bw_prof then policer 50m-pol
user@es4# set term VPN_pd_bw_prof then count srv1_vpn_cnt
user@es4# set term ANY then count srv1_inet_cnt
```

4. Define the firewall filter SERVICE2:

```
[edit firewall family bridge]
user@es4# set filter SERVICE2
```

5. Define the terms Voice_sw_prof, PR_DATA_policer, and ANY for the SERVICE2 filter:

```
[edit firewall family bridge filter SERVICE2]
user@es4# set term Voice_sw_prof from forwarding-class VOICE-EF
user@es4# set term Voice_sw_prof then policer 40m-pol
user@es4# set term Voice_sw_prof then count srv2_ef_cnt
user@es4# set term PR_DATA_policer from forwarding-class VPN-PR-DATA
user@es4# set term PR_DATA_policer then policer 30m-pol
user@es4# set term PR_DATA_policer then count srv2_pr_data_cnt
user@es4# set term ANY then count srv2_be_cnt
```

6. Define the firewall filter SERVICE3:

```
[edit firewall family bridge]
user@es4# set filter SERVICE3
```

7. Define the term ANY for the SERVICE3 filter:

```
[edit firewall family bridge filter SERVICE3]
user@es4# set term ANY then count srv3_cnt
user@es4# set term ANY then forwarding-class INET-BEST-EFFORT
```

8. Apply the firewall filter SERVICE1 and SERVICE2 as an input filter to the interfaces for the servers hosting services:

```
[edit interfaces]
user@es4# set ge-1/0/3 unit 1 family bridge filter input SERVICE1
user@es4# set ge-1/0/3 unit 2 family bridge filter input SERVICE2
```

9. Configure classifiers to classify the packets in the customer's VPN:

```
[edit class-of-service classifiers]
user@es4# set ieee-802.1 802p_class forwarding-class INET-BEST-EFFORT
loss-priority low code-points 000
user@es4# set ieee-802.1 802p_class forwarding-class INET-BEST-EFFORT
loss-priority low code-points 001
user@es4# set ieee-802.1 802p_class forwarding-class INET-BEST-EFFORT
loss-priority high code-points 010
user@es4# set ieee-802.1 802p_class forwarding-class INET-BEST-EFFORT
loss-priority high code-points 011
user@es4# set ieee-802.1 802p_class forwarding-class VPN-PR-DATA
loss-priority low code-points 100
user@es4# set ieee-802.1 802p_class forwarding-class VPN-PR-DATA
loss-priority high code-points 101
user@es4# set ieee-802.1 802p_class forwarding-class VOICE-EF
loss-priority low code-points 111
user@es4# set ieee-802.1 802p_class forwarding-class VOICE-EF loss-priority
high code-points 110
```

10. Configure policers to limit traffic of a certain class to a specified bandwidth and burst size:

```
[edit firewall]
user@es4# set policer 15m-pol if-exceeding bandwidth-limit 15m
user@es4# set policer 15m-pol if-exceeding burst-size-limit 60k
user@es4# set policer 15m-pol then discard
user@es4# set policer 50m-pol if-exceeding bandwidth-limit 50m
user@es4# set policer 50m-pol if-exceeding burst-size-limit 150k
user@es4# set policer 50m-pol then discard
user@es4# set policer 30m-pol if-exceeding bandwidth-limit 30m
user@es4# set policer 30m-pol if-exceeding burst-size-limit 45k
user@es4# set policer 30m-pol then discard
user@es4# set policer 40m-pol if-exceeding bandwidth-limit 40m
user@es4# set policer 40m-pol if-exceeding burst-size-limit 45k
user@es4# set policer 40m-pol then discard
```

11. Configure schedulers to determine which queue to service based on the transmit rate and the buffer size:

```
[edit class-of-service schedulers]
user@es4# set BE transmit-rate percent 30
user@es4# set BE buffer-size percent 30
user@es4# set BE priority low set PD transmit-rate percent 40
```

```

user@es4# set PD buffer-size percent 40
user@es4# set PD priority high
user@es4# set EF transmit-rate percent 10
user@es4# set EF buffer-size percent 10
user@es4# set EF priority strict-high

```

12. Assign the forwarding classes to schedulers with the scheduler map EVC:

```

[edit class-of-service scheduler-maps]
user@es4# set EVC forwarding-class INET-BEST-EFFORT scheduler BE
user@es4# set EVC forwarding-class VPN-PR-DATA scheduler PD
user@es4# set EVC forwarding-class VOICE-EF scheduler EF

```

13. Configure an 802.1p rewrite rule named 802p_rwrule in the rewrite table and associate them with forwarding classes:

```

[edit class-of-service rewrite-rules (Definition)]
user@es4# set ieee-802.1 802p_rwrule forwarding-class VPN-PR-DATA
loss-priority low code-point 010
user@es4# set ieee-802.1 802p_rwrule forwarding-class VPN-PR-DATA
loss-priority high code-point 110
user@es4# set ieee-802.1 802p_rwrule forwarding-class VPN-PR-DATA
loss-priority high code-point 110
user@es4# set ieee-802.1 802p_rwrule forwarding-class VOICE-EF
loss-priority low code-point 011
user@es4# set ieee-802.1 802p_rwrule forwarding-class VOICE-EF
loss-priority high code-point 111
user@es4# set ieee-802.1 802p_rwrule forwarding-class INET-BEST-EFFORT
loss-priority low code-point 100
user@es4# set ieee-802.1 802p_rwrule forwarding-class INET-BEST-EFFORT
loss-priority high code-point 000

```

14. Configure traffic control profiles. These policies are applied to enqueue a packet and send it out to the next router. The profile VUNI:SERVICE will be applied to interface set vuni-set1.

```

[edit class-of-service traffic-control-profiles]
user@es4# set EVC:SERVICE scheduler-map EVC
user@es4# set EVC:SERVICE shaping-rate 20m
user@es4# set VUNI:SERVICE scheduler-map EVC
user@es4# set VUNI:SERVICE shaping-rate 100m
user@es4# set VUNI:SERVICE guaranteed-rate 100m

```

15. Configure the interface sets and associate them with the logical interfaces on which the services are configured (vuni-set1 is used for eline1 and eline2 traffic, and vuni-set2 is used for elan1 and elan2 traffic):

```

[edit interfaces]
user@es4# set interface-set vuni-set1 interface ge-1/0/3 unit 1
user@es4# set interface-set vuni-set1 interface ge-1/0/3 unit 3
user@es4# set interface-set vuni-set2 interface ge-1/0/3 unit 4
user@es4# set interface-set vuni-set2 interface ge-1/0/3 unit 2

```

16. Configure the output traffic control profile to apply the policy that queues packets and sends them onto the next router (here, policies VUNI:SERVICE and EVC:SERVICE are applied):

```
[edit class-of-service interfaces]
user@es4# set interface-set vuni-set1 output-traffic-control-profile
VUNI:SERVICE
user@es4# set interface-set vuni-set2 output-traffic-control-profile
VUNI:SERVICE
user@es4# set ge-1/0/3 unit 1 output-traffic-control-profile EVC:SERVICE
```

17. Apply classifiers and rewrite rules to the logical interfaces supporting the services:

```
[edit class-of-service interfaces]
user@es4# set ge-1/0/0 unit 1 classifiers ieee-802.1 802p_class
user@es4# set ge-1/0/0 unit 1 rewrite-rules ieee-802.1 802p_rwrule
user@es4# set ge-1/0/0 unit 2 classifiers ieee-802.1 802p_class
user@es4# set ge-1/0/0 unit 2 rewrite-rules ieee-802.1 802p_rwrule
user@es4# set ge-1/0/0 unit 3 forwarding-class INET-BEST-EFFORT
user@es4# set ge-1/0/0 unit 4 forwarding-class INET-BEST-EFFORT
user@es4# set ge-1/0/3 unit 1 classifiers ieee-802.1 802p_class
user@es4# set ge-1/0/3 unit 1 rewrite-rules ieee-802.1 802p_rwrule
user@es4# set ge-1/0/3 unit 2 classifiers ieee-802.1 802p_class
user@es4# set ge-1/0/3 unit 2 rewrite-rules ieee-802.1 802p_rwrule
user@es4# set ge-1/0/3 unit 3 forwarding-class INET-BEST-EFFORT
user@es4# set ge-1/0/3 unit 4 forwarding-class INET-BEST-EFFORT
```

Results Check the results of the configuration:

```
user@switch1> show configuration
class-of-service {
  classifiers {
    # P-BIT 7, 6 => VOICE ef
    # P-BIT 4, 5 => VPN Priority data
    # Others => Internet Best effort
    ieee-802.1 802p_class {
      forwarding-class INET-BEST-EFFORT {
        loss-priority low code-points [ 000 001 ];
        loss-priority high code-points [ 010 011 ];
      }
      forwarding-class VPN-PR-DATA {
        loss-priority low code-points 100;
        loss-priority high code-points 101;
      }
      forwarding-class VOICE-EF {
        loss-priority low code-points 111;
        loss-priority high code-points 110;
      }
    }
  }
  forwarding-classes {
    class INET-BEST-EFFORT queue-num 0;
    class VPN-PR-DATA queue-num 1;
    class VOICE-EF queue-num 2 priority high;
  }
}
```

```

    class UNUSED queue-num 3;
}
traffic-control-profiles {
    EVC:SERVICE {
        scheduler-map EVC;
        shaping-rate 20m;
    }
    VUNI:SERVICE {
        scheduler-map EVC;
        shaping-rate 100m;
        guaranteed-rate 100m;
    }
}
interfaces {
    interface-set vuni-set1 {
        # vuni-set1 is grouped E-LINE services
        output-traffic-control-profile VUNI:SERVICE;
    }
    interface-set vuni-set2 {
        # vuni-set2 is grouped E-LAN services
        output-traffic-control-profile VUNI:SERVICE;
    }
    ge-1/0/0 {
        # ge-1/0/0 is customer edge
        unit 1 {
            classifiers {
                ieee-802.1 802p_class;
            }
            rewrite-rules {
                ieee-802.1 802p_rwrule;
            }
        }
        unit 2 {
            classifiers {
                ieee-802.1 802p_class;
            }
            rewrite-rules {
                ieee-802.1 802p_rwrule;
            }
        }
        unit 3 {
            forwarding-class INET-BEST-EFFORT;
        }
        unit 4 {
            forwarding-class INET-BEST-EFFORT;
        }
    }
    ge-1/0/3 {
        unit 1 {
            # In hierarchical-scheduler mode:
            # EVC can be shaped at EVC (unit) level in addition to
            # being shaped at virtual-UNI and port-level
            # But this level is currently disabled
            # classification of incoming UNI traffic for ELINE1
            classifiers {
                ieee-802.1 802p_class;
            }

```

```

    }
    # marking of .1p bits of outgoing UNI traffic
    rewrite-rules {
        ieee-802.1 802p_rwrule;
    }
}
unit 2 {
    # classification of incoming UNI traffic for ELINE2
    classifiers {
        ieee-802.1 802p_class;
    }
    # marking of .1p bits of outgoing UNI traffic
    rewrite-rules {
        ieee-802.1 802p_rwrule;
    }
}
unit 3 {
    # fixed-classification for ELAN1, all ELAN traffic is
    # best effort
    forwarding-class INET-BEST-EFFORT;
}
unit 4 {
    # fixed-classification for ELAN2, all ELAN traffic is
    # best effort
    forwarding-class INET-BEST-EFFORT;
}
}
}
rewrite-rules {
    ieee-802.1 802p_rwrule {
        forwarding-class VPN-PR-DATA {
            loss-priority low code-point 010;
            loss-priority high code-point 110;
        }
        forwarding-class VOICE-EF {
            loss-priority low code-point 011;
            loss-priority high code-point 111;
        }
        forwarding-class INET-BEST-EFFORT {
            loss-priority low code-point 100;
            loss-priority high code-point 000;
        }
    }
}
}
scheduler-maps {
    EVC {
        forwarding-class INET-BEST-EFFORT scheduler BE;
        forwarding-class VPN-PR-DATA scheduler PD;
        forwarding-class VOICE-EF scheduler EF;
    }
}
schedulers {
    BE {
        transmit-rate percent 30;
        buffer-size percent 30;
        priority low;
    }
}

```

```

    }
    PD {
        transmit-rate percent 40;
        buffer-size percent 40;
        priority high;
    }
    EF {
        transmit-rate percent 10;
        buffer-size percent 10;
        priority strict-high;
    }
}
}
}
firewall {
    policer 15m-pol {
        if-exceeding {
            bandwidth-limit 15m;
            burst-size-limit 5k;
        }
        then discard;
    }
    policer 50m-pol {
        if-exceeding {
            bandwidth-limit 50m;
            burst-size-limit 30k;
        }
        then discard;
    }
    policer 30m-pol {
        if-exceeding {
            bandwidth-limit 30m;
            burst-size-limit 45k;
        }
        then discard;
    }
    policer 40m-pol {
        if-exceeding {
            bandwidth-limit 40m;
            burst-size-limit 45k;
        }
        then discard;
    }
}
family bridge {
    filter SERVICE1 {
        # bandwidth profile for Voice service
        interface-specific;
        term Voice_bw_prof {
            from {
                forwarding-class VOICE-EF;
            }
            then {
                policer 15m-pol;
                count srv1_voice_cnt;
            }
        }
    }
    # bandwidth profile for VPN priority-data service

```



```

term VPN_pd_bw_prof {
    from {
        forwarding-class VPN-PR-DATA;
    }
    then {
        policer 50m-pol;
        count srv1_vpn_cnt;
    }
}
# everything else is best-effort internet
term ANY {
    then count srv1_inet_cnt;
}
}
filter SERVICE2 {
    term Voice_sw_prof {
        from {
            forwarding-class VOICE-EF;
        }
        then {
            policer 40m-pol;
            count srv2_ef_cnt;
        }
    }
    term PR_DATA_policer {
        from {
            forwarding-class VPN-PR-DATA;
        }
        then {
            policer 30m-pol;
            count srv2_pr_data_cnt;
        }
    }
    term ANY {
        then count srv2_be_cnt;
    }
}
filter SERVICE3 {
    term ANY {
        then {
            count srv3_cnt;
            forwarding-class INET-BEST-EFFORT;
        }
    }
}
}
}
}
# Interface configuration shown for completeness-done for PBB E-LINE and PBB-E-LAN
example
interfaces {
    ge-1/0/0 {
        description "Connected to ES4 Reds ge-1/0/0";
        flexible-vlan-tagging;
        encapsulation flexible-ethernet-services;
        unit 1 {
            family bridge {

```

```

        interface-mode trunk;
        vlan-id-list 2100;
        vlan-rewrite {
            translate 1100 2100;
        }
    }
}
unit 2 {
    family bridge {
        interface-mode trunk;
        vlan-id-list 1200;
    }
}
unit 3 {
    family bridge {
        interface-mode trunk;
        vlan-id-list 1300;
    }
}
unit 4 {
    family bridge {
        interface-mode trunk;
        vlan-id-list 1400;
    }
}
}
ge-1/0/4 {
    description "Connected to BCB1 Syrah ge-2/1/5";
    unit 0 {
        family bridge {
            interface-mode trunk;
            vlan-id-list 3000-4000;
        }
    }
}
ge-1/2/2 {
    description "Connected to BCB2 Cabernet ge-2/0/6";
    unit 0 {
        family bridge {
            interface-mode trunk;
            vlan-id-list 3000-4000;
        }
    }
}
cbp0 {
    unit 0 {
        family bridge {
            interface-mode trunk;
            bridge-domain-type bvlan;
            isid-list all;
        }
    }
}
pip0 {
    unit 0 {
        family bridge {

```

```

        interface-mode trunk;
        bridge-domain-type svlan;
        isid-list all-service-groups;
    }
}
unit 1 {
    family bridge {
        interface-mode trunk;
        bridge-domain-type svlan;
        isid-list all-service-groups;
    }
}
}
}
# routing-instances configuration shown for completeness
# routing-instances configuration done for PBB E-LINE and PBB-E-LAN example
routing-instances {
    pbn-3-for-eline {
        instance-type virtual-switch;
        interface ge-1/0/0.1;
        interface ge-1/0/0.2;
        interface pip0.0;
        bridge-domains {
            eline-svlans {
                vlan-id-list [ 1200 2100 ];
            }
        }
    }
    pbn-3-for-elan {
        instance-type virtual-switch;
        interface ge-1/0/0.3;
        interface ge-1/0/0.4;
        interface pip0.1;
        bridge-domains {
            elan-svlans {
                vlan-id-list [ 1300 1400 ];
            }
        }
    }
    pbb-options {
        peer-instance pbbn-1;
    }
    service-groups {
        elan1 {
            service-type elan;
            pbb-service-options {
                isid 10300 vlan-id-list 1300;
            }
        }
        elan2 {
            service-type elan;
            pbb-service-options {
                isid 10400 vlan-id-list 1400;
            }
        }
    }
}
pbb-options {

```

```

        peer-instance pbbn-1;
    }
    service-groups {
        eline1 {
            service-type eline;
            pbb-service-options {
                isid 10100 interface ge-1/0/0.1;
            }
        }
        eline2 {
            service-type eline;
            pbb-service-options {
                isid 10200 interface ge-1/0/0.2;
            }
        }
    }
}
}
}

```

Verification

To confirm that the configuration is working properly, perform these tasks:

- Verifying Ingress SLA Enforcement on page 102
- Verifying Egress SLA on page 104
- Verify Traffic Shaping and Scheduling Profiles on page 104
- Verifying Schedulers and the Scheduler Map on page 104
- Egress SLA Enforcement on page 105

Verifying Ingress SLA Enforcement

Purpose Verify that SLA enforcement is occurring for traffic entering ES4 and exiting towards ES1. The policers for the forwarding classes are:

- 15 Mbps for voice traffic
- 50 Mbps for priority data
- No policer for best effort—all traffic within 40 Mbps is accepted

Action Use the following operational mode command:

```

user@es4> show firewall
Filter: __default_bpdu_filter__

```

```

Filter: SERVICE1-ge-1/0/3.1-i

```

Counters:

Name	Bytes	Packets
srv1_vpn_cnt-ge-1/0/3.1-i	899929660584	644648754
srv1_voice_cnt-ge-1/0/3.1-i	183642199700	175737551
srv1_inet_cnt-ge-1/0/3.1-i	359309729428	257385193

Policers:

Name	Packets
50m-pol-VPN_pd_bw_prof-ge-1/0/3.1-i	255914707

15m-pol-Voice_bw_prof-ge-1/0/3.1-i 0

Filter: SERVICE2

Counters:

Name	Bytes	Packets
srv2_pr_data_cnt	0	0
srv2_ef_cnt	2953233408	46144272
srv2_be_cnt	0	0

Policers:

Name	Packets
30m-pol-PR_DATA_policer	0
---(more)---	
0	
40m-pol-Voice_sw_prof	

Filter: SERVICE3

Counters:

Name	Bytes	Packets
srv3_cnt	0	0

Filter: __default_arp_policer__

Filter: __cfm_filter_bds-vlan-0500_6__

Counters:

Name	Bytes	Packets
__cfm_ethtype_term__	750	15
__cfm_erp_term__	0	0
__ge-1/0/3.5_cc_term_lvl_0__	0	0
__ge-1/0/3.5_cc_term_lvl_1__	0	0
__ge-1/0/3.5_cc_term_lvl_2__	0	0
__ge-1/0/3.5_lt_term_lvl_0__	0	0
__ge-1/0/3.5_lt_term_lvl_1__	0	0
__ge-1/0/3.5_lt_term_lvl_2__	0	0
__ge-1/0/3.5_cc_term_lvl_3__	0	0
__ge-1/0/3.5_cc_term_lvl_4__	0	0
__ge-1/0/3.5_cc_term_lvl_5__	0	0
__ge-1/0/3.5_cc_term_lvl_6__	0	0
__ge-1/0/3.5_cc_term_lvl_7__	0	0
__ge-1/0/3.5_lt_term_lvl_3__	0	0
__ge-1/0/3.5_lt_term_lvl_4__	0	0
__ge-1/0/3.5_lt_term_lvl_5__	0	0
__ge-1/0/3.5_lt_term_lvl_6__	0	0
__ge-1/0/3.5_lt_term_lvl_7__	0	0
__mgrp_1_cc_term_lvl_0__	0	0
__mgrp_1_cc_term_lvl_1__	0	0
__mgrp_1_cc_term_lvl_2__	0	0
__mgrp_1_cc_term_lvl_3__	111794828	1152524
__mgrp_1_cc_term_lvl_4__	0	0
__mgrp_1_cc_term_lvl_5__	0	0
__mgrp_1_cc_term_lvl_6__	0	0
__mgrp_1_cc_term_lvl_7__	0	0
__mgrp_1_lt_term_lvl_0__	0	0
__mgrp_1_lt_term_lvl_1__	0	0
__mgrp_1_lt_term_lvl_2__	0	0
__mgrp_1_lt_term_lvl_3__	1152	18
__mgrp_1_lt_term_lvl_4__	0	0
__mgrp_1_lt_term_lvl_5__	0	0
__mgrp_1_lt_term_lvl_6__	0	0
__mgrp_1_lt_term_lvl_7__	0	0

[truncated]

Meaning The operational mode command `show firewall` displays statistics about the firewall filters. Under the `Filter: SERVICE1` region, the values `50-pol-VPN_pd_bw_prof-ge-1/0/3.1-I` and `15-pol-Voice_bw_prof-ge-1/0/3.1-I` indicate that each forwarding class is policed to a certain bandwidth rate. The `Bytes` value for `50-pol-VPN_pd_bw_prof-ge-1/0/3.1-I` is 255914707, which exceeds the 50 Mbps bandwidth limit for priority data. Packets exceeding 50 Mbps will be dropped.

Verifying Egress SLA

Purpose Verify that SLA enforcement is occurring for traffic coming from ES1 towards ES4. Only 100 Mbps can egress ES1. Voice traffic and priority data take precedence over best-effort traffic.

Action Use the following operational mode commands:

```
user@es4> show class-of-service interface-set
Interface-set: vuni-set1, Index: 1
Physical interface: ge-1/0/3, Index: 151
Queues supported: 4, Queues in use: 4
  Output traffic control profile: VUNI:SERVICE, Index: 49590

Interface-set: vuni-set2, Index: 2
Physical interface: ge-1/0/3, Index: 151
Queues supported: 4, Queues in use: 4
  Output traffic control profile: VUNI:SERVICE, Index: 49590
```

Meaning The operational mode command `show class-of-service interface-set` displays the two interface sets `vuni-set1` and `vuni-set2`. It also shows that the `VUNI:SERVICE` CoS policy is applied to both interface sets.

Verify Traffic Shaping and Scheduling Profiles

Purpose Verify traffic shaping and scheduling profiles on the router.

Action Use the following operational mode commands:

```
user@es4> show class-of-service traffic-control-profile
run show class-of-service traffic-control-profile
Traffic control profile: EVC:SERVICE, Index: 57589
  Shaping rate: 200000000
  Scheduler map: EVC

Traffic control profile: VUNI:SERVICE, Index: 49590
  Shaping rate: 100000000
  Scheduler map: EVC
  Guaranteed rate: 100000000
```

Meaning The operational mode command `show class-of-service traffic-control-profiles` shows that `eline1`, `elan1`, and `elan2` are subject to 100 Mbps shaping rate (see guaranteed rate). While 160 Mbps can ingress, only 100 Mbps can egress.

Verifying Schedulers and the Scheduler Map

Purpose Verify the schedulers and the scheduler map configured on router ES4.

Action Use the following operational mode command:

```
user@es4> show class-of-service scheduler-map EVC
Scheduler map: EVC, Index: 7810

Scheduler: BE, Forwarding class: INET-BEST-EFFORT, Index: 2053
  Transmit rate: 30 percent, Rate Limit: none, Buffer size: 30 percent,
  Priority: low
  Excess Priority: unspecified
  Drop profiles:
    Loss priority  Protocol  Index  Name
    Low           any       1      default-drop-profile
    Medium low    any       1      default-drop-profile
    Medium high   any       1      default-drop-profile
    High          any       1      default-drop-profile

Scheduler: PD, Forwarding class: VPN-PR-DATA, Index: 2628
  Transmit rate: 40 percent, Rate Limit: none, Buffer size: 40 percent,
  Priority: high
  Excess Priority: unspecified
  Drop profiles:
    Loss priority  Protocol  Index  Name
    Low           any       1      default-drop-profile
    Medium low    any       1      default-drop-profile
    Medium high   any       1      default-drop-profile
    High          any       1      default-drop-profile

Scheduler: EF, Forwarding class: VOICE-EF, Index: 2278
  Transmit rate: 10 percent, Rate Limit: none, Buffer size: 10 percent,
  Priority: strict-high
  Excess Priority: unspecified
  Drop profiles:
    Loss priority  Protocol  Index  Name
    Low           any       1      default-drop-profile
    Medium low    any       1      default-drop-profile
    Medium high   any       1      default-drop-profile
    High          any       1      default-drop-profile
```

Meaning The operational mode command `show class-of-service scheduler-maps EVC` displays information about the schedulers BE, PD, and EF that are configured for scheduler map EVC. It also shows how each scheduler is tied to a forwarding class. Scheduler BE is tied to the forwarding class INET-BEST-EFFORT. Scheduler PD is tied to the forwarding class VPN-PR-DATA. Scheduler EF is tied to the forwarding class VOICE-EF.

Egress SLA Enforcement

Purpose Compare the queues for interface sets `vuni-set1` and `vuni-set2`. Dropped packets for either interface set indicates that bandwidth limits are being exceeded and enforcement is occurring.

Action Use the following operational mode command:

```
user@es4> show interfaces interface-set queue vuni-set1
Interface set: vuni-set1
  Interface set index: 1
  Forwarding classes: 16 supported, 4 in use
  Egress queues: 4 supported, 4 in use
  Queue: 0, Forwarding classes: INET-BEST-EFFORT
```

```

Queued:
  Packets      :      2977942923      8933 pps
  Bytes       :      1949099612484    100314048 bps
Transmitted:
  Packets      :      1488278642      4464 pps
  Bytes       :      973656736604     50139648 bps
  Tail-dropped packets :      0      0 pps
  RED-dropped packets :      1489660186  4466 pps
    Low       :      1489660186  4466 pps
    Medium-low :      0      0 pps
    Medium-high :      0      0 pps
    High       :      0      0 pps
  RED-dropped bytes :      975440779240  50162112 bps
    Low       :      975440779240  50162112 bps
    Medium-low :      0      0 bps
    Medium-high :      0      0 bps
    High       :      0      0 bps
Queue: 1, Forwarding classes: VPN-PR-DATA
Queued:
  Packets      :      1231342961      3576 pps
  Bytes       :      785429404088     40144224 bps
Transmitted:
  Packets      :      1231342958      3573 pps
  Bytes       :      785429402552     40131936 bps
  Tail-dropped packets :      0      0 pps
  RED-dropped packets :      0      0 pps
    Low       :      0      0 pps
    Medium-low :      0      0 pps
    Medium-high :      0      0 pps
    High       :      0      0 pps
  RED-dropped bytes :      0      0 bps
    Low       :      0      0 bps
    Medium-low :      0      0 bps
    Medium-high :      0      0 bps
    High       :      0      0 bps
Queue: 2, Forwarding classes: VOICE-EF
Queued:
  Packets      :      1639301652      893 pps
  Bytes       :      294440262416     10030176 bps
Transmitted:
  Packets      :      1639301652      893 pps
  Bytes       :      294440262416     10030176 bps
  Tail-dropped packets :      0      0 pps
  RED-dropped packets :      0      0 pps
    Low       :      0      0 pps
    Medium-low :      0      0 pps
    Medium-high :      0      0 pps
    High       :      0      0 pps
  RED-dropped bytes :      0      0 bps
    Low       :      0      0 bps
    Medium-low :      0      0 bps
    Medium-high :      0      0 bps
    High       :      0      0 bps
Queue: 3, Forwarding classes: UNUSED
Queued:
  Packets      :      3091521      0 pps
  Bytes       :      222589512      0 bps
Transmitted:
  Packets      :      3091521      0 pps
  Bytes       :      222589512      0 bps
  Tail-dropped packets :      0      0 pps

```



```

RED-dropped packets : 0 0 pps
  Low : 0 0 pps
  Medium-low : 0 0 pps
  Medium-high : 0 0 pps
  High : 0 0 pps
RED-dropped bytes : 0 0 bps
  Low : 0 0 bps
  Medium-low : 0 0 bps
  Medium-high : 0 0 bps
  High : 0 0 bps
user@es4> show interfaces interface-set queue vuni-set2
Interface set: vuni-set2
Interface set index: 2
Forwarding classes: 16 supported, 4 in use
Egress queues: 4 supported, 4 in use
Queue: 0, Forwarding classes: INET-BEST-EFFORT
  Queued:
    Packets : 513317220 3572 pps
    Bytes : 720697385280 40120704 bps
  Transmitted:
    Packets : 513317220 3572 pps
    Bytes : 720697385280 40120704 bps
    Tail-dropped packets : 0 0 pps
    RED-dropped packets : 0 0 pps
      Low : 0 0 pps
      Medium-low : 0 0 pps
      Medium-high : 0 0 pps
      High : 0 0 pps
    RED-dropped bytes : 0 0 bps
      Low : 0 0 bps
      Medium-low : 0 0 bps
      Medium-high : 0 0 bps
      High : 0 0 bps
Queue: 1, Forwarding classes: VPN-PR-DATA
  Queued:
    Packets : 513317223 3571 pps
    Bytes : 720697376892 40109472 bps
  Transmitted:
    Packets : 513317223 3571 pps
    Bytes : 720697376892 40109472 bps
    Tail-dropped packets : 0 0 pps
    RED-dropped packets : 0 0 pps
      Low : 0 0 pps
      Medium-low : 0 0 pps
      Medium-high : 0 0 pps
      High : 0 0 pps
    RED-dropped bytes : 0 0 bps
      Low : 0 0 bps
      Medium-low : 0 0 bps
      Medium-high : 0 0 bps
      High : 0 0 bps
Queue: 2, Forwarding classes: VOICE-EF
  Queued:
    Packets : 175354436 893 pps
    Bytes : 183560157444 10030176 bps
  Transmitted:
    Packets : 175354436 893 pps
    Bytes : 183560157444 10030176 bps
    Tail-dropped packets : 0 0 pps
    RED-dropped packets : 0 0 pps
      Low : 0 0 pps

```

```

Medium-low      : 0 0 pps
Medium-high     : 0 0 pps
High            : 0 0 pps
RED-dropped bytes : 0 0 bps
Low             : 0 0 bps
Medium-low      : 0 0 bps
Medium-high     : 0 0 bps
High            : 0 0 bps
Queue: 3, Forwarding classes: UNUSED
Queued:
Packets         : 0 0 pps
Bytes           : 0 0 bps
Transmitted:
Packets         : 0 0 pps
Bytes           : 0 0 bps
Tail-dropped packets : 0 0 pps
RED-dropped packets : 0 0 pps
Low             : 0 0 pps
Medium-low      : 0 0 pps
Medium-high     : 0 0 pps
High            : 0 0 pps
RED-dropped bytes : 0 0 bps
Low             : 0 0 bps
Medium-low      : 0 0 bps
Medium-high     : 0 0 bps
High            : 0 0 bps

```

Meaning The operational mode commands `show interfaces interface-set queue vuni-set1` and `show interfaces interface-set queue vuni-set2` show the queue statistics for the forwarding classes `INET-BEST-EFFORT`, `VPN-PR-DATA`, and `VOICE-EF`. See **Queue 2: Forwarding classes: VOICE-EF** in the output for command `show interfaces interface-set queue vuni-set1`. Notice that packets are being dropped for forwarding class `INET-BEST-EFFORT`. Queue 1 for forwarding class `VOICE-EF` and queue 2 for forwarding class `VPN-PR-DATA` are given a high priority during scheduling. Consequently, they do not have any dropped packets. Total traffic is shaped at 100 Mbps. After the 10 Mbps for voice traffic and the 40 Mbps for priority data is subtracted from the total bandwidth of 100 Mbps, 50 Mbps remains and is shared between the best-effort traffic for `eline1` and `eline2`. Excess best-effort traffic is dropped.

- Related Topics**
- Understanding JUNOS CoS Components for MX Series Routers on page 10
 - Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX series Routers on page 17
 - Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers on page 108

Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers

Provider backbone bridging (PBB) extends Layer 2 Ethernet switching to provide enhanced scalability, quality of service (QoS) features, and carrier-class reliability in service provider networks. Connectivity fault management (CFM) is used with PBB to support that carrier-class reliability. Use CFM to monitor, isolate, and verify faults in the network.

The JUNOS Software implementation of PBB supports the IEEE 802.1ah (PBB) and IEEE 802.1ag (CFM) standards.

This example describes how to configure end-to-end fault management in a PBN and a PBBN:

- Requirements on page 109
- Overview and Topology on page 109
- Configuring Connectivity Fault Management for a PBBN on page 113
- Configuring Connectivity Fault Management for a PBN on page 124
- Verification on page 133

Requirements

This example uses the following hardware and software components:

- JUNOS Release 10.0 or later for MX Series routers
- Eight MX Series routers in a PBB configuration

Before you configure the routers for PBB and services, be sure you have:

- Installed the MX Series router.
- Performed the initial router configuration.
- Performed the PBB configuration for Ethernet private line (E-LINE) and Ethernet transparent LAN (E-LAN) services. For more information, refer to ““Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX series Routers” on page 17”.

Overview and Topology

There are two different networks that need to be configured for CFM in this example:

- A provider backbone bridge network (PBBN).
- Provider bridged networks (PBNs) that include PBN1, PBN2, and PBN3.

This example uses a series of maintenance end points (MEPs) and maintenance intermediate points (MIPs). MIPs respond to the OAM processes initiated by the MEPs. Using MEPs and MIPs, CFM provides end-to-end connectivity in the PBBN because it can exactly pinpoint a failure in the topology.

Figure 7 on page 110 displays the topology for the PBBN. The PBBN connect the PBNs and provides services to the PBNs. Two backbone core bridges (BCBs) are connected to PBN1, PBN2, and PBN3. Operation, Administration, and Maintenance (OAM) in the PBBN is limited to fault detection in the PBBN.

Figure 7: Network Topology for the PBBN

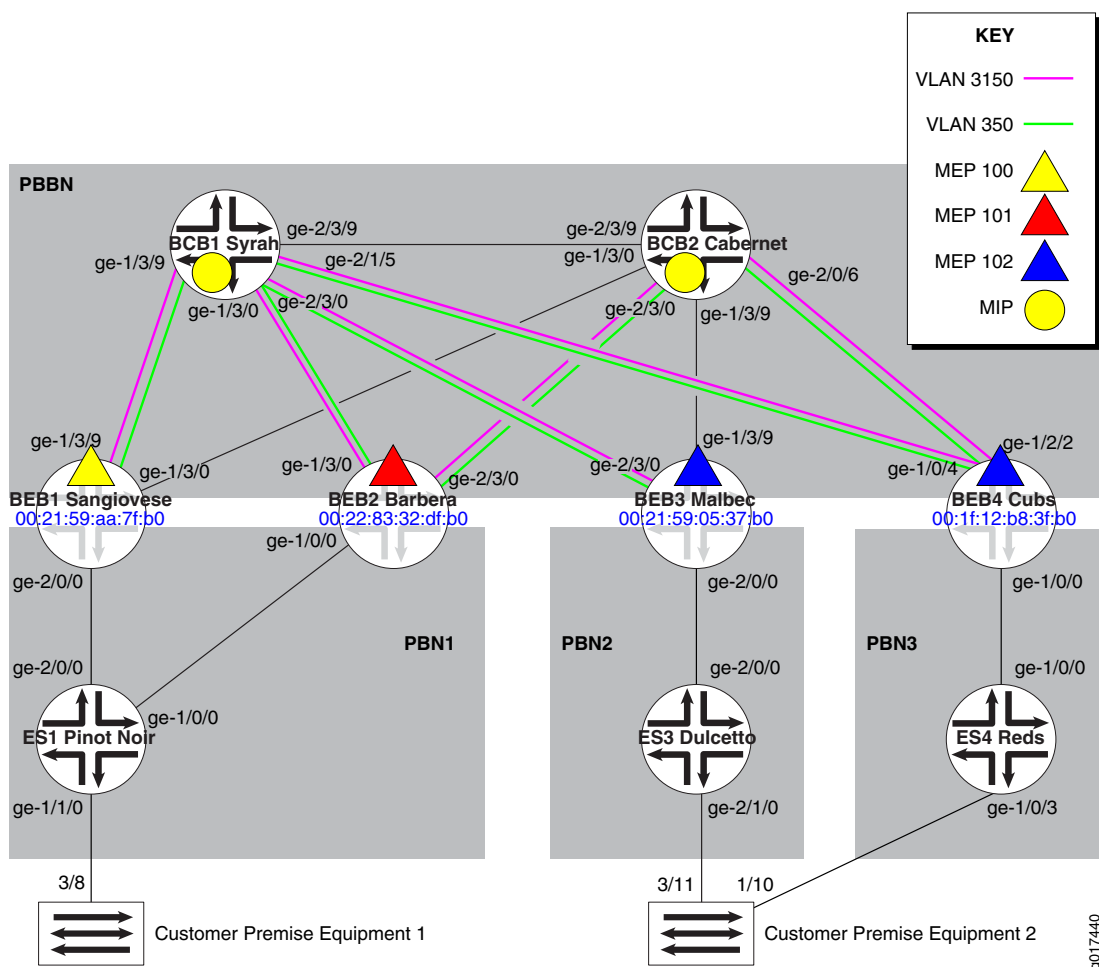


Table 12 on page 111 shows the maintenance end points (MEPs) and maintenance intermediate points (MIPs) that are configured for each router in the PBBN. The PBBN is configured with VLAN 3150 and 3350. CFM must be configured for monitoring the connectivity in both the VLANs. To do this, configure a MEP for each VLAN at the endpoints (BEBs), and configure a MIP for each VLAN on the core bridges (BCBs).

To configure a MIP for level x , the maintenance domain default- x is configured on the router. For example, if MEPs in the PBBN are configured at level 3, the MIP is configured as **default-3**.



NOTE: CFM in the PBBN is used to check the connectivity in the PBBN domain only, and packets are never leaked to the PBN.

Table 12: CFM Components Configured for the PBBN

VLAN	Router	Level	MEP	MIP
3150	BEB1 (Sangiovese)	5	100	—
	BEB2 (Barbera)	5	101	—
	BEB4 (Cubs)	5	102	—
	BCB1 (Syrah)	5	—	default-5
	BCB2 (Cabernet)	5	—	default-5
VLAN 3350	BEB1 (Sangiovese)	5	100	—
	BEB3 (Malbec)	5	102	—
	BEB4 (Cubs)	5	102	—
	BCB1 (Syrah)	5	—	default-5
	BCB2 (Cabernet)	5	—	default-5

Figure 8 on page 112 displays the topology for PBN. BEB1, BEB2, BEB3, and BEB4 are connected to customer edge switches ES1, ES3, and ES4.

The PBN is configured with VLAN 500 and 600. CFM must be configured for monitoring the connectivity in both the VLANs. To do this, configure a MEP for each VLAN at the endpoints (ESs), and configure a MIP for each VLAN on the BEBs.

Comparing both topologies, notice that the BEBs are actually part of both the PBN and the PBBN. They perform the function of a MEP in the PBBN, but perform the function of a MIP in the PBN and participate in multiple maintenance domains. In comparison, BCBs in the PBBN participate in one maintenance domain and ESs in the PBN participate in one maintenance domain.



NOTE: CFM on the PBN is used to check the connectivity in the PBN domain—these packets are simply tunneled in the PBBN domain as data packets.

Figure 8: Network Topology for the PBN

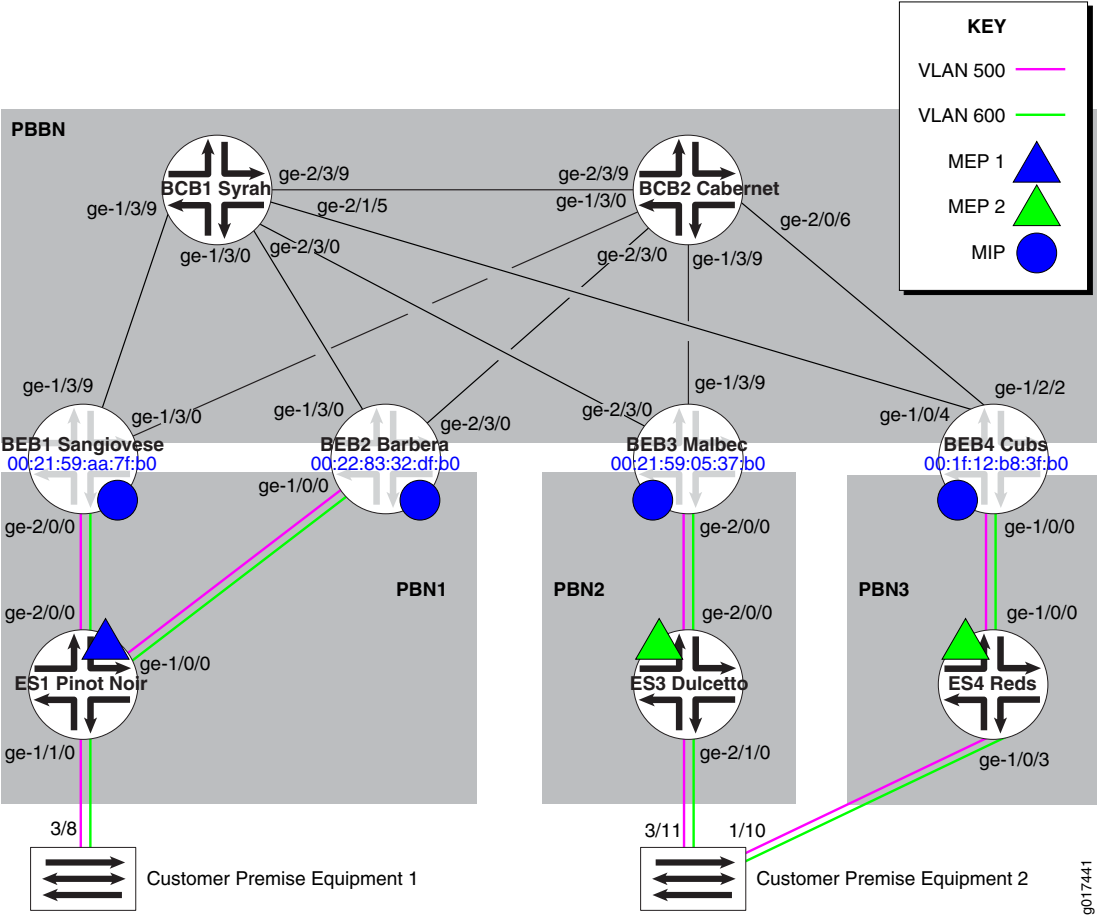


Table 13 on page 112 shows the MEPs and MIPs that are configured in the PBN.

Table 13: CFM Components Configured for the PBN

VLAN	Router	Level	MEP	MIP
500	ES1 (Pinot Noir)	3	1	—
	ES3 (Dulcetto)	3	2	—
	ES4 (Reds)	3	2	—
	BEB1 (Sangiovese)	3	—	default-3
	BEB2 (Barbera)	3	—	default-3
	BEB3 (Malbec)	3	—	default-3
	BEB4 (Cubs)	3	—	default-3

Table 13: CFM Components Configured for the PBN *(continued)*

VLAN	Router	Level	MEP	MIP
600	ES1 (Pinot Noir)	3	1	—
	ES4 (Reds)	3	2	—
	BEB1 (Sangiovese)	3	—	default-3
	BEB2 (Barbera)	3	—	default-3
	BEB3 (Malbec)	3	—	default-3
	BEB4 (Cubs)	3	—	default-3



NOTE: MX Series router ES3 (Dolcetto) is visible in the topology, but is not part of the CFM configuration example.

Configuring Connectivity Fault Management for a PBBN

To configure connectivity fault management on MX Series routers in a provider backbone bridge network, perform these tasks:

- Configuring a MEP on BEB1 (Sangiovese) on page 113
- Configuring a MEP on BEB2 (Barbera) on page 116
- Configuring a MEP on BEB3 (Malbec) on page 118
- Configuring a MEP on BEB4 (Cubs) on page 119
- Configuring a MIP on BCB1 (Syrah) on page 122
- Configuring a MIP on BCB2 (Cabernet) on page 123

Configuring a MEP on BEB1 (Sangiovese)

CLI Quick Configuration

To quickly configure a MEP for BEB1, copy the following commands and paste them into the router terminal window:

```
[edit]
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn
level 5
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn
maintenance-association vlan3350 continuity-check interval 1s
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn
maintenance-association vlan3350 mep 100 interface cbp0.0
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn
maintenance-association vlan3350 mep 100 interface vlan 3350
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn
maintenance-association vlan3350 mep 100 direction up
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn
maintenance-association vlan3350 mep 100 auto-discovery
```

```

set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn
maintenance-association vlan3150 continuity-check interval 1s
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn
maintenance-association vlan3150 mep 100 interface cbp0.0
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn
maintenance-association vlan3150 mep 100 interface vlan 3150
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn
maintenance-association vlan3150 mep 100 direction up
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn
maintenance-association vlan3150 mep 100 auto-discovery

```

Step-by-Step Procedure To configure a MEP for BEB1:

1. Create a maintenance domain at level 5 for PBBN monitoring (here, the maintenance domain is pbbn):

```

[edit protocols oam]
user@beb1# set ethernet connectivity-fault-management maintenance-domain
pbbn level 5

```

2. Configure the continuity check interval for the maintenance association (here, vlan3350). The continuity check protocol is used for fault detection by a Maintenance End Point (MEP). The MEP periodically sends continuity check multicast messages, and receiving MEPs use the CC messages to build a MEP database of all MEPs in the maintenance association.

```

[edit protocols oam]
user@beb1# set ethernet connectivity-fault-management maintenance-domain
pbbn maintenance-association vlan3350 continuity-check interval 1s

```

3. Configure a MEP with the same maintenance association identifier and maintenance domain level (here, vlan3150 and pbbn) and associate them to VLAN 3150 and the pseudo-logical interface cbp0.0).

```

[edit protocols oam]
user@beb1# set ethernet connectivity-fault-management maintenance-domain
pbbn maintenance-association vlan3350 mep 100 interface vlan 3350
user@beb1# set ethernet connectivity-fault-management maintenance-domain
pbbn maintenance-association vlan3350 mep 100 interface cbp0.0

```



NOTE: When you configure PBB, a customer backbone port (cbp) pseudo-logical interface is configured for the B-component of the BEB. This permits multiple customer routing instances to be associated with a single PBBN provider routing instance.

4. Configure the direction in which CFM packets are transmitted for the MEP. Direction up CCMs are transmitted out of every logical interface that is part of the same bridge (here, direction is specified as up).

```

[edit protocols oam]
user@beb1# set ethernet connectivity-fault-management maintenance-domain
pbbn maintenance-association vlan3350 mep 100 direction up

```


5. Configure automatic discovery to enable the MEP to accept continuity check messages from all remote MEPs of the same maintenance association.

```
[edit protocols oam]
user@beb1# set ethernet connectivity-fault-management maintenance-domain
pbbn maintenance-association vlan3350 mep 100 auto-discovery
```

6. Configure the continuity check interval for the maintenance association (here, vlan3150). The continuity check protocol is used for fault detection by a MEP. The MEP periodically sends continuity check multicast messages, and receiving MEPs use the CC messages to build a MEP database of all MEPs in the maintenance association.

```
[edit protocols oam]
user@beb1# set ethernet connectivity-fault-management maintenance-domain
pbbn maintenance-association vlan3150 continuity-check interval 1s
```

7. Configure a MEP with the same maintenance association identifier and maintenance domain level (here, vlan3150 and pbbn).

```
[edit protocols oam]
user@beb1# set ethernet connectivity-fault-management maintenance-domain
pbbn maintenance-association vlan3150 mep 100 interface vlan 3350
```

8. Configure the direction in which CFM packets are transmitted for the MEP. Direction up CCMs are transmitted out of every logical interface that is part of the same bridge (here, direction is specified as up).

```
[edit protocols oam]
user@beb1# set ethernet connectivity-fault-management maintenance-domain
pbbn maintenance-association vlan3150 mep 100 direction up
```

9. Configure automatic discovery to enable the MEP to accept continuity check messages from all remote MEPs of the same maintenance association.



NOTE: You can also use the command `remote-mep` to specify a remote MEP.

```
[edit protocols oam]
user@beb1# set ethernet connectivity-fault-management maintenance-domain
pbbn maintenance-association vlan3150 mep 100 auto-discovery
```

Results Check the results of the configuration:

```
user@beb1> show configuration
protocols {
  oam {
    ethernet {
      maintenance-domain pbbn {
        level 5;
```

```

maintenance-association vlan3350 {
    continuity-check {
        interval 1s;
    }
    mep 100 {
        interface cbp0.0 vlan 3350;
        direction up;
        auto-discovery;
    }
}
maintenance-association vlan3150 {
    continuity-check {
        interval 1s;
    }
    mep 100 {
        interface cbp0.0 vlan 3150;
        direction up;
        auto-discovery;
    }
}
}
}
}
}
}
}

```

Configuring a MEP on BEB2 (Barbera)

CLI Quick Configuration To quickly configure a MEP for BEB2, copy the following commands and paste them into the router terminal window:

```

[edit]
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn
level 5
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn
maintenance-association vlan3150 continuity-check interval 1s
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn
maintenance-association vlan3150 mep 101 interface cbp0.0
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn
maintenance-association vlan3150 mep 101 interface vlan 3150
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn
maintenance-association vlan3150 mep 101 auto-discovery

```

Step-by-Step Procedure To configure a MEP for BEB2:

1. Create a maintenance domain at level 5 for PBBN monitoring (here, the maintenance domain is pbbn):

```

[edit protocols oam]
user@beb2# set protocols oam ethernet connectivity-fault-management
maintenance-domain pbbn level 5

```

2. Configure the continuity check (CC) interval for the maintenance association (here, vlan3150). The continuity check protocol is used for fault detection by a MEP. The MEP periodically sends continuity check multicast messages, and

receiving MEPs use the CC messages to build a MEP database of all MEPs in the maintenance association.

```
[edit protocols oam ]
user@beb2# set ethernet connectivity-fault-management maintenance-domain
pbbn maintenance-association vlan3150 continuity-check interval 1s
```

3. Configure a MEP with the same maintenance association identifier and maintenance domain level (here, vlan3150 and pbbn) and associate them to VLAN 3150 and the pseudo-logical interface cbp0.0).

```
[edit protocols oam ]
user@beb2# set ethernet connectivity-fault-management maintenance-domain
pbbn maintenance-association vlan3150 mep 101 interface vlan 3150
user@beb2# set cfm-pbbn protocols oam ethernet
connectivity-fault-management maintenance-domain pbbn
maintenance-association vlan3150 mep 101 interface cbp0.0
```



NOTE: When you configure PBB, a customer backbone port (cbp) pseudo-logical interface is configured for the B-component of the BEB. This permits multiple customer routing instances to be associated with a single PBBN provider routing instance.

4. Configure the direction in which CFM packets are transmitted for the MEP. Direction up CCMs are transmitted out of every logical interface that is part of the same bridge (here, direction is specified as up).

```
[edit protocols oam ]
user@beb2# set ethernet connectivity-fault-management maintenance-domain
pbbn maintenance-association vlan3150 mep 101 direction up
```

5. Configure automatic discovery to enable the MEP to accept continuity check messages from all remote MEPs of the same maintenance association.

```
[edit protocols oam ]
user@beb2# set ethernet connectivity-fault-management maintenance-domain
pbbn maintenance-association vlan3150 mep 101 auto-discovery
```

Results Check the results of the configuration:

```
user@beb2> show configuration
protocols {
  oam {
    ethernet {
      maintenance-domain pbbn {
        level 5;
        maintenance-association vlan3150 {
          continuity-check {
            interval 1s;
          }
        }
      }
    }
  }
}
```

```

        mep 101 {
            interface cbp0.0 vlan 3150;
            direction up;
            auto-discovery;
        }
    }
}

```

Configuring a MEP on BEB3 (Malbec)

CLI Quick Configuration To quickly configure a MEP on BEB3, copy the following commands and paste them into the router terminal window:

```

[edit]
set protocols oam ethernet connectivity-fault-management maintenance-domain
pbbn-elan level 5
set protocols oam ethernet connectivity-fault-management maintenance-domain
pbbn-elan maintenance-association vlan3350 mep 2 interface cbp0.0
set protocols oam ethernet connectivity-fault-management maintenance-domain
pbbn-elan maintenance-association vlan3350 mep 2 interface vlan 3350
set protocols oam ethernet connectivity-fault-management maintenance-domain
pbbn-elan maintenance-association vlan3350 mep 2 direction up
set protocols oam ethernet connectivity-fault-management maintenance-domain
pbbn-elan maintenance-association vlan3350 mep 2 auto-discovery

```

Step-by-Step Procedure To configure a MEP on BEB3:

1. Create a maintenance domain at level 5 for PBBN monitoring (here, the maintenance domain is pbbn-elan):

```

[edit groups]
user@beb3# set protocols oam ethernet connectivity-fault-management
maintenance-domain pbbn-elan level 5

```

2. Configure a MEP with the same maintenance association identifier and maintenance domain level (here, vlan3350 and pbbn-elan and associate them to VLAN 3150 and the pseudo-logical interface cbp0.0.

```

[edit protocols oam]
user@beb3# set ethernet connectivity-fault-management maintenance-domain
pbbn-elan maintenance-association vlan3350 mep 102 interface vlan 3350
user@beb3# set ethernet connectivity-fault-management maintenance-domain
pbbn-elan maintenance-association vlan3350 mep 101 interface cbp0.0

```



NOTE: When you configure PBB, a customer backbone port (cbp) pseudo-logical interface is configured for the B-component of the BEB. This permits multiple customer routing instances to be associated with a single PBBN provider routing instance.

3. Configure the direction in which CFM packets are transmitted for the MEP. Direction up CCMs are transmitted out of every logical interface that is part of the same bridge (here, direction is specified as **up**).

```
[edit protocols oam]
user@beb3# set ethernet connectivity-fault-management maintenance-domain
pbbn maintenance-association vlan3150 mep 101 direction up
```

4. Configure automatic discovery to enable the MEP to accept continuity check messages from all remote MEPs of the same maintenance association.

```
[edit protocols oam]
user@beb3# set ethernet connectivity-fault-management maintenance-domain
pbbn maintenance-association vlan3150 mep 101 auto-discovery
```

Results Check the results of the configuration:

```
user@beb3> show configuration
protocols {
  oam {
    ethernet {
      connectivity-fault-management {
        maintenance-domain pbbn-elan {
          level 5;
          maintenance-association vlan3350 {
          }
          mep 102 {
            interface cbp0.0 vlan 3350;
            direction up;
            auto-discovery;
          }
        }
      }
    }
  }
}
```

Configuring a MEP on BEB4 (Cubs)

CLI Quick Configuration

To quickly configure a MEP for BEB4, copy the following commands and paste them into the router terminal window:

```
[edit]
set protocols oam ethernet connectivity-fault-management maintenance-domain
pbbn level 5
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn
maintenance-association vlan3350 continuity-check interval 1s
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn
maintenance-association vlan3350 mep 102 interface vlan 3350
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn
maintenance-association vlan3350 mep 102 interface cbp0.0
```

```

set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn
maintenance-association vlan3350 mep 102 direction up
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn
maintenance-association vlan3350 mep 102 auto-discovery
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn
maintenance-association vlan3150 continuity-check interval 1s
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn
maintenance-association vlan3150 mep 102 interface vlan 3150
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn
maintenance-association vlan3150 mep 102 direction up
set protocols oam ethernet connectivity-fault-management maintenance-domain pbbn
maintenance-association vlan3150 mep 102 auto-discovery

```

Step-by-Step Procedure To configure a MEP for BEB4:

1. Create a maintenance domain at level 5 for PBBN monitoring (here, the maintenance domain is pbbn):

```

[edit protocols oam]
user@beb4# set ethernet connectivity-fault-management maintenance-domain
pbbn level 5

```

2. Configure the continuity check interval for the maintenance association (here, vlan3350). The continuity check protocol is used for fault detection by a MEP. The MEP periodically sends continuity check multicast messages, and receiving MEPs use the CC messages to build a MEP database of all MEPs in the maintenance association.

```

[edit protocols oam]
user@beb4# set ethernet connectivity-fault-management maintenance-domain
pbbn maintenance-association vlan3350 continuity-check interval 1s

```

3. Configure a MEP with the same maintenance association identifier and maintenance domain level (here, vlan3150 and pbbn) and associate them to VLAN 3150 and the pseudo-logical interface cbp0.0.

```

[edit protocols oam]
user@beb4# set ethernet connectivity-fault-management maintenance-domain
pbbn maintenance-association vlan3350 mep 102 interface vlan 3350
user@beb4# set ethernet connectivity-fault-management maintenance-domain
pbbn maintenance-association vlan3350 mep 102 interface cbp0.0

```



NOTE: When you configure PBB, a customer backbone port (cbp) pseudo-logical interface is configured for the B-component of the BEB. This permits multiple customer routing instances to be associated with a single PBBN provider routing instance.

4. Configure the direction in which CFM packets are transmitted for the MEP. Direction up CCMs are transmitted out of every logical interface that is part of the same bridge (here, direction is specified as up).

```

[edit protocols oam]

```

```
user@beb4# set ethernet connectivity-fault-management maintenance-domain
pbbn maintenance-association vlan3350 mep 102 direction up
```

5. Configure automatic discovery to enable the MEP to accept continuity check messages from all remote MEPs of the same maintenance association.

```
[edit protocols oam]
user@beb4# set protocols oam ethernet connectivity-fault-management
maintenance-domain pbbn maintenance-association vlan3350 mep 102 auto-discovery
```

6. Configure the continuity check interval for the maintenance association (here, vlan3150). The continuity check protocol is used for fault detection by a MEP. The MEP periodically sends continuity check multicast messages, and receiving MEPs use the CC messages to build a MEP database of all MEPs in the maintenance association.

```
[edit protocols oam]
user@beb4# set ethernet connectivity-fault-management maintenance-domain
pbbn maintenance-association vlan3150 continuity-check interval 1s
```

7. Configure a MEP with the same maintenance association identifier and maintenance domain level (here, vlan3150 and pbbn).

```
[edit protocols oam]
user@beb4# set ethernet connectivity-fault-management maintenance-domain
pbbn maintenance-association vlan3150 mep 102 interface vlan 3150
```

8. Configure the direction in which CFM packets are transmitted for the MEP. Direction up CCMs are transmitted out of every logical interface that is part of the same bridge (here, direction is specified as up).

```
[edit protocols oam]
user@beb4# set ethernet connectivity-fault-management maintenance-domain
pbbn maintenance-association vlan3150 mep 102 direction up
```

9. Configure automatic discovery to enable the MEP to accept continuity check messages from all remote MEPs of the same maintenance association.

```
[edit protocols oam]
user@beb4# set ethernet connectivity-fault-management maintenance-domain
pbbn maintenance-association vlan3150 mep 102 auto-discovery
```

Results Check the results of the configuration:

```
user@beb4> show configuration
protocols {
  oam {
    ethernet {
      connectivity-fault-management {
        maintenance-domain pbbn {
          level 5;
```

```
maintenance-association vlan3350 {  
    continuity-check {  
        interval 1s;  
    }  
    mep 102 {  
        interface cbp0.0 vlan 3350;  
        direction up;  
        auto-discovery;  
    }  
}  
  
maintenance-association vlan3150 {  
    continuity-check {  
        interval 1s;  
    }  
    mep 102 {  
        interface cbp0.0 vlan 3150;  
        direction up;  
        auto-discovery;  
    }  
}  
  
}  
  
}  
  
}
```

Configuring a MIP on BCB1 (Syrah)

CLI Quick Configuration To quickly configure a MIP for BCB1, copy the following commands and paste them into the router terminal window:

```
[edit]
set protocols oam ethernet connectivity-fault-management maintenance-domain
default-5 virtual-switch pbbn-1 bridge-domain eline-bvlan vlan-id 3150
set protocols oam ethernet connectivity-fault-management maintenance-domain
default-5 mip-half-function default
```

Step-by-Step Procedure

To configure a MIP for BCB1:

1. Configure a maintenance domain **default-5** and the bridge domain **eline-bvlan** and associate them to VLAN ID **3150**.

```
[edit protocols oam]
user@bcb1# set ethernet connectivity-fault-management maintenance-domain
default-5 virtual-switch pbbn-1 bridge-domain eline-bvlan vlan-id 3150
```

- Specify the OAM Ethernet CFM maintenance domain MIP half functions (here, the MIP half function is **default**):

```
[edit protocols oam]
user@bcb1# ethernet connectivity-fault-management maintenance-domain
default-5 mip-half-function default
```




NOTE: Whenever a MIP is configured and a bridge domain is mapped to multiple maintenance domains (MDs) or maintenance associations (MAs), it is essential that the `mip-half-function` value for all MDs and MAs be the same.

Results Check the results of the configuration:

```
user@bcb1> show configuration
protocols {
  oam {
    ethernet {
      maintenance-domain default-5 {
        virtual-switch pbbn-1 bridge-domain{
        }
        mip-half-function default;
      }
    }
  }
}
```

Configuring a MIP on BCB2 (Cabernet)

CLI Quick Configuration To quickly configure a MIP for BCB2, copy the following commands and paste them into the router terminal window:

```
[edit]
set protocols oam ethernet connectivity-fault-management maintenance-domain
default-5 virtual-switch pbbn-1 bridge-domain eline-bvlan vlan-id 3150
set protocols oam ethernet connectivity-fault-management maintenance-domain
default-5 mip-half-function default
```

Step-by-Step Procedure To configure a MIP for BCB2:

1. Configure maintenance domain `default-5` and the bridge domain `eline-bvlan` and associate them to VLAN ID 3150.

```
[edit protocols oam]
user@bcb2# set ethernet connectivity-fault-management maintenance-domain
default-5 virtual-switch pbbn-1 bridge-domain eline-bvlan vlan-id 3150
```

2. Specify the OAM Ethernet CFM maintenance domain MIP half functions (here, the MIP half function is `default`):

```
[edit protocols oam]
user@bcb2# ethernet connectivity-fault-management maintenance-domain
default-5 mip-half-function default
```



NOTE: Whenever a MIP is configured and a bridge domain is mapped to multiple maintenance domains (MDs) or maintenance associations (MAs), it is essential that the `mip-half-function` value for all MDs and MAs be the same.

Results Check the results of the configuration:

```
user@bcb2> show configuration
protocols {
  oam {
    ethernet {
      maintenance-domain default-5 {
        virtual-switch pbbn-1 bridge-domain{
        }
        mip-half-function default;
      }
    }
  }
}
```

Configuring Connectivity Fault Management for a PBN

To configure connectivity fault management on MX Series routers in a PBN, perform these tasks:

- Configuring a MIP on BEB1 (Sangiovese) on page 124
- Configuring a MIP on BEB2 (Barbera) on page 125
- Configuring a MIP on BEB4 (Cubs) on page 126
- Configuring a MEP on ES1 (Pinotnoir) on page 128
- Configuring a MEP on ES4 (Reds) on page 130

Configuring a MIP on BEB1 (Sangiovese)

CLI Quick Configuration To quickly configure a MIP for BEB1, copy the following commands and paste them into the router terminal window:

```
[edit]
set protocols oam ethernet connectivity-fault-management maintenance-domain
default-3 virtual-switch pbn-1-for-eline bridge-domain eline-svlans vlan-id 1200
set protocols oam ethernet connectivity-fault-management maintenance-domain
default-3 virtual-switch pbn-1-for-eline bridge-domain eline-svlans vlan-id 2100
set protocols oam ethernet connectivity-fault-management maintenance-domain
default-3 mip-half-function default
```

Step-by-Step Procedure To configure a MIP for BEB1:

1. To enable CFM at the B-VLAN level, specify the B-VLAN routing instance name, the B-VLAN ID, and the service group (here, the routing instance is **pbn-1-for-eline**, the B-VLAN IDs are **1200** and **2100**, and the service group is **eline-svlans**):

```
[edit protocols oam ethernet connectivity-fault-management]
set maintenance-domain default-3 virtual-switch pbn-1-for-eline
bridge-domain eline-svlans vlan-id 1200
set maintenance-domain default-3 virtual-switch pbn-1-for-eline
bridge-domain eline-svlans vlan-id 2100
```

2. Specify the OAM Ethernet CFM maintenance domain MIP half functions (here, the MIP half function is **default**):

```
[edit protocols oam ethernet connectivity-fault-management]
user@beb1# maintenance-domain default-3 mip-half-function default
```



NOTE: Whenever a MIP is configured and a bridge domain is mapped to multiple maintenance domains (MDs) or maintenance associations (MAs), it is essential that the **mip-half-function** value for all MDs and MAs be the same.

Results Check the results of the configuration:

```
user@beb1> show configuration
protocols {
  oam {
    ethernet {
      connectivity-fault-management {
        maintenance-domain default-3 {
          virtual-switch pbn-1-for-eline {
            bridge-domain eline-svlans vlan-id [ 1200 2100 ];
          }
          mip-half-function default;
        }
      }
    }
  }
}
```

Configuring a MIP on BEB2 (Barbera)

CLI Quick Configuration To quickly configure a MIP for BEB2, copy the following commands and paste them into the router terminal window:

```
[edit]
set protocols oam ethernet connectivity-fault-management maintenance-domain
default-3 virtual-switch pbn-1-for-eline bridge-domain eline-svlans vlan-id 1200
```

```
set protocols oam ethernet connectivity-fault-management maintenance-domain
default-3 virtual-switch pbn-1-for-eline bridge-domain eline-svlans vlan-id 2100
set protocols oam ethernet connectivity-fault-management maintenance-domain
default-3 mip-half-function default
```

Step-by-Step Procedure To configure a MIP for BEB2:

1. Create a MIP for the PBN (here, at level default-3):

```
[edit protocols oam ]
set ethernet connectivity-fault-management maintenance-domain default-3
virtual-switch pbn-1-for-eline bridge-domain eline-svlans vlan-id 1200
set maintenance-domain default-3 virtual-switch pbn-1-for-eline
bridge-domain eline-svlans vlan-id 2100
```

2. Specify the OAM Ethernet CFM maintenance domain MIP half functions (here, the MIP half function is default):

```
[edit protocols oam ]
user@beb2# ethernet connectivity-fault-management maintenance-domain
default-3 mip-half-function default
```



NOTE: Whenever a MIP is configured and a bridge domain is mapped to multiple MDs or MAs, it is essential that the `mip-half-function` value for all MDs and MAs be the same.

Results Check the results of the configuration:

```
user@beb2> show configuration
protocols {
  oam {
    ethernet {
      connectivity-fault-management {
        maintenance-domain default-3 {
          virtual-switch pbn-1-for-eline {
            bridge-domain eline-svlans vlan-id [ 1200 2100 ];
          }
        }
        mip-half-function default;
      }
    }
  }
}
```

Configuring a MIP on BEB4 (Cubs)

CLI Quick Configuration To quickly configure a MIP for BEB4, copy the following commands and paste them into the router terminal window:

```
[edit]
set protocols oam ethernet connectivity-fault-management maintenance-domain
default-3 virtual-switch pbn-3-for-eline bridge-domain eline-svlans vlan-id 1200
set protocols oam ethernet connectivity-fault-management maintenance-domain
default-3 virtual-switch pbn-3-for-eline bridge-domain eline-svlans vlan-id 2100
set protocols oam ethernet connectivity-fault-management maintenance-domain
default-3 mip-half-function default
```

Step-by-Step Procedure To configure a MIP for BEB4:

1. To enable CFM at the B-VLAN level, specify the B-VLAN routing instance name, the B-VLAN ID, and the service group (here, the routing instance is `pbn-3-for-eline` the B-VLAN IDs are 1200 and 2100, and the service group is `eline-svlans`):

```
[edit protocols oam]
set ethernet connectivity-fault-management maintenance-domain default-3
virtual-switch pbn-3-for-eline bridge-domain eline-svlans vlan-id 1200
set ethernet connectivity-fault-management maintenance-domain default-3
virtual-switch pbn-3-for-eline bridge-domain eline-svlans vlan-id 2100
```

2. Specify the OAM Ethernet CFM maintenance domain MIP half functions (here, the MIP half function is `default`):

```
[edit protocols oam ]
user@beb4# ethernet connectivity-fault-management maintenance-domain
default-3 mip-half-function default
```



NOTE: Whenever a MIP is configured and a bridge domain is mapped to multiple maintenance domains (MDs) or maintenance associations (MAs), it is essential that the `mip-half-function` value for all MDs and MAs be the same.

Results Check the results of the configuration:

```
user@beb4> show configuration
protocols {
  oam {
    ethernet {
      connectivity-fault-management {
        maintenance-domain default-3 {
          virtual-switch pbn-3-for-eline {
            bridge-domain eline-svlans vlan-id [ 1200 2100 ];
          }
          mip-half-function default;
        }
      }
    }
  }
}
```

Configuring a MEP on ES1 (Pinotnoir)

CLI Quick Configuration To quickly configure a MEP for ES1, copy the following commands and paste them into the router terminal window:

```
[edit]
set protocols oam ethernet ethernet connectivity-fault-management
maintenance-domain es-domain level 3
set protocols oam ethernet connectivity-fault-management maintenance-domain
es-domain maintenance-association eline-1 continuity-check interval 1s
set protocols oam ethernet connectivity-fault-management maintenance-domain
es-domain maintenance-association eline-1 mep 1 interface ge-1/1/0.0
set protocols oam ethernet connectivity-fault-management maintenance-domain
es-domain maintenance-association eline-1 mep 1 interface vlan 500
set protocols oam ethernet connectivity-fault-management maintenance-domain
es-domain maintenance-association eline-1 mep 1 direction up
set protocols oam ethernet connectivity-fault-management maintenance-domain
es-domain maintenance-association eline-1 mep 1 auto-discovery
set protocols oam ethernet connectivity-fault-management maintenance-domain
es-domain maintenance-association eline-2 continuity-check interval 1s
set protocols oam ethernet connectivity-fault-management maintenance-domain
es-domain maintenance-association eline-2 mep 1 interface ge-1/1/0.0
set protocols oam ethernet connectivity-fault-management maintenance-domain
es-domain maintenance-association eline-2 mep 1 interface vlan 600
set protocols oam ethernet connectivity-fault-management maintenance-domain
es-domain maintenance-association eline-2 mep 1 direction up
set protocols oam ethernet connectivity-fault-management maintenance-domain
es-domain maintenance-association eline-2 mep 1 auto-discovery
```

Step-by-Step Procedure To configure a MEP for ES1:

1. Configure the maintenance domain `es-domain`, a mandatory parameter that indicates the nesting relationship between various maintenance domains and is embedded in each of the CFM frames:

```
[edit protocols oam]
user@es1# set protocols oam ethernet ethernet connectivity-fault-management
maintenance-domain es-domain level 3
```

2. Configure the continuity check interval for the maintenance association (here, `vlan3350`). The continuity check protocol is used for fault detection by a MEP. The MEP periodically sends continuity check multicast messages, and receiving MEPs use the CC messages to build a MEP database of all MEPs in the maintenance association.

```
[edit protocols oam]
user@es1# set ethernet connectivity-fault-management maintenance-domain
es-domain maintenance-association eline-1 continuity-check interval 1s
```

3. Configure a MEP with the same maintenance domain and maintenance association identifier (here, `es-domain` and `eline-1`) and associate them to VLAN 500 and the pseudo-logical interface `ge-1/1/0.0`.

```
[edit protocols oam]
```

```

user@es1# set ethernet connectivity-fault-management maintenance-domain
es-domain maintenance-association eline-1 mep 1 interface ge-1/1/0.0
user@es1# set ethernet connectivity-fault-management maintenance-domain
es-domain maintenance-association eline-1 mep 1 interface vlan 500

```

4. Configure the direction in which CFM packets are transmitted for the MEP. Direction up CCMs are transmitted out of every logical interface that is part of the same bridge (here, direction is specified as up).

```

[edit protocols oam]
user@es1# set ethernet connectivity-fault-management maintenance-domain
es-domain maintenance-association eline-1 mep 1 direction up

```

5. Configure automatic discovery to enable the MEP to accept continuity check messages from all remote MEPs of the same maintenance association.

```

[edit protocols oam]
user@es1# set ethernet connectivity-fault-management maintenance-domain
pbbn maintenance-association eline-1 mep 1 auto-discovery

```

6. Configure the continuity check interval for the maintenance association (here, vlan3150). The continuity check protocol is used for fault detection by a MEP. The MEP periodically sends continuity check multicast messages, and receiving MEPs use the CC messages to build a MEP database of all MEPs in the maintenance association.

```

[edit protocols oam]
user@es1# set ethernet connectivity-fault-management maintenance-domain
es-domain maintenance-association eline-2 continuity-check interval 1s

```

7. Configure a MEP with the same maintenance domain and maintenance association identifier (here, es-domain and eline-2) and associate them to VLAN 500 and the pseudo-logical interface ge-1/0/3.6.

```

[edit protocols oam]
user@es1# set ethernet connectivity-fault-management maintenance-domain
es-domain maintenance-association eline-2 mep 1 interface ge-1/1/0.0
user@es4# set ethernet connectivity-fault-management maintenance-domain
es-domain maintenance-association eline-2 mep 1 interface vlan 600

```

8. Configure the direction in which CFM packets are transmitted for the MEP. Direction up CCMs are transmitted out of every logical interface that is part of the same bridge (here, direction is specified as up).

```

[edit protocols oam]
user@es4# set ethernet connectivity-fault-management maintenance-domain
es-domain maintenance-association eline-2 mep 1 direction up

```

9. Configure automatic discovery to enable the MEP to accept continuity check messages from all remote MEPs of the same maintenance association.

```

[edit protocols oam]

```

```
user@es4# set ethernet connectivity-fault-management maintenance-domain
es-domain maintenance-association eline-2 mep 1 auto-discovery
```

Results Check the results of the configuration:

```
user@es1> show configuration
protocols {
  oam {
    ethernet {
      connectivity-fault-management {
        maintenance-domain es-domain {
          level 3;
          maintenance-association eline-1 {
            continuity-check {
              interval 1s;
            }
            mep 1 {
              interface ge-1/1/0.0 vlan 500;
              direction up;
              auto-discovery;
            }
          }
          maintenance-association eline-2 {
            continuity-check {
              interval 1s;
            }
            mep 1 {
              interface ge-1/1/0.0 vlan 600;
              direction up;
              auto-discovery;
            }
          }
        }
      }
    }
  }
}
```

Configuring a MEP on ES4 (Reds)

CLI Quick Configuration To quickly configure OAM for ES4, copy the following commands and paste them into the router terminal window:

```
[edit]
set protocols oam ethernet ethernet connectivity-fault-management
maintenance-domain es-domain level 3
set protocols oam ethernet connectivity-fault-management maintenance-domain
es-domain maintenance-association eline-1 continuity-check interval 1s
set protocols oam ethernet connectivity-fault-management maintenance-domain
es-domain maintenance-association eline-1 mep 2 interface ge-1/0/3.5
set protocols oam ethernet connectivity-fault-management maintenance-domain
es-domain maintenance-association eline-1 mep 2 interface vlan 500
```



```

set protocols oam ethernet connectivity-fault-management maintenance-domain
es-domain maintenance-association eline-1 mep 2 direction up
set protocols oam ethernet connectivity-fault-management maintenance-domain
es-domain maintenance-association eline-1 mep 2 auto-discovery
set protocols oam ethernet connectivity-fault-management maintenance-domain
es-domain maintenance-association eline-2 continuity-check interval 1s
set protocols oam ethernet connectivity-fault-management maintenance-domain
es-domain maintenance-association eline-2 mep 2 interface ge-1/0/3.6
set protocols oam ethernet connectivity-fault-management maintenance-domain
es-domain maintenance-association eline-2 mep 2 interface vlan 600
set protocols oam ethernet connectivity-fault-management maintenance-domain
es-domain maintenance-association eline-2 mep 2 direction up
set protocols oam ethernet connectivity-fault-management maintenance-domain
es-domain maintenance-association eline-2 mep 2 auto-discovery

```

Step-by-Step Procedure To configure a MEP for ES4:

1. Configure the maintenance domain `es-domain`, a mandatory parameter that indicates the nesting relationship between various maintenance domains and is embedded in each of the CFM frames:

```

[edit protocols oam]
user@es4# set ethernet connectivity-fault-management maintenance-domain
es-domain level 3

```

2. Configure the continuity check interval for the maintenance association (here, `vlan3350`). The continuity check protocol is used for fault detection by a MEP. The MEP periodically sends continuity check multicast messages, and receiving MEPs use the CC messages to build a MEP database of all MEPs in the maintenance association.

```

[edit protocols oam]
user@es4# set ethernet connectivity-fault-management maintenance-domain
es-domain maintenance-association eline-1 continuity-check interval 1s

```

3. Configure a MEP with the same maintenance domain and maintenance association identifier (here, `es-domain` and `eline-1`) and associate them to VLAN 500 and the pseudo-logical interface `ge-1/0/3.5`.

```

[edit protocols oam]
user@es4# set ethernet connectivity-fault-management maintenance-domain
es-domain maintenance-association eline-1 mep 2 interface ge-1/0/3.5
user@es4# set ethernet connectivity-fault-management maintenance-domain
es-domain maintenance-association eline-1 mep 2 interface vlan 500

```

4. Configure the direction in which CFM packets are transmitted for the MEP. Direction up CCMs are transmitted out of every logical interface that is part of the same bridge (here, direction is specified as up).

```

[edit protocols oam]
user@es4# ethernet connectivity-fault-management maintenance-domain
es-domain maintenance-association eline-1 mep 2 direction up

```

5. Configure automatic discovery to enable the MEP to accept continuity check messages from all remote MEPs of the same maintenance association.

```
[edit protocols oam]
user@es4# set ethernet connectivity-fault-management maintenance-domain
pbbn maintenance-association eline-1 mep 2 auto-discovery
```

6. Configure the continuity check interval for the maintenance association (here, vlan3150). The continuity check protocol is used for fault detection by a MEP. The MEP periodically sends continuity check multicast messages, and receiving MEPs use the CC messages to build a MEP database of all MEPs in the maintenance association.

```
[edit protocols oam]
user@es4# set ethernet connectivity-fault-management maintenance-domain
es-domain maintenance-association eline-2 continuity-check interval 1s
```

7. Configure a MEP with the same maintenance domain and maintenance association identifier (here, es-domain and eline-2) and associate them to VLAN 500 and the pseudo-logical interface ge-1/0/3.6.

```
[edit protocols oam]
user@es4# set ethernet connectivity-fault-management maintenance-domain
es-domain maintenance-association eline-2 mep 2 interface ge-1/0/3.6
user@es4# set ethernet connectivity-fault-management maintenance-domain
es-domain maintenance-association eline-2 mep 2 interface vlan 600
```

8. Configure the direction in which CFM packets are transmitted for the MEP. Direction up CCMs are transmitted out of every logical interface that is part of the same bridge (here, direction is specified as up).

```
[edit protocols oam]
user@es4# set ethernet connectivity-fault-management maintenance-domain
es-domain maintenance-association eline-2 mep 2 direction up
```

9. Configure automatic discovery to enable the MEP to accept continuity check messages from all remote MEPs of the same maintenance association.

```
[edit protocols oam]
user@es4# set ethernet connectivity-fault-management maintenance-domain
es-domain maintenance-association eline-2 mep 2 auto-discovery
```

Results Check the results of the configuration:

```
user@es4> show configuration
protocols {
  oam {
    ethernet {
      connectivity-fault-management {
        maintenance-domain es-domain {
          level 3;
          maintenance-association eline-1 {
            continuity-check {
              interval 1s;
            }
          }
        }
      }
    }
  }
}
```

```

    }
    mep 2 {
        interface ge-1/0/3.5 vlan 500;
        direction up;
        auto-discovery;
    }
}
maintenance-association eline-2 {
    continuity-check {
        interval 1s;
    }
}
mep 2 {
    interface ge-1/0/3.6 vlan 600;
    direction up;
    auto-discovery;
}
}
}
}
}
}
}
```

Verification

To confirm that the configuration is working properly on each router in the PBBN and PBN:

- Verify that the CC protocol is **UP** for VLAN 3150 and VLAN 3350 (in the PBBN) and VLAN 500 and VLAN 600 (in the PBN). The MEP should be able to discover remote MEPs in each VLAN.
- Verify the path between a pair of MEPs using the Linktrace protocol. The MIPS should respond to linktrace messages.

To confirm that the configuration is working properly, perform these tasks:

- Verifying CFM on VLAN 3150 in the PBBN on page 133
- Verifying CFM for VLAN 3350 in the PBBN on page 138
- Verifying CFM for VLAN 500 in the PBN on page 141
- Verifying CFM for VLAN 600 in the PBN on page 145

Verifying CFM on VLAN 3150 in the PBBN

Purpose Verify the CFM configuration on the following routers that are participating in VLAN-3150 using the maintenance domain **pbbn** and the maintenance association **vlan3150** level-5 for OAM monitoring:

- BEB1 (Sangiovese) MEP-100
- BEB2 (Barbera) MEP-101
- BEB4 (Cubs) MEP-102

- BCB1 (Syrah) MIP
- BCB2 (Cabernet) MIP

Action For BEB1:

Use the following operational mode command on BEB1 to verify the connectivity of the MEP to the remote MEPs (the remote MEPs are displayed at the bottom of the output):

```
user@beb1> show oam ethernet connectivity-fault-management mep-database maintenance-domain
pbbn maintenance-association vlan3150
```

```
Interface name: cbp0.0, vlan 3150, Interface status: Active, Link status: Up
```

```
Maintenance domain name: pbbn, Format: string, Level: 5
```

```
Maintenance association name: vlan3150, Format: string
```

```
Continuity-check status: enabled, Interval: 1s, Loss-threshold: 3 frames
```

```
Interface status TLV: none, Port status TLV: none
```

```
MEP identifier: 100, Direction: up, MAC address: 00:21:59:aa:78:11
```

```
MEP status: running
```

```
Defects:
```

```
Remote MEP not receiving CCM                : no
Erroneous CCM received                      : no
Cross-connect CCM received                  : no
RDI sent by some MEP                       : no
Some remote MEP's MAC in error state        : no
```

```
Statistics:
```

```
CCMs sent                                   : 14670
CCMs received out of sequence              : 0
LBMs sent                                  : 0
Valid in-order LBRs received               : 0
Valid out-of-order LBRs received           : 0
LBRs received with corrupted data          : 0
LBRs sent                                  : 0
LTMs sent                                  : 5
LTMs received                              : 0
LTRs sent                                  : 0
LTRs received                              : 10
Sequence number of next LTM request        : 5
1DMs sent                                   : 0
Valid 1DMs received                        : 0
Invalid 1DMs received                      : 0
Out of sync 1DMs received                  : 0
DMMs sent                                   : 0
Valid DMMs received                        : 0
Invalid DMMs received                      : 0
DMRs sent                                   : 0
Valid DMRs received                        : 0
Invalid DMRs received                      : 0
```

```
Remote MEP count: 2
```

Identifier	MAC address	State	Interface
101	00:22:83:32:d8:11	ok	ge-1/3/9.0
102	00:1f:12:b8:38:11	ok	ge-1/3/9.0

Perform a linktrace to each remote MEP to display the path from the source MEP to the remote MEP:

```
user@beb1> traceroute ethernet maintenance-domain pbbn maintenance-association vlan3150
00:22:83:32:d8:11
```

```
Linktrace to 00:22:83:32:d8:11, Interface : ge-1/3/9.0
```

```

Maintenance Domain: pbbn, Level: 5
Maintenance Association: vlan3150, Local Mep: 100
Transaction Identifier: 5
Hop   TTL   Source MAC address      Next-hop MAC address
.
1     62    00:21:59:aa:74:8d      00:21:59:aa:74:84
2     61    00:22:83:32:d8:11      00:00:00:00:00:00

```

```

user@beb1> traceroute ethernet maintenance-domain pbbn maintenance-association vlan3150
00:21:59:aa:74:8d

```

```

Linktrace to 00:1f:12:b8:38:11, Interface : ge-1/3/9.0
Maintenance Domain: pbbn, Level: 5
Maintenance Association: vlan3150, Local Mep: 100
Transaction Identifier: 6
Hop   TTL   Source MAC address      Next-hop MAC address
.
1     62    00:21:59:aa:74:8d      00:21:59:aa:75:d4
2     61    00:1f:12:b8:38:11      00:00:00:00:00:00

```

For BEB2:

Use the following operational mode command on BEB2 to verify the connectivity of the MEP to the remote MEPs (the remote MEPs are displayed at the bottom of the output):

```

user@beb2> show oam ethernet connectivity-fault-management mep-database maintenance-domain
pbbn maintenance-association vlan3150

```

```

Interface name: cbp0.0, vlan 3150, Interface status: Active, Link status: Up
Maintenance domain name: pbbn, Format: string, Level: 5
Maintenance association name: vlan3150, Format: string
Continuity-check status: enabled, Interval: 1s, Loss-threshold: 3 frames
Interface status TLV: none, Port status TLV: none
MEP identifier: 101, Direction: up, MAC address: 00:22:83:32:d8:11
MEP status: running
Defects:
  Remote MEP not receiving CCM                : no
  Erroneous CCM received                      : no
  Cross-connect CCM received                  : no
  RDI sent by some MEP                       : no
  Some remote MEP's MAC in error state        : no
Statistics:
  CCMs sent                                  : 6021
  CCMs received out of sequence              : 0
  LBMs sent                                  : 0
  Valid in-order LBRs received               : 0
  Valid out-of-order LBRs received          : 0
  LBRs received with corrupted data          : 0
  LBRs sent                                  : 0
  LTMs sent                                  : 1
  LTMs received                             : 4
  LTRs sent                                  : 4
  LTRs received                             : 2
  Sequence number of next LTM request        : 1
  1DMs sent                                  : 0
  Valid 1DMs received                       : 0
  Invalid 1DMs received                     : 0
  Out of sync 1DMs received                 : 0
  DMMs sent                                  : 0

```

```

Valid DMMs received           : 0
Invalid DMMs received         : 0
DMRs sent                     : 0
Valid DMRs received           : 0
Invalid DMRs received         : 0
Remote MEP count: 2
Identifier   MAC address      State   Interface
100         00:21:59:aa:78:11  ok     ge-1/3/0.0
102         00:1f:12:b8:38:11  ok     ge-1/3/0.0

```

Perform a linktrace to each remote MEP to display the path from the source MEP to the remote MEP:

```

user@beb2> traceroute ethernet maintenance-domain pbbn maintenance-association vlan3150 00:21:59:aa:78:11

```

```

Linktrace to 00:21:59:aa:78:11, Interface : ge-1/3/0.0
Maintenance Domain: pbbn, Level: 5
Maintenance Association: vlan3150, Local Mep: 101
Transaction Identifier: 1
Hop   TTL   Source MAC address      Next-hop MAC address
.
1     62    00:21:59:aa:74:84       00:21:59:aa:74:8d
2     61    00:21:59:aa:78:11       00:00:00:00:00:00

```

```

user@beb2> traceroute ethernet maintenance-domain pbbn maintenance-association vlan3150 00:1f:12:b8:38:11

```

```

Linktrace to 00:1f:12:b8:38:11, Interface : ge-1/3/0.0
Maintenance Domain: pbbn, Level: 5
Maintenance Association: vlan3150, Local Mep: 101
Transaction Identifier: 2
Hop   TTL   Source MAC address      Next-hop MAC address
.
1     62    00:21:59:aa:74:84       00:21:59:aa:75:d4
2     61    00:1f:12:b8:38:11       00:00:00:00:00:00

```

For BEB4:

Use the following operational mode command on BEB4 to verify the connectivity of the MEP to the remote MEPs (the remote MEPs are displayed at the bottom of the output):

```

user@beb4> show oam ethernet connectivity-fault-management mep-database maintenance-domain pbbn maintenance-association vlan3150

```

```

Interface name: cbp0.0, vlan 3150, Interface status: Active, Link status: Up
Maintenance domain name: pbbn, Format: string, Level: 5
Maintenance association name: vlan3150, Format: string
Continuity-check status: enabled, Interval: 1s, Loss-threshold: 3 frames
Interface status TLV: none, Port status TLV: none
MEP identifier: 102, Direction: up, MAC address: 00:1f:12:b8:38:11
MEP status: running
Defects:
Remote MEP not receiving CCM           : no
Erroneous CCM received                 : no
Cross-connect CCM received              : no
RDI sent by some MEP                   : no
Some remote MEP's MAC in error state   : no
Statistics:
CCMs sent                             : 7507
CCMs received out of sequence          : 0
LBMs sent                             : 0

```

```

Valid in-order LBRs received           : 0
Valid out-of-order LBRs received       : 0
LBRs received with corrupted data      : 0
LBRs sent                             : 0
LTMs sent                             : 1
LTMs received                         : 6
LTRs sent                             : 6
LTRs received                         : 2
Sequence number of next LTM request    : 1
1DMs sent                             : 0
Valid 1DMs received                   : 0
Invalid 1DMs received                  : 0
Out of sync 1DMs received              : 0
DMMs sent                             : 0
Valid DMMs received                   : 0
Invalid DMMs received                  : 0
DMRs sent                             : 0
Valid DMRs received                   : 0
Invalid DMRs received                  : 0
Remote MEP count: 2
Identifier   MAC address      State   Interface
100         00:21:59:aa:78:11  ok     ge-1/0/4.0
101         00:22:83:32:d8:11  ok     ge-1/0/4.0

```

Perform a linktrace to each remote MEP to display the path from the source MEP to the remote MEP:

```

user@beb4> traceroute ethernet maintenance-domain pbbn maintenance-association vlan3150
00:21:59:aa:78:11
Linktrace to 00:21:59:aa:78:11, Interface : ge-1/0/4.0
Maintenance Domain: pbbn, Level: 5
Maintenance Association: vlan3150, Local Mep: 102
Transaction Identifier: 1
Hop  TTL    Source MAC address      Next-hop MAC address
.
1    62     00:21:59:aa:75:d4         00:21:59:aa:74:8d
2    61     00:21:59:aa:78:11         00:00:00:00:00:00

```

```

user@beb4> traceroute ethernet maintenance-domain pbbn maintenance-association vlan3150
00:22:83:32:d8:11
Linktrace to 00:22:83:32:d8:11, Interface : ge-1/0/4.0
Maintenance Domain: pbbn, Level: 5
Maintenance Association: vlan3150, Local Mep: 102
Transaction Identifier: 2
Hop  TTL    Source MAC address      Next-hop MAC address
.
1    62     00:21:59:aa:75:d4         00:21:59:aa:74:8d
2    61     00:22:83:32:d8:11         00:00:00:00:00:00

```

For BCB1:

Use the following operational mode command on BCB1 to verify the MIP status:

```

user@bcb1> show oam ethernet connectivity-fault-management mip
MIP information for instance pbbn-1 eline-bvlan-vlan-3150
maintenance-domain mhf           : unspecified
maintenance-association mhf       : unspecified
default maintenance-domain mhf    : default

Interface      Level
ge-2/1/5.0     5

```

```

ge-2/3/0.0      5
ge-2/3/9.0      5
ge-1/3/0.0      5
ge-1/3/9.0      5

```

For BCB2:

Use the following operational mode command on BCB1 to verify the MIP status:

```

user@bcb2> show oam ethernet connectivity-fault-management mip
MIP information for instance pbbn-1 eline-bvlan-vlan-3150
  maintenance-domain mhf      : unspecified
  maintenance-association mhf  : unspecified
  default maintenance-domain mhf : default

Interface      Level
ge-2/0/6.0     5
ge-1/3/0.0     5
ge-1/3/9.0     5
ge-2/3/0.0     5
ge-2/3/9.0     5

```

Meaning The command `show oam ethernet connectivity-fault-management interfaces mep-database` displays the CFM connectivity status per service. When used with the maintenance association `vlan3150`, it displays the source MAC addresses for the Remote MEPs at the bottom of the output. Use the MAC addresses shown in the Remote MEPs section along with the maintenance association to issue the `traceroute ethernet` command. This command triggers the linktrace protocol to trace the route between two maintenance points. The operational mode command `show oam ethernet connectivity-fault-management mip` displays all the MIPs created in the system.

Verifying CFM for VLAN 3350 in the PBBN

Purpose Verify the CFM configuration on the following routers that are participating in VLAN 3350 using the maintenance domain `pbbn` and the maintenance association `vlan3350` level-5 for OAM monitoring:

- BEB1 (Sangiovese) MEP-100
- BEB4 (Cubs) MEP-102
- BCB1 (Syrah) MIP
- BCB2 (Cabernet) MIP

Action For BEB1:

Use the following operational mode command on BEB1 to verify the connectivity of the MEP to the remote MEPs (the remote MEPs are displayed at the bottom of the output):

```

user@beb1> show oam ethernet connectivity-fault-management mep-database maintenance-domain
pbbn maintenance-association vlan3350
Interface name: cbp0.0, vlan 3350, Interface status: Active, Link status: Up
Maintenance domain name: pbbn, Format: string, Level: 5

```



```

Maintenance association name: vlan3350, Format: string
Continuity-check status: enabled, Interval: 1s, Loss-threshold: 3 frames
Interface status TLV: none, Port status TLV: none
MEP identifier: 100, Direction: up, MAC address: 00:21:59:aa:78:11
MEP status: running
Defects:
  Remote MEP not receiving CCM                : no
  Erroneous CCM received                      : no
  Cross-connect CCM received                  : no
  RDI sent by some MEP                       : no
  Some remote MEP's MAC in error state        : no
Statistics:
  CCMs sent                                  : 14666
  CCMs received out of sequence              : 0
  LBMs sent                                  : 0
  Valid in-order LBRs received               : 0
  Valid out-of-order LBRs received           : 0
  LBRs received with corrupted data          : 0
  LBRs sent                                  : 0
  LTMs sent                                  : 2
  LTMs received                              : 0
  LTRs sent                                  : 0
  LTRs received                              : 2
  Sequence number of next LTM request        : 2
  1DMs sent                                  : 0
  Valid 1DMs received                       : 0
  Invalid 1DMs received                     : 0
  Out of sync 1DMs received                 : 0
  DMMs sent                                  : 0
  Valid DMMs received                      : 0
  Invalid DMMs received                    : 0
  DMRs sent                                  : 0
  Valid DMRs received                      : 0
  Invalid DMRs received                    : 0
Remote MEP count: 1
  Identifier  MAC address  State  Interface
    102      00:1f:12:b8:38:11  ok    ge-1/3/9.0

```

Perform a linktrace to each remote MEP to display the path from the source MEP to the remote MEP:

```

user@beb1> traceroute ethernet maintenance-domain pbbn maintenance-association vlan3350
00:1f:12:b8:38:11
Linktrace to 00:1f:12:b8:38:11, Interface : ge-1/3/9.0
  Maintenance Domain: pbbn, Level: 5
  Maintenance Association: vlan3350, Local Mep: 100
  Transaction Identifier: 2
Hop  TTL  Source MAC address  Next-hop MAC address
.
1    62    00:1f:12:b8:38:11    00:00:00:00:00:00

```

For BEB4:

Use the following operational mode command on BEB4 to verify the connectivity of the MEP to the remote MEPs (the remote MEPs are displayed at the bottom of the output):

```
user@beb4> show oam ethernet connectivity-fault-management mep-database maintenance-domain
pbbn maintenance-association vlan3350
```

```
Interface name: cbp0.0, vlan 3350, Interface status: Active, Link status: Up
Maintenance domain name: pbbn, Format: string, Level: 5
Maintenance association name: vlan3350, Format: string
Continuity-check status: enabled, Interval: 1s, Loss-threshold: 3 frames
Interface status TLV: none, Port status TLV: none
MEP identifier: 102, Direction: up, MAC address: 00:1f:12:b8:38:11
MEP status: running
Defects:
  Remote MEP not receiving CCM                : no
  Erroneous CCM received                      : no
  Cross-connect CCM received                  : no
  RDI sent by some MEP                       : no
  Some remote MEP's MAC in error state        : no
Statistics:
  CCMs sent                                  : 7507
  CCMs received out of sequence               : 0
  LBMs sent                                  : 0
  Valid in-order LBRs received                : 0
  Valid out-of-order LBRs received            : 0
  LBRs received with corrupted data           : 0
  LBRs sent                                   : 0
  LTMs sent                                  : 0
  LTMs received                              : 3
  LTRs sent                                  : 3
  LTRs received                              : 0
  Sequence number of next LTM request          : 0
  1DMs sent                                   : 0
  Valid 1DMs received                         : 0
  Invalid 1DMs received                       : 0
  Out of sync 1DMs received                   : 0
  DMMs sent                                   : 0
  Valid DMMs received                        : 0
  Invalid DMMs received                      : 0
  DMRs sent                                   : 0
  Valid DMRs received                        : 0
  Invalid DMRs received                      : 0
Remote MEP count: 1
  Identifier  MAC address      State  Interface
  100        00:21:59:aa:78:11 ok     ge-1/0/4.0
```

Perform a linktrace to the remote MEP to display the path from the source MEP to the remote MEP:

```
user@beb4> traceroute ethernet maintenance-domain pbbn maintenance-association vlan3350
00:21:59:aa:78:11
Linktrace to 00:21:59:aa:78:11, Interface : ge-1/0/4.0
  Maintenance Domain: pbbn, Level: 5
  Maintenance Association: vlan3350, Local Mep: 102
  Transaction Identifier: 0
Hop  TTL    Source MAC address      Next-hop MAC address
.
1    62     00:21:59:aa:78:11        00:00:00:00:00:00
```

For BCB1:

Use the following operational mode command on BCB1 to verify the MIP status:

```
user@bcb1> show oam ethernet connectivity-fault-management mip
```

```

MIP information for instance pbbn-1 eline-bvlan-vlan-3150
maintenance-domain mhf      : unspecified
maintenance-association mhf  : unspecified
default maintenance-domain mhf : default

```

Interface	Level
ge-2/1/5.0	5
ge-2/3/0.0	5
ge-2/3/9.0	5
ge-1/3/0.0	5
ge-1/3/9.0	5

For BCB2:

Use the following operational mode command on BCB1 to verify the MIP status:

```

user@bcb2> show oam ethernet connectivity-fault-management mip
MIP information for instance pbbn-1 eline-bvlan-vlan-3150
maintenance-domain mhf      : unspecified
maintenance-association mhf  : unspecified
default maintenance-domain mhf : default

```

Interface	Level
ge-2/0/6.0	5
ge-1/3/0.0	5
ge-1/3/9.0	5
ge-2/3/0.0	5
ge-2/3/9.0	5

Meaning The command `show oam ethernet connectivity-fault-management interfaces mep-database` displays the CFM connectivity status per service. When used with the maintenance association `vlan3350`, it displays the source MAC addresses for the Remote MEPs at the bottom of the output. Use the MAC addresses shown in the Remote MEPs section along with the maintenance association to issue the `traceroute ethernet` command. This command triggers the linktrace protocol to trace the route between two maintenance points. The operational mode command `show oam ethernet connectivity-fault-management mip` displays all the MIPs created in the system.

Verifying CFM for VLAN 500 in the PBN

Purpose Verify the CFM configuration on the following routers that are participating in VLAN 500 using the maintenance domain `es-domain` and the maintenance association `eline-1` at level-3 for OAM monitoring:

- ES1 (Pinot Noir) MEP-1
- ES4 (Reds) MEP-2
- BEB1 (Sangiovese) MIP
- BEB2 (Barbera) MIP
- BEB4 (Cubs) MIP

Action For ES1:

Use the following operational mode command on ES1 to verify the connectivity of the MEP to the remote MEPs (the remote MEPs are displayed at the bottom of the output):

```
user@es1> show oam ethernet connectivity-fault-management mep-database maintenance-domain
es-domain maintenance-association eline-1
Interface name: ge-1/1/0.0, vlan 500, Interface status: Active, Link status: Up
Maintenance domain name: es-domain, Format: string, Level: 3
Maintenance association name: eline-1, Format: string
Continuity-check status: enabled, Interval: 1s, Loss-threshold: 3 frames
Interface status TLV: none, Port status TLV: none
MEP identifier: 1, Direction: up, MAC address: 00:21:59:01:e3:3a
MEP status: running
Defects:
  Remote MEP not receiving CCM                : no
  Erroneous CCM received                      : no
  Cross-connect CCM received                  : no
  RDI sent by some MEP                       : no
  Some remote MEP's MAC in error state        : no
Statistics:
  CCMs sent                                  : 29310
  CCMs received out of sequence              : 0
  LBMs sent                                  : 0
  Valid in-order LBRs received                : 0
  Valid out-of-order LBRs received            : 0
  LBRs received with corrupted data           : 0
  LBRs sent                                  : 0
  LTMs sent                                  : 3
  LTMs received                              : 2
  LTRs sent                                  : 2
  LTRs received                              : 9
  Sequence number of next LTM request         : 3
  1DMs sent                                  : 0
  Valid 1DMs received                        : 0
  Invalid 1DMs received                      : 0
  Out of sync 1DMs received                  : 0
  DMMs sent                                  : 0
  Valid DMMs received                       : 0
  Invalid DMMs received                     : 0
  DMRs sent                                  : 0
  Valid DMRs received                       : 0
  Invalid DMRs received                     : 0
Remote MEP count: 1
  Identifier  MAC address  State  Interface
    2        00:1f:12:b8:72:98  ok    ge-2/0/0.1
```

Perform a linktrace to each remote MEP to display the path from the source MEP to the remote MEP:

```
user@es1> traceroute ethernet maintenance-domain pbbn maintenance-association eline-1
mep2
Linktrace to 00:1f:12:b8:72:98, Interface : ge-2/0/0.1
Maintenance Domain: es-domain, Level: 3
Maintenance Association: eline-1, Local Mep: 1
Transaction Identifier: 1
```

Hop	TTL	Source MAC address	Next-hop MAC address
.	.	.	.
1	60	00:1f:12:b8:72:98	00:00:00:00:00:00
2	61	00:1f:12:b8:3f:b0	00:1f:12:b8:3a:95

```
3      62      00:21:59:aa:7d:2a      00:21:59:aa:7f:b0
```

For ES4:

Use the following operational mode command on ES4 to verify the connectivity of the MEP to the remote MEPs (the remote MEPs are displayed at the bottom of the output):

```
user@es4> show oam ethernet connectivity-fault-management mep-database maintenance-domain
es-domain maintenance-association eline-1
Interface name: ge-1/0/3.5, vlan 500, Interface status: Active, Link status: Up
Maintenance domain name: es-domain, Format: string, Level: 3
Maintenance association name: eline-1, Format: string
Continuity-check status: enabled, Interval: 1s, Loss-threshold: 3 frames
Interface status TLV: none, Port status TLV: none
MEP identifier: 2, Direction: up, MAC address: 00:1f:12:b8:72:98
MEP status: running
Defects:
  Remote MEP not receiving CCM                : no
  Erroneous CCM received                      : no
  Cross-connect CCM received                  : no
  RDI sent by some MEP                       : no
  Some remote MEP's MAC in error state        : no
Statistics:
  CCMs sent                                  : 8133
  CCMs received out of sequence              : 0
  LBMs sent                                  : 8
  Valid in-order LBRs received               : 0
  Valid out-of-order LBRs received          : 0
  LBRs received with corrupted data          : 0
  LBRs sent                                  : 0
  LTMs sent                                  : 4
  LTMs received                             : 0
  LTRs sent                                  : 0
  LTRs received                             : 8
  Sequence number of next LTM request        : 4
  1DMs sent                                  : 0
  Valid 1DMs received                       : 0
  Invalid 1DMs received                     : 0
  Out of sync 1DMs received                 : 0
  DMMs sent                                  : 0
  Valid DMMs received                       : 0
  Invalid DMMs received                     : 0
  DMRs sent                                  : 0
  Valid DMRs received                       : 0
  Invalid DMRs received                     : 0
Remote MEP count: 1
  Identifier  MAC address  State  Interface
    1        00:21:59:01:e3:3a  ok    ge-1/0/0.1
```

Perform a linktrace to each remote MEP to display the path from the source MEP to the remote MEP:

```
user@es4> traceroute ethernet maintenance-domain pbbn maintenance-association eline-1
00:21:59:01:e3:3a
Linktrace to 00:21:59:01:e3:3a, Interface : ge-1/0/0.1
Maintenance Domain: es-domain, Level: 3
Maintenance Association: eline-1, Local Mep: 2
```

Transaction Identifier: 4			
Hop	TTL	Source MAC address	Next-hop MAC address
.			
1	62	00:1f:12:b8:3a:95	00:1f:12:b8:3f:b0
2	61	00:22:83:32:df:b0	00:22:83:32:da:95

For BEB1:

Use the following operational mode command on BEB1 to verify the MIP status:

```
user@beb1> show oam ethernet connectivity-fault-management mip
MIP information for instance pbn-1-for-eline eline-svlans-vlan-1200
maintenance-domain mhf      : unspecified
maintenance-association mhf  : unspecified
default maintenance-domain mhf : default

Interface      Level
pip0.0         3
ge-2/0/0.2     3

MIP information for instance pbn-1-for-eline eline-svlans-vlan-2100
maintenance-domain mhf      : unspecified
maintenance-association mhf  : unspecified
default maintenance-domain mhf : default

Interface      Level
pip0.0         3
ge-2/0/0.1     3
```

For BEB2:

Use the following operational mode command on BEB2 to verify the MIP status:

```
user@beb2> show oam ethernet connectivity-fault-management mip
MIP information for instance pbn-1-for-eline eline-svlans-vlan-1200
maintenance-domain mhf      : unspecified
maintenance-association mhf  : unspecified
default maintenance-domain mhf : default

Interface      Level
pip0.0         3
ge-1/0/0.2     3

MIP information for instance pbn-1-for-eline eline-svlans-vlan-2100
maintenance-domain mhf      : unspecified
maintenance-association mhf  : unspecified
default maintenance-domain mhf : default

Interface      Level
pip0.0         3
ge-1/0/0.1     3
```

For BEB4:

Use the following operational mode command on BEB4 to verify the MIP status:

```
user@beb4> show oam ethernet connectivity-fault-management mip
MIP information for instance pbn-3-for-eline eline-svlans-vlan-1200
maintenance-domain mhf      : unspecified
```

```

maintenance-association mhf      : unspecified
default maintenance-domain mhf   : default

```

```

Interface      Level
pip0.0         3
ge-1/0/0.2     3

```

MIP information for instance pbn-3-for-eline eline-svlans-vlan-2100

```

maintenance-domain mhf      : unspecified
maintenance-association mhf  : unspecified
default maintenance-domain mhf : default

```

```

Interface      Level
pip0.0         3
ge-1/0/0.1     3

```

Meaning The command `show oam ethernet connectivity-fault-management interfaces mep-database` displays the CFM connectivity status per service. When used with the maintenance association `eline-1`, it displays the source MAC addresses for the Remote MEPs at the bottom of the output. Use the MAC address shown in the Remote MEPs section along with the maintenance association to issue the `traceroute ethernet` command. This command triggers the linktrace protocol to trace the route between two maintenance points. The operational mode command `show oam ethernet connectivity-fault-management mip` displays all the MIPs created in the system.

Verifying CFM for VLAN 600 in the PBN

Purpose Verify the CFM configuration on the following routers that are participating in VLAN 600 using the maintenance domain `es-domain` and the maintenance association `eline-2` at level-3 for OAM monitoring:

- ES1 (Pinot Noir) MEP-1
- ES4 (Reds) MEP-2
- BEB1 (Sangiovese) MIP
- BEB2 (Barbera) MIP
- BEB4 (Cubs) MIP

Action For ES1:

Use the following operational mode command on ES1 to verify the connectivity of the MEP to the remote MEPs (the remote MEPs are displayed at the bottom of the output):

```

user@es1> show oam ethernet connectivity-fault-management mep-database maintenance-domain
es-domain maintenance-association eline-2
Interface name: ge-1/1/0.0, vlan 600, Interface status: Active, Link status: Up
Maintenance domain name: es-domain, Format: string, Level: 3
Maintenance association name: eline-2, Format: string
Continuity-check status: enabled, Interval: 1s, Loss-threshold: 3 frames
Interface status TLV: none, Port status TLV: none
MEP identifier: 1, Direction: up, MAC address: 00:21:59:01:e3:3a
MEP status: running
Defects:

```

```

Remote MEP not receiving CCM                : no
Erroneous CCM received                      : no
Cross-connect CCM received                  : no
RDI sent by some MEP                       : no
Some remote MEP's MAC in error state        : no
Statistics:
CCMs sent                                  : 29310
CCMs received out of sequence               : 0
LBMs sent                                  : 19
Valid in-order LBRs received                : 1
Valid out-of-order LBRs received            : 0
LBRs received with corrupted data           : 0
LBRs sent                                  : 0
LTMs sent                                  : 2
LTMs received                              : 0
LTRs sent                                  : 0
LTRs received                              : 6
Sequence number of next LTM request         : 2
1DMs sent                                  : 0
Valid 1DMs received                        : 0
Invalid 1DMs received                      : 0
Out of sync 1DMs received                  : 0
DMMs sent                                  : 0
Valid DMMs received                       : 0
Invalid DMMs received                      : 0
DMRs sent                                  : 0
Valid DMRs received                       : 0
Invalid DMRs received                      : 0
Remote MEP count: 1
Identifier  MAC address      State  Interface
   2      00:1f:12:b8:72:98   ok    ge-2/0/0.2

```

Perform a linktrace to each remote MEP to display the path from the source MEP to the remote MEP:

```

user@es1> traceroute ethernet maintenance-domain pbbn maintenance-association eline-2 mep2

```

```

Linktrace to 00:1f:12:b8:72:98, Interface : ge-2/0/0.2
Maintenance Domain: es-domain, Level: 3
Maintenance Association: eline-2, Local Mep: 2
Transaction Identifier: 1
Hop   TTL   Source MAC address      Next-hop MAC address
.
1     60    00:1f:12:b8:72:98      00:00:00:00:00:00
2     61    00:1f:12:b8:3f:b0      00:1f:12:b8:3a:95
3     62    00:21:59:aa:7d:2a      00:21:59:aa:7f:b0

```

For ES4:

Use the following operational mode command on ES4 to verify the connectivity of the MEP to the remote MEPs (the remote MEPs are displayed at the bottom of the output):

```

user@es4> show oam ethernet connectivity-fault-management mep-database maintenance-domain
es-domain maintenance-association eline-2
Interface name: ge-1/0/3.6, vlan 600, Interface status: Active, Link status: Up
Maintenance domain name: es-domain, Format: string, Level: 3
Maintenance association name: eline-2, Format: string

```



```

Continuity-check status: enabled, Interval: 1s, Loss-threshold: 3 frames
Interface status TLV: none, Port status TLV: none
MEP identifier: 2, Direction: up, MAC address: 00:1f:12:b8:72:98
MEP status: running
Defects:
  Remote MEP not receiving CCM                : no
  Erroneous CCM received                      : no
  Cross-connect CCM received                  : no
  RDI sent by some MEP                       : no
  Some remote MEP's MAC in error state        : no
Statistics:
  CCMs sent                                  : 8135
  CCMs received out of sequence              : 0
  LBMs sent                                  : 0
  Valid in-order LBRs received               : 0
  Valid out-of-order LBRs received           : 0
  LBRs received with corrupted data          : 0
  LBRs sent                                  : 0
  LTMs sent                                  : 1
  LTMs received                             : 0
  LTRs sent                                  : 0
  LTRs received                             : 2
  Sequence number of next LTM request        : 1
  1DMs sent                                  : 0
  Valid 1DMs received                       : 0
  Invalid 1DMs received                     : 0
  Out of sync 1DMs received                 : 0
  DMMs sent                                  : 0
  Valid DMMs received                      : 0
  Invalid DMMs received                    : 0
  DMRs sent                                  : 0
  Valid DMRs received                      : 0
  Invalid DMRs received                    : 0
Remote MEP count: 1
  Identifier  MAC address  State  Interface
    1         00:21:59:01:e3:3a    ok    ge-1/0/0.2

```

Perform a linktrace to each remote MEP to display the path from the source MEP to the remote MEP:

```

user@es4> traceroute ethernet maintenance-domain pbbn maintenance-association eline-2
00:21:59:01:e3:3a
Linktrace to 00:21:59:01:e3:3a, Interface : ge-1/0/0.2
  Maintenance Domain: es-domain, Level: 3
  Maintenance Association: eline-2, Local Mep: 2
  Transaction Identifier: 1
Hop  TTL  Source MAC address  Next-hop MAC address
.
1    62    00:1f:12:b8:3a:95    00:1f:12:b8:3f:b0
2    61    00:21:59:aa:7f:b0    00:21:59:aa:7d:2a

```

For BEB1:

Use the following operational mode command on BEB1 to verify the MIP status:

```

user@beb1> show oam ethernet connectivity-fault-management mip
MIP information for instance pbn-1-for-eline eline-svlans-vlan-1200
  maintenance-domain mhf          : unspecified
  maintenance-association mhf      : unspecified

```

```

default maintenance-domain mhf      : default

Interface      Level
pip0.0         3
ge-2/0/0.2     3

MIP information for instance pbn-1-for-eline eline-svlans-vlan-2100
maintenance-domain mhf              : unspecified
maintenance-association mhf         : unspecified
default maintenance-domain mhf      : default

Interface      Level
pip0.0         3
ge-2/0/0.1     3

```

For BEB2:

Use the following operational mode command on BEB2 to verify the MIP status:

```

user@beb2> show oam ethernet connectivity-fault-management mip
MIP information for instance pbn-1-for-eline eline-svlans-vlan-1200
maintenance-domain mhf              : unspecified
maintenance-association mhf         : unspecified
default maintenance-domain mhf      : default

Interface      Level
pip0.0         3
ge-1/0/0.2     3

MIP information for instance pbn-1-for-eline eline-svlans-vlan-2100
maintenance-domain mhf              : unspecified
maintenance-association mhf         : unspecified
default maintenance-domain mhf      : default

Interface      Level
pip0.0         3
ge-1/0/0.1     3

```

For BEB4:

Use the following operational mode command on BEB4 to verify the MIP status:

```

user@beb4> show oam ethernet connectivity-fault-management mip
MIP information for instance pbn-3-for-eline eline-svlans-vlan-1200
maintenance-domain mhf              : unspecified
maintenance-association mhf         : unspecified
default maintenance-domain mhf      : default

Interface      Level
pip0.0         3
ge-1/0/0.2     3

MIP information for instance pbn-3-for-eline eline-svlans-vlan-2100
maintenance-domain mhf              : unspecified
maintenance-association mhf         : unspecified
default maintenance-domain mhf      : default

Interface      Level
pip0.0         3

```

ge-1/0/0.1

3

Meaning The command `show oam ethernet connectivity-fault-management interfaces mep-database` displays the CFM connectivity status per service. When used with the maintenance association `eline-2`, it displays the source MAC addresses for the **Remote MEPs** at the bottom of the output. Use the MAC address shown in the **Remote MEPs** section along with the maintenance association to issue the `traceroute ethernet` command. This command triggers the linktrace protocol to trace the route between two maintenance points. The operational mode command `show oam ethernet connectivity-fault-management mip` displays all the MIPs created in the system.

- Related Topics**
- Understanding Fault Isolation and Detection in a PBB using Connectivity Fault Management for MX Series Routers on page 13
 - Understanding Provider Backbone Bridging on MX Series Routers on page 3
 - Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX series Routers on page 17
 - Example: Configuring CoS for a PBB Network on MX Series Routers on page 84

Chapter 5

PBB Configuration Statements

bridge-domains

Syntax

```
bridge-domains {
  bridge-domain-name {
    bridge-options {
      ...bridge-options-configuration...
    }
    domain-type bridge;
    interface interface-name;
    routing-interface routing-interface-name;
    vlan-id (all | none | number);
    vlan-id-list [ vlan-id-numbers ];
    vlan-tags outer number inner number;
    bridge-options {
      interface interface-name {
        static-mac mac-address;
      }
      interface-mac-limit limit;
      mac-statistics;
      mac-table-size limit;
      no-mac-learning;
    }
  }
}
```

Hierarchy Level [edit],
[edit logical-systems *logical-system-name* routing-instances *routing-instance-name*],
[edit routing-instances *routing-instance-name*]

Release Information Statement introduced in JUNOS Release 8.4.
Support for logical systems added in JUNOS Release 9.6.

Description (MX Series routers only) Configure a domain that includes a set of logical ports that share the same flooding or broadcast characteristics in order to perform Layer 2 bridging.

Options *bridge-domain-name*—Name of the bridge domain.

The remaining statements are explained separately.

Usage Guidelines See Configuring Bridge Domains, Configuring Layer 2 Virtual Switches, Configuring Layer 2 Virtual Switches, and “Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX series Routers” on page 17.

Required Privilege Level routing—To view this statement in the configuration.
routing-control—To add this statement to the configuration.

Related Topics instance-type

bridge-domain-type

Syntax	bridge-domain-type [bvlan svlan];
Hierarchy Level	[edit interfaces <i>pseudo-logical-interface-name</i> unit <i>logical-unit-number</i> family bridge
Release Information	Statement introduced in JUNOS Release 10.0.
Description	For IEEE 802.1ah Provider Backbone Bridge (PBB) configurations, configure the bridge domain type for the routing instance.
Options	<p>bvlan—The backbone VLAN (B-VLAN) for the provider routing instance configured in the B-component.</p> <p>svlan —The service VLAN (S-VLAN) for the customer routing instance configured in the I-component.</p>
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
Related Topics	<ul style="list-style-type: none"> ■ Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX series Routers on page 17

default-bvlan

Syntax	default-bvlan
Hierarchy Level	[edit routing-instances <i>instance-name</i> pbb-options]
Release Information	Statement introduced in JUNOS Release 10.0.
Description	For IEEE 802.1ah PBB configuration, specify the default B-VLAN for all unmapped service identifiers (I-SIDs).
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
Related Topics	<ul style="list-style-type: none"> ■ Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX series Routers on page 17

default-isid

Syntax	<code>default-isid <i>isid-number</i>;</code>
Hierarchy Level	[edit routing-instances <i>routing-instance-name</i> service-groups <i>service-group-name</i> pbb-service-options]
Release Information	Statement introduced in JUNOS Release 10.0.
Description	For IEEE 802.1ah provider backbone bridge (PBB) configurations, configure the default service identifier (I-SID) for all unmapped service VLANs (S-VLANs) for the customer routing instance (I-component) service group.
Options	<i>default-isid</i> — Default service identifier. Enter an I-SID in the range from 256 through 16777214.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Topics	■ Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX series Routers on page 17

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 (Logical Interfaces) {
    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 (Interface in Bridge Domain) [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 routers 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 routers only) Virtual private LAN service

The remaining statements are explained separately.

Usage Guidelines See Configuring the Protocol Family, “Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX series Routers” on page 17, 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.

isid

Syntax	<code>isid isid-number vlan-id-list [vlan-ids];</code>
Hierarchy Level	<code>[edit routing-instances routing-instance-name service-groups service-group-name pbb-service-options]</code>
Release Information	Statement introduced in JUNOS Release 10.0.
Description	For IEEE 802.1ah provider backbone bridge (PBB) configurations, configure the service identifier (I-SID) for the customer routing instance (I-component) service group.
Options	<p><i>isid</i>—Service identifier. Enter an I-SID in the range from 256 through 16777214.</p> <p><i>vlan-id-list [vlan-ids]</i>—List of service VLANs (S-VLANs).</p>
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
Related Topics	<ul style="list-style-type: none"> ■ Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX series Routers on page 17

isid-list

Syntax	<code>isid-list isid-number;</code>
Hierarchy Level	<code>[edit routing-instances instance-name pbb-options];</code> <code>[edit interfaces pseudo-logical-interface-name unit logical-unit-number family bridge]</code>
Release Information	Statement introduced in JUNOS Release 10.0.
Description	For IEEE 802.1ah provider backbone bridge (PBB) configurations, configure the service identifier (I-SID) for the B-VLAN routing instance.
Options	<i>isid-number</i> —I-SID for the B-VLAN routing instance. Specify a value in the range from 256 through 16777214.
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
Related Topics	<ul style="list-style-type: none"> ■ Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX series Routers on page 17

isid-list (interfaces)

Syntax	isid-list all-service-groups;
Hierarchy Level	[edit interfaces <i>pseudo-logical-interface-name</i> unit <i>logical-unit-number</i> family bridge]
Release Information	Statement introduced in JUNOS Release 10.0.
Description	For IEEE 802.1ah provider backbone bridge (PBB) configurations, map all service identifiers (I-SIDs) specified for the service groups.
Options	all-service-groups—Map all service identifiers (I-SIDs) for the specified service groups.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Topics	■ Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX series Routers on page 17

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 (Logical Interfaces) {
    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 (Interface in Bridge Domain) [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 routers 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 routers only) Virtual private LAN service

The remaining statements are explained separately.

Usage Guidelines See Configuring the Protocol Family, “Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX series Routers” on page 17, 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.

mac-address

Syntax	<code>mac-address <i>mac-address</i>;</code>
Hierarchy Level	[edit routing-instances <i>routing-instance-name</i> service-groups <i>service-group-name</i> pbb-service-options]
Release Information	Statement introduced in JUNOS Release 10.0.
Description	For IEEE 802.1ah provider backbone bridge (PBB) configurations, configure a unicast or multicast MAC address for the customer routing instance (I-component) service group.
Options	<i>mac-address</i> —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.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Topics	■ Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX series Routers on page 17

pbb-options

Syntax	<pre>pbb-options { default-bvlan; peer-instance [elan eline]; vlan-id <i>vlan-number</i> { isid-list <i>isid-number</i>; } }</pre>
Hierarchy Level	[edit routing-instances <i>routing-instance-name</i>]
Release Information	Statement introduced in JUNOS Release 10.0.
Description	<p>Configure provider backbone bridging options for a routing instance.</p> <p>The remaining statements are explained separately.</p>
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Topics	■ Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX series Routers on page 17

pbb-service-options

Syntax	pbb-service-options { default-isid <i>isid-number</i> ; isid <i>isid-number</i> <i>vlan-id-list</i> [<i>vlan-ids</i>]; mac-address <i>mac-address</i> ; }
Hierarchy Level	[edit routing-instances <i>routing-instance-name</i> service-groups <i>service-group-name</i>]
Release Information	Statement introduced in JUNOS Release 10.0.
Description	For IEEE 802.1ah provider backbone bridge (PBB) configurations, configure PBB service options for the customer routing instance (I-component) service group. The remaining statements are explained separately.
Options	<i>service-group-name</i> —Name of a service group.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Topics	■ Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX series Routers on page 17

peer-instance

Syntax	peer-instance <i>pbbn-instance-name</i> ;
Hierarchy Level	[edit routing-instances <i>instance-name</i> pbb-options]
Release Information	Statement introduced in JUNOS Release 10.0.
Description	For IEEE 802.1ah provider backbone bridge (PBB) configurations, configure the peer PBBN routing instance in the I-component routing instance.
Options	<i>pbbn-instance-name</i> —Name of the PBBN routing instance.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Topics	■ Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX series Routers on page 17

routing-instances

Syntax `routing-instances routing-instance-name { ... }`

Hierarchy Level [edit],
[edit logical-systems *logical-system-name*]

Release Information Statement introduced before JUNOS Release 7.4.

Description Configure an additional routing entity for a router. You can create multiple instances of BGP, IS-IS, OSPF, OSPFv3, and RIP for a router. You can also create multiple routing instances for separating routing tables, routing policies, and interfaces for individual wholesale subscribers (retailers) in a Layer 3 wholesale network.

Default Routing instances are disabled for the router.

Options *routing-instance-name*—Name of the routing instance, a maximum of 128 characters. A routing instance name can contain letters, numbers, and hyphens.



NOTE: In JUNOS Release 9.6 and later, you can include a slash (/) in a routing-instance name only if a logical system is not configured. That is, you cannot include the slash character in a routing-instance name if a logical system other than the default is explicitly configured.

The remaining statements are explained separately.



NOTE: In JUNOS Release 9.0 and later, you cannot specify a routing-instance name of default or include special characters within the name of a routing instance.

Required Privilege Level routing—To view this statement in the configuration.
routing-control—To add this statement to the configuration.

- Related Topics**
- [\[Unresolved xref\]](#)
 - [\[Unresolved xref\]](#) Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX series Routers on page 17
 - *JUNOS Policy Framework Configuration Guide*

service-groups

Syntax

```

service-groups {
  service-group-name {
    service-type (eline | elan);
    pbb-service-options {
      default-isid isid-number;
      isid isid-number vlan-id-list [vlan-ids];
      mac-address mac-address;
    }
  }
}

```

Hierarchy Level [edit routing-instances *routing-instance-name*]

Release Information Statement introduced in JUNOS Release 10.0.

Description For IEEE 802.1ah provider backbone bridge (PBB) configurations, configure the service groups to be supported in the customer routing instance (I-component).

The remaining statements are explained separately.

Options *service-group-name*—Name of a service group.

Required Privilege Level routing—To view this statement in the configuration.
routing-control—To add this statement to the configuration.

Related Topics ■ Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX series Routers on page 17

service-type

Syntax	service-type (eline elan);
Hierarchy Level	[edit routing-instances <i>routing-instance-name</i> service-groups]
Release Information	Statement introduced in JUNOS Release 10.0.
Description	For IEEE 802.1ah provider backbone bridge (PBB) configurations, configure the service type for the service group in the customer routing instance (I-component).
Options	<p>eline—Connects two customer Ethernet ports over a WAN. E-LINE service is also known as point-to-point service.</p> <p>elan—Connects a set of customer endpoints (like a bridged Ethernet network). E-LAN service is also known as point-to-multipoint service.</p>
Required Privilege Level	<p>routing—To view this statement in the configuration.</p> <p>routing-control—To add this statement to the configuration.</p>
Related Topics	<ul style="list-style-type: none"> ■ Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX series Routers on page 17 ■ Understanding Provider Backbone Bridging on MX Series Routers on page 3

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;
    }
    dynamic-profile profile-name;
    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 (Stacked 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 (Logical Interfaces) {
    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 ];
}
}
}




```

Hierarchy Level	[edit interfaces <i>interface-name</i>], [edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i>], [edit interfaces interface-set (Ethernet Interfaces) <i>interface-set-name</i> interface <i>interface-name</i>]
Release Information	Statement introduced before JUNOS Release 7.4.
Description	Configure a logical interface on the physical device. You must configure a logical interface to be able to use the physical device.
Options	<i>logical-unit-number</i> —Number of the logical unit. Range: 0 through 16,384 The remaining statements are explained separately.
Usage Guidelines	See [Unresolved xref] .
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Topics	<i>JUNOS Services Interfaces Configuration Guide</i> and Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX series Routers on page 17

vlan-id

Syntax	<code>vlan-id <i>vlan-id</i>;</code> <code>isid-list <i>isid-number</i>;</code> <code>}</code>
Hierarchy Level	[edit routing-instances <i>instance-name</i> pbb-options]
Release Information	Statement introduced in JUNOS Release 10.0.
Description	<p>For IEEE 802.1ah provider backbone bridge (PBB) configurations, configure the mapping for the service identifier (I-SID) between the service VLAN (S-VLAN) and the backbone VLANs (B-VLANs).</p> <p>The remaining statement is explained separately.</p>
Options	<i>vlan-id</i> —Configure the B-VLAN in the range from 0 through 4094.
Required Privilege Level	routing—To view this statement in the configuration. routing-control—To add this statement to the configuration.
Related Topics	■ Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX series Routers on page 17

vlan-id

Syntax	vlan-id (all none <i>number</i>);
Hierarchy Level	[edit bridge-domains <i>bridge-domain-name</i>], [edit logical-systems <i>logical-system-name</i> bridge-domainss <i>bridge-domain-name</i>], [edit logical-systems <i>logical-system-name</i> routing-instances <i>routing-instance-name</i> bridge-domains <i>bridge-domain-name</i>], [edit routing-instances <i>routing-instance-name</i> bridge-domains <i>bridge-domain-name</i>]
Release Information	Statement introduced in JUNOS Release 8.4. Support for Layer 2 trunk ports added in JUNOS Release 9.2. Support for logical systems added in JUNOS Release 9.6.
Description	(MX Series routers only) Specify a VLAN identifier (VID) to include in the packets sent to and from the bridge domain or a VPLS routing instance.
	NOTE: When configuring a VLAN identifier for provider backbone bridge (PBB) routing instances, dual-tagged VIDs and the none option are not permitted.
Options	<i>number</i> —A valid VLAN identifier. If you configure multiple bridge domains with a valid VLAN identifier, you must specify a unique VLAN identifier for each domain. However, you can use the same VLAN identifier for bridge domains that belong to different virtual switches. Use this option to send singly tagged frames with the specified VLAN identifier over VPLS VT interfaces.
	NOTE: If you specify a VLAN identifier, you cannot also use the all option. They are mutually exclusive.
	all —Specify that the bridge domain spans all the VLAN identifiers configured on the member logical interfaces.
	NOTE: You cannot specify the all option if you include a routing interface in the bridge domain.
	none —Specify to enable shared VLAN learning or to send untagged frames over VPLS VT interfaces.
Usage Guidelines	See “Configuring Bridge Domains”, “Configuring VLAN Identifiers for Bridge Domains and VPLS Routing Instances”, “Configuring Bridge Domains as Switches for Layer 2 Trunk Ports”, “Configuring Layer 2 Virtual Switches”, “Configuring Layer 2 Virtual Switches”, “Configuring Layer 2 Virtual Switches”, and ““Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX series Routers” on page 17”.
Required Privilege Level	routing—To view this statement in the configuration.

routing-control—To add this statement to the configuration.

Related Topics vlan-tags and the *JUNOS VPNs Configuration Guide*

Chapter 6

Connectivity Fault Management Configuration Statements

- [edit protocols oam] Hierarchy Level on page 179

[edit protocols oam] Hierarchy Level

The following statement hierarchy can also be included at the [edit logical-systems *logical-system-name*] hierarchy level.

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

```

    }
    performance-monitoring {
        hardware-assisted-timestamping;
    }
    traceoptions {
        file <filename> <files number> <match regular-expression>
            <size maximum-file-size> <world-readable | no-world-readable>;
        flag flag;
        no-remote-trace;
    }
}
link-fault-management {
    action-profile profile-name {
        action {
            link-down;
            send-critical-event;
            syslog;
        }
        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;
}
traceoptions {
    file <filename> <files number> <match regular-expression>
        <size maximum-file-size> <world-readable | no-world-readable>;
    flag flag;
    no-remote-trace;
}
}
}
}
```

auto-discovery

Syntax	auto-discovery;
Hierarchy Level	[edit protocols oam ethernet connectivity-fault-management maintenance-domain <i>domain-name</i> maintenance-association <i>ma-name</i> mep <i>mep-id</i>]
Release Information	Statement introduced in JUNOS Release 8.4.
Description	Enable the MEP to accept continuity check messages from all remote MEPs.
Usage Guidelines	See Enabling Maintenance End Point Automatic Discovery and “Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers” on page 108.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.

bridge-domain

Syntax	bridge-domain <i>name</i> ;
Hierarchy Level	[edit protocols oam ethernet connectivity-fault-management maintenance-domain routing-instances <i>name</i>]
Release Information	Statement introduced in JUNOS Release 9.4.
Description	Specify the OAM Ethernet CFM maintenance domain bridge domain.
Options	<i>name</i> —Specify the name of the bridge domain.
Usage Guidelines	See Configuring Maintenance Intermediate Points and “Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers” on page 108.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Topics	maintenance-domain

connectivity-fault-management

Syntax

```

connectivity-fault-management {
  action-profile profile-name {
    default-action {
      interface-down;
    }
  }
  performance-monitoring {
    hardware-assisted-timestamping;
  }
  linktrace {
    age (30m | 10m | 1m | 30s | 10s);
    path-database-size path-database-size;
  }
  maintenance-domain domain-name {
    interface interface-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 (OAM) 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 routers, specify connectivity fault management for IEEE 802.1ag Operation, Administration, and Management (OAM) support.

The remaining statements are explained separately.

Usage Guidelines See [\[Unresolved xref\]](#) and “Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers” on page 108.

Required Privilege Level interface—To view this statement in the configuration.
 interface-control—To add this statement to the configuration.

continuity-check

Syntax continuity-check {
 hold-interval (OAM) *minutes*;
 interval (10m | 10s | 1m | 1s| 100ms | 10ms);
 loss-threshold *number*;
 interface-status-tlv;
 port-status-tlv;
 }

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 Specify continuity check protocol options.

Options hold-interval *minutes*—Specify the continuity check hold-interval, in minutes.
 interval (10m | 10s | 1m | 1s| 100ms | 10ms)—Specify the continuity check interval.
 loss-threshold *minutes*—Specify the loss-threshold, in minutes.
 interface-status-tlv—Enable interface-status-tlv transmission.
 port-status-tlv—Enable port-status-tlv transmission.

Usage Guidelines See Continuity Check Protocol and “Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers” on page 108.

Required Privilege Level interface—To view this statement in the configuration.
 interface-control—To add this statement to the configuration.

direction

Syntax	direction (up down);
Hierarchy Level	[edit protocols oam ethernet connectivity-fault-management maintenance-domain <i>domain-name</i> maintenance-association <i>ma-name</i> mep <i>mep-id</i>]
Release Information	Statement introduced in JUNOS Release 8.4.
Description	Configure the direction of the MEP.
Options	<p>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.</p> <p>down—Down MEP CCMs are transmitted only out the interface configured on this MEP.</p>
Usage Guidelines	See Configuring the Maintenance End Point Direction, “Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers” on page 108, and [Unresolved xref] .
Required Privilege Level	<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;
            }
        }
    }
    performance-monitoring {
        hardware-assisted-timestamping;
    }
    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 (OAM) 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;
                }
            }
        }
    }
}
evcs evc-id {
    evc-protocol cfm management-domain domain-id (<management-association
        association-id> | vpls (routing-instance instance-id);
    remote-uni-count count;
    multipoint-to-multipoint;
}
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;
    }
}
}
}
lmi (Ethernet OAM) {
    status-counter count;
    polling-verification-timer value;
    interface name {
        uni-id uni-name;
        status-counter number;
        polling-verification-timer value;
        evc-map-type (all-to-one-bundling | bundling | service-multiplexing);
        evc evc-name {
            default-evc;
            vlan-list vlan-id-list;
        }
    }
}
}
}

```

Hierarchy Level [edit protocols oam]

Release Information Statement introduced in JUNOS Release 8.2.

Description For Ethernet interfaces on M320, MX Series, and T Series routers, provide fault signaling and detection for 802.3ah Operation, Administration, and Management (OAM) support.

The remaining statements are explained separately.

Usage Guidelines	See Enabling IEEE 802.3ah OAM Support and “Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers” on page 108.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.

interface (IEEE 802.1ag OAM Connectivity-Fault Management)

Syntax	interface (<i>interface-name</i> ((ge- xe-) (<i>fpc/pic/port</i> <i>fpc/pic/port.unit-number</i> <i>fpc/pic/port.unit-number</i> vlan <i>vlan-id</i>)));
Hierarchy Level	[edit protocols oam ethernet connectivity-fault-management maintenance-domain <i>domain-name</i> maintenance-association <i>ma-name</i> mep <i>mep-id</i>]
Release Information	Statement introduced in JUNOS Release 8.4.
Description	<p>For Ethernet interfaces on M320, MX Series, and T Series routers, configure IEEE 802.1ag Operation, Administration, and Management (OAM) support.</p> <p>For Gigabit Ethernet interfaces and 10-Gigabit Ethernet interfaces on MX Series routers, configure IEEE 802.1ag Connectivity Fault Management (CFM) support on trunk interface ports.</p>
Options	<i>interface-name</i> —Interface to which the MEP is attached. It could be a physical Ethernet interface, logical Ethernet interface, or on a specific VLAN of a trunk port interface (MX Series only).
Usage Guidelines	See Configuring the Maintenance End Point Interface and “Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers” on page 108.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.

interval

Syntax	interval (10m 10s 1m 1s 100ms 10ms);
Hierarchy Level	[edit protocols oam ethernet connectivity-fault-management maintenance-domain <i>domain-name</i> maintenance-association <i>ma-name</i> continuity-check]
Release Information	Statement introduced in JUNOS Release 8.4. Ten milliseconds option introduced in JUNOS Release 9.1.
Description	The time between continuity check messages.
Options	10m—10 minutes. 10s—10 seconds. 1m—1 minute. 1s—1 second. 100ms—100 milliseconds. 10ms—10 milliseconds.
Usage Guidelines	See Configuring the Continuity Check Interval and “Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers” on page 108.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.

level

Syntax	level <i>number</i> ;
Hierarchy Level	[edit protocols oam ethernet connectivity-fault-management maintenance-domain <i>domain-name</i>]
Release Information	Statement introduced in JUNOS Release 8.4.
Description	A number used in CFM messages to identify the maintenance association.
Options	number—A number used to identify the maintenance domain to which the CFM message belongs. Range: 0 through 7
Usage Guidelines	See Creating the Maintenance Domain and “Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers” on page 108.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.

maintenance-association

Syntax maintenance-association *ma-name* {
 short-name-format (character-string | vlan | 2octet | rfc-2685-vpn-id);
 continuity-check {
 hold-interval (OAM) *minutes*;
 interval (10m | 10s | 1m | 1s| 100ms);
 loss-threshold *number*;
 }
 mep *mep-id* {
 auto-discovery;
 direction (up | down);
 interface *interface-name*;
 lowest-priority-defect (all-defects | err-xcon | mac-rem-err-xcon | no-defect | rem-err-xcon
 |xcon);
 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 a Maintenance Association and “Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers” on page 108.

Required Privilege Level interface—To view this statement in the configuration.
 interface-control—To add this statement to the configuration.

maintenance-domain

Syntax maintenance-domain *domain-name* {
 bridge-domain *name*;
 instance *vpls-instance*;
 level *number*;
 mip-half-function (none | default | explicit);
 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 (OAM) *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*;
 }
 }
 mip-half-function(none | default | explicit);
 }
 routing-instance *name* {
 bridge-domain *name*;
 }
 virtual-switch *name* bridge-domain *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 and “Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers” on page 108.

Required Privilege Level interface—To view this statement in the configuration.
 interface-control—To add this statement to the configuration.

mep

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 Configuring a Maintenance Endpoint and “Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers” on page 108.

Required Privilege Level `interface`—To view this statement in the configuration.
 `interface-control`—To add this statement to the configuration.

mip-half-function

Syntax	mip-half-function (none default explicit);
Hierarchy Level	[edit protocols oam ethernet connectivity-fault-management maintenance-domain <i>md-name</i>] [edit protocols oam ethernet connectivity-fault-management maintenance-association <i>ma-name</i>]
Description	Specify the OAM Ethernet CFM maintenance domain MIP half functions.
	NOTE: Whenever a MIP is configured and a bridge domain is mapped to multiple maintenance domains (MD) or maintenance associations (MA), it is essential that the mip-half-function value for all MDs and MAs are the same.
Options	<p>none—Specify to not use the mip-half-function.</p> <p>default—Specify to use the default mip-half-function.</p> <p>explicit—Specify an explicit mip-half-function.</p>
Usage Guidelines	See Creating the Maintenance Domain and “Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers” on page 108.
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Topics	See maintenance-domain.

virtual-switch

Syntax	virtual-switch <i>name</i> bridge-domain <i>name</i> vlan-id [<i>vlan-ids</i>];
Hierarchy Level	[edit protocols oam ethernet connectivity-fault-management maintenance-domain <i>domain-name</i> default-x]
Description	Specify the routing-instance type as a virtual switch, under which bridge-domain MIPs must be enabled.
Usage Guidelines	See Configuring MIP for Bridge Domains of a Virtual Switch and “Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers” on page 108.
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>

Chapter 7

CoS Configuration Statements

buffer-size

Syntax	buffer-size (percent <i>percentage</i> remainder temporal <i>microseconds</i>);
Hierarchy Level	[edit class-of-service [Unresolved xref] <i>scheduler-name</i>]
Release Information	Statement introduced before JUNOS Release 7.4.
Description	Specify buffer size.
Default	If you do not include this statement, the default scheduler transmission rate and buffer size percentages for queues 0 through 7 are 95, 0, 0, 5, 0, 0, 0, and 0 percent.
Options	<p>percent <i>percentage</i>—Buffer size as a percentage of total buffer.</p> <p>remainder—Remaining buffer available.</p> <p>temporal <i>microseconds</i>—Buffer size as a temporal value. The queuing algorithm starts dropping packets when it queues more than a computed number of bytes. This maximum is computed by multiplying the logical interface speed by the configured temporal value.</p> <p>Range: The ranges vary by platform as follows:</p> <ul style="list-style-type: none">■ For M320 and T Series routers with Type 1 and Type 2 FPCs: 1 through 80,000 microseconds.■ For M320 and T Series routers with Type 3 FPCs: 1 through 50,000 microseconds.■ For M7i, M10i, M5, and M10 routers: 1 through 100,000 microseconds.■ For other M Series routers: 1 through 200,000 microseconds.■ For IQ PICs on M320 and T Series routers: 1 through 50,000 microseconds.■ For IQ PICs on other M Series routers: 1 through 100,000 microseconds.
Usage Guidelines	See Configuring the Scheduler Buffer Size and “Example: Configuring CoS for a PBB Network on MX Series Routers” on page 84.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.

classifiers (Definition)

Syntax	<pre> classifiers { type classifier-name { [Unresolved xref] (classifier-name default); [Unresolved xref] class-name { [Unresolved xref] level code-points [aliases] [bit-patterns]; } } } </pre>
Hierarchy Level	[edit class-of-service], [edit class-of-service routing-instances <i>routing-instance-name</i>]
Release Information	Statement introduced before JUNOS Release 7.4. ieee-802.1ad option introduced in JUNOS Release 9.2.
Description	Define a CoS aggregate behavior classifier for classifying packets. You can associate the classifier with a forwarding class or code-point mapping, and import a default classifier or one that is previously defined.
Options	<i>classifier-name</i> —Name of the aggregate behavior classifier. <i>type</i> —Traffic type: dscp, dscp-ipv6, exp, ieee-802.1, ieee-802.1ad, inet-precedence.
Usage Guidelines	See [Unresolved xref] and “Example: Configuring CoS for a PBB Network on MX Series Routers” on page 84.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.

code-point

Syntax	code-point [<i>aliases</i>] [<i>bit-patterns</i>];
Hierarchy Level	[edit class-of-service rewrite-rules <i>type</i> <i>rewrite-name</i> [Unresolved xref] <i>class-name</i>]
Release Information	Statement introduced before JUNOS Release 7.4.
Description	Specify one or more code-point aliases or bit sets for association with a forwarding class.
Options	<i>aliases</i> —Name of each alias. <i>bit-patterns</i> —Value of the code-point bits, in decimal form.
Usage Guidelines	See Configuring Rewrite Rules.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.

code-points

Syntax	<code>code-points [<i>aliases</i>] [<i>bit-patterns</i>];</code>
Hierarchy Level	<code>[edit class-of-service classifiers type <i>classifier-name</i> forwarding-class <i>class-name</i>]</code>
Release Information	Statement introduced before JUNOS Release 7.4.
Description	Specify one or more DSCP code-point aliases or bit sets for association with a forwarding class.
Options	<i>aliases</i> —Name of the DSCP alias. <i>bit-patterns</i> —Value of the code-point bits, in decimal form.
Usage Guidelines	See [Unresolved xref] and “Example: Configuring CoS for a PBB Network on MX Series Routers” on page 84.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.

family

Syntax

```
family family-name {
    filter filter-name {
        accounting-profile name;
        interface-specific;
        physical-interface-filter;
    }
    prefix-action name {
        count;
        destination-prefix-length prefix-length;
        policer policer-name;
        source-prefix-length prefix-length;
        subnet-prefix-length prefix-length;
    }
    simple-filter filter-name {
        term term-name {
            from {
                match-conditions;
            }
            then {
                action;
                action-modifiers;
            }
        }
    }
}
```

Hierarchy Level [edit firewall],
[edit logical-systems *logical-system-name* firewall]

Release Information Statement introduced before JUNOS Release 7.4.
Logical systems support introduced in JUNOS Release 9.3.
simple-filter statement introduced in JUNOS Release 7.6.
any family type introduced in JUNOS Release 8.0.
bridge family type introduced in JUNOS Release 8.4 (MX Series routers only).

Description Configure a firewall filter for IP version 4 (IPv4) or IP version 6 (IPv6) traffic. On the MX Series routers only, configure a firewall filter for Layer 2 traffic in a bridging environment.

Options *family-name*—Version or type of addressing protocol:

- any—Protocol-independent match conditions.
- bridge—(MX Series routers only) Layer 2 packets that are part of bridging domain.
- ccc—Layer 2 switching cross-connects.
- inet—IPv4 addressing protocol.
- inet6—IPv6 addressing protocol.
- mpls—MPLS.

- **vpls**—Virtual private LAN service (VPLS).

The remaining statements are explained separately.

Usage Guidelines See Configuring Standard Firewall Filters and “Example: Configuring CoS for a PBB Network on MX Series Routers” on page 84.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

filter

Syntax `filter filter-name {
 accounting-profile name;
 interface-specific;
 physical-interface-filter;
 term term-name {
 filter filter-name;
 from {
 match-conditions;
 }
 then {
 action;
 action-modifiers;
 }
 }
}`

Hierarchy Level [edit firewall family *family-name*],
[edit logical-systems *logical-system-name* firewall family *family-name*]

Release Information Statement introduced before JUNOS Release 7.4.
Logical systems support introduced in JUNOS Release 9.3.
physical-interface-filter statement introduced in JUNOS Release 9.6.

Description Configure firewall filters.

Options *filter-name*—Name that identifies the filter. The name can contain letters, numbers, and hyphens (-) and can be up to 64 characters long. To include spaces in the name, enclose it in quotation marks (“ ”).

The remaining statements are explained separately.

Usage Guidelines See Configuring Standard Firewall Filters and “Example: Configuring CoS for a PBB Network on MX Series Routers” on page 84.

Required Privilege Level firewall—To view this statement in the configuration.
firewall-control—To add this statement to the configuration.

firewall

Syntax	firewall { ... }
Hierarchy Level	[edit], [edit logical-systems <i>logical-system-name</i>]
Release Information	Statement introduced before JUNOS Release 7.4. Logical systems support introduced in JUNOS Release 9.3.
Description	Configure firewall filters. The statements are explained separately.
Usage Guidelines	See Configuring Standard Firewall Filters.
Required Privilege Level	firewall—To view this statement in the configuration. firewall-control—To add this statement to the configuration.

forwarding-classes

Syntax	forwarding-classes { [Unresolved xref] <i>class-name</i> queue-num <i>queue-number</i> [Unresolved xref] (high low); [Unresolved xref] <i>queue-number</i> <i>class-name</i> [Unresolved xref] (high low) [policing-priority (premium normal)]; }
Hierarchy Level	[edit class-of-service]
Release Information	Statement introduced before JUNOS Release 7.4. policing-priority option introduced in JUNOS Release 9.5.
Description	Associate the forwarding class with a queue name and number. For M320, MX Series, and T Series routers only, you can configure fabric priority queuing by including the priority statement. For Enhanced IQ PICs, you can include the policing-priority option. The statements are explained separately.
Usage Guidelines	See Configuring Forwarding Classes, Overriding Fabric Priority Queuing, and “Example: Configuring CoS for a PBB Network on MX Series Routers” on page 84. For the policing-priority option, see Configuring Layer 2 Policing on IQE PICs. For classification by egress interface, see Classifying Packets by Egress Interface.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.

ieee-802.1

Syntax	ieee-802.1 (<i>rewrite-name</i> default) vlan-tag (outer outer-and-inner);
Hierarchy Level	[edit class-of-service interfaces <i>interface-name</i> unit <i>logical-unit-number</i> [Unresolved xref]]
Release Information	Statement introduced before JUNOS Release 7.4. vlan-tag statement introduced in JUNOS Release 8.1.
Description	Apply an IEEE-802.1 rewrite rule. For IQ PICs, you can only configure one IEEE 802.1 rewrite rule on a physical port. All logical ports (units) on that physical port should apply the same IEEE 802.1 rewrite rule.
Options	<i>rewrite-name</i> —Name of a rewrite-rules mapping configured at the [edit class-of-service rewrite-rules ieee-802.1] hierarchy level. default—The default mapping.
Usage Guidelines	See Configuring Rewrite Rules.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Topics	Example: Configuring CoS for a PBB Network on MX Series Routers on page 84, [Unresolved xref] , dscp-ipv6, exp, exp-push-push-push, exp-swap-push-push, inet-precedence, rewrite-rules (Definition)

interfaces

Syntax	interfaces { ... }
Hierarchy Level	[edit]
Release Information	Statement introduced before JUNOS Release 7.4.
Description	Configure interfaces on the router.
Default	The management and internal Ethernet interfaces are automatically configured. You must configure all other interfaces.
Usage Guidelines	See individual chapters.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.

interface-set

Syntax	<pre>interface-set <i>interface-set-name</i> { excess-bandwidth-share (proportional <i>value</i> equal); internal-node; output-traffic-control-profile <i>profile-name</i>; output-traffic-control-profile-remaining <i>profile-rem-name</i>; }</pre>
Hierarchy Level	[edit class-of-service interfaces]
Release Information	Statement introduced in JUNOS Release 8.5.
Description	For MX Series routers with Enhanced Queuing DPCs, configure hierarchical schedulers.
Options	<p><i>interface-set-name</i>—Name of the interface set.</p> <p>The remaining statements are explained separately.</p>
Usage Guidelines	See Configuring Hierarchical Schedulers for CoS.
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>

interface-set (Ethernet Interfaces)

Syntax	<pre>interface-set <i>interface-set-name</i> { interface <i>ethernet-interface-name</i> { (unit <i>unit-number</i> vlan-tags-outer <i>vlan-tag</i>); } }</pre>
Hierarchy Level	[edit interfaces]
Release Information	Statement introduced in JUNOS Release 8.5.
Description	<p>The set of interfaces used to configure hierarchical CoS schedulers on Ethernet interfaces on the MX Series router.</p> <p>The remaining statements are described separately.</p>
Usage Guidelines	See the <i>JUNOS Class of Service Configuration Guide</i> and “Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX series Routers” on page 17.
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>

loss-priority (Rewrite Rules)

Syntax	<code>loss-priority <i>level</i>;</code>
Hierarchy Level	[edit class-of-service rewrite-rules <i>type rewrite-name</i> [Unresolved xref] <i>class-name</i>]
Release Information	Statement introduced before JUNOS Release 7.4.
Description	Specify a loss priority to which to apply a rewrite rule. The rewrite rule sets the code-point aliases and bit patterns for a specific forwarding class and packet loss priority (PLP). The inputs for the map are the forwarding class and the PLP. The output of the map is the code-point alias or bit pattern.
Options	<p><i>level</i> can be one of the following:</p> <ul style="list-style-type: none"> ■ high—The rewrite rule applies to packets with high loss priority. ■ low—The rewrite rule applies to packets with low loss priority. ■ medium-high—(For J Series routers only) The rewrite rule applies to packets with medium-high loss priority. ■ medium-low—(For J Series routers only) The rewrite rule applies to packets with medium-low loss priority.
Usage Guidelines	See Configuring Rewrite Rules, [Unresolved xref] , Configuring Tricolor Marking, and “Example: Configuring CoS for a PBB Network on MX Series Routers” on page 84.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.

loss-priority (BA Classifiers)

Syntax	<code>loss-priority <i>level</i>;</code>
Hierarchy Level	<code>[edit class-of-service classifiers type <i>classifier-name</i> forwarding-class <i>class-name</i>]</code>
Release Information	Statement introduced before JUNOS Release 7.4.
Description	Specify packet loss priority value for a specific set of code-point aliases and bit patterns.
Options	<p><i>level</i> can be one of the following:</p> <ul style="list-style-type: none"> ■ <code>high</code>—Packet has high loss priority. ■ <code>medium-high</code>—Packet has medium-high loss priority. ■ <code>medium-low</code>—Packet has medium-low loss priority. ■ <code>low</code>—Packet has low loss priority.
Usage Guidelines	See [Unresolved xref] , “Example: Configuring CoS for a PBB Network on MX Series Routers” on page 84, and Configuring Tricolor Marking.
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>

output-traffic-control-profile

Syntax	output-traffic-control-profile <i>profile-name</i> shared-instance <i>instance-name</i> ;
Hierarchy Level	[edit class-of-service interfaces <i>interface-name</i> unit <i>logical-unit-number</i>], [edit class-of-service interfaces <i>interface-name</i> interface-set <i>interface-set-name</i>]
Release Information	Statement introduced in JUNOS Release 7.6. Interface set option for Enhanced Queuing DPCs on MX Series routers introduced in JUNOS Release 8.5
Description	For Channelized IQ PICs, Gigabit Ethernet IQ, link services IQ (LSQ) interfaces on AS PICs, and Enhanced Queuing DPCs on MX Series routers, apply an output traffic scheduling and shaping profile to the logical interface. The shared-instance statement is supported on Gigabit Ethernet IQ2 PICs only.
Options	<i>profile-name</i> —Name of the traffic-control profile to be applied to this interface
Usage Guidelines	See Oversubscribing Interface Bandwidth, Configuring Traffic Control Profiles for Shared Scheduling and Shaping, and “Example: Configuring CoS for a PBB Network on MX Series Routers” on page 84. For Enhanced Queuing DPCs on MX Series routers, see Configuring Hierarchical Schedulers for CoS.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Topics	traffic-control-profiles, output-traffic-control-profile-remaining

policer

Syntax	<pre> policer <i>policer-name</i> { filter-specific; if-exceeding { bandwidth-limit <i>bps</i>; bandwidth-percent <i>number</i>; burst-size-limit <i>bytes</i>; } logical-interface-policer; physical-interface-policer; then { <i>policer-action</i>; } } </pre>
Hierarchy Level	[edit firewall], [edit logical-systems <i>logical-system-name</i> firewall]
Release Information	Statement introduced before JUNOS Release 7.4. Logical systems support introduced in JUNOS Release 9.3. physical-interface-policer statement introduced in JUNOS Release 9.6.
Description	Configure policer rate limits and actions. When included at the [edit firewall] hierarchy level, it creates a template, and you do not have to configure a policer individually for every firewall filter or interface. To activate a policer, you must include the policer action modifier in the then statement in a firewall filter term or on an interface.
Options	<p><i>policer-action</i>—One or more actions to take:</p> <ul style="list-style-type: none"> ■ discard—Discard traffic that exceeds the rate limits. ■ forwarding-class <i>class-name</i>—Specify the particular forwarding class. ■ loss-priority—Set the packet loss priority (PLP) to low, medium-low, medium-high, or high. <p><i>policer-name</i>—Name that identifies the policer. The name can contain letters, numbers, and hyphens (-), and can be up to 255 characters long. To include spaces in the name, enclose it in quotation marks (" ").</p> <p>then—Actions to take on matching packets.</p> <p>The remaining statements are explained separately.</p>
Usage Guidelines	See Configuring Policers.
Required Privilege Level	firewall —To view this statement in the configuration. firewall-control —To add this statement to the configuration.
Related Topics	<ul style="list-style-type: none"> ■ Example: Configuring CoS for a PBB Network on MX Series Routers on page 84

- physical-interface-policer

rewrite-rules (Definition)

Syntax `rewrite-rules {
 type rewrite-name{
 [Unresolved xref] (rewrite-name | default);
 [Unresolved xref] class-name {
 [Unresolved xref] level code-point [aliases] [bit-patterns];
 }
 }
 }`

Hierarchy Level [edit class-of-service]

Release Information Statement introduced before JUNOS Release 7.4.
 ieee-802.1ad option introduced in JUNOS Release 9.2.

Description Specify a rewrite-rules mapping for the traffic that passes through all queues on the interface.

Options *rewrite-name*—Name of a rewrite-rules mapping.

type—Traffic type.

Values: dscp, dscp-ipv6, exp, frame-relay-de (J Series routers only), ieee-802.1, ieee-802.1ad, inet-precedence

The remaining statements are explained separately.

Usage Guidelines See “Example: Configuring CoS for a PBB Network on MX Series Routers” on page 84, Configuring Rewrite Rules, and the J Series router documentation.

Required Privilege Level interface—To view this statement in the configuration.
 interface-control—To add this statement to the configuration.

scheduler (Scheduler Map)

Syntax	<code>scheduler scheduler-name;</code>
Hierarchy Level	[edit class-of-service scheduler-maps <i>map-name</i>]
Release Information	Statement introduced before JUNOS Release 7.4.
Description	Associate a scheduler with a scheduler map.
Options	<i>scheduler-name</i> —Name of the scheduler configuration block.
Usage Guidelines	See [Unresolved xref] and “Example: Configuring CoS for a PBB Network on MX Series Routers” on page 84.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.

scheduler-maps (For Most Interface Types)

Syntax	<pre>scheduler-maps { map-name { [Unresolved xref] class-name [Unresolved xref] scheduler-name; } }</pre>
Hierarchy Level	[edit class-of-service]
Release Information	Statement introduced before JUNOS Release 7.4.
Description	Specify a scheduler map name and associate it with the scheduler configuration and forwarding class.
Options	<i>map-name</i> —Name of the scheduler map. The remaining statements are explained separately.
Usage Guidelines	See [Unresolved xref] and “Example: Configuring CoS for a PBB Network on MX Series Routers” on page 84.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.

scheduler-maps (For Most Interface Types)

Syntax	<pre> scheduler-maps { map-name { [Unresolved xref] class-name [Unresolved xref] scheduler-name; } } </pre>
Hierarchy Level	[edit class-of-service]
Release Information	Statement introduced before JUNOS Release 7.4.
Description	Specify a scheduler map name and associate it with the scheduler configuration and forwarding class.
Options	<p><i>map-name</i>—Name of the scheduler map.</p> <p>The remaining statements are explained separately.</p>
Usage Guidelines	See [Unresolved xref] and “Example: Configuring CoS for a PBB Network on MX Series Routers” on page 84.
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>

schedulers (Class-of-Service)

Syntax schedulers {
 scheduler-name {
 buffer-size (seconds | percent *percentage* | remainder | temporal *microseconds*);
 drop-profile-map [Unresolved xref] (any | low | medium-low | medium-high | high)
 [Unresolved xref] (any | non-tcp | tcp) drop-profile *profile-name*;
 [Unresolved xref] *priority-level*;
 [Unresolved xref] (percent *percentage* | *rate*);
 transmit-rate (percent *percentage* | *rate* | remainder) <exact | rate-limit>;
 }
}

Hierarchy Level [edit class-of-service]

Release Information Statement introduced before JUNOS Release 7.4.

Description Specify scheduler name and parameter values.

Options *scheduler-name*—Name of the scheduler to be configured.

The remaining statements are explained separately.

Usage Guidelines See [Unresolved xref] and “Example: Configuring CoS for a PBB Network on MX Series Routers” on page 84.

Required Privilege Level interface—To view this statement in the configuration.
 interface-control—To add this statement to the configuration.

term

Syntax	<pre>term term-name { filter filter-name; from { match-conditions; } then { action; action-modifiers; } }</pre>
Hierarchy Level	<pre>[edit firewall family family-name filter filter-name], [edit firewall family family-name service-filter filter-name], [edit firewall family family-name simple-filter filter-name], [edit logical-systems logical-system-name firewall family family-name filter filter-name], [edit logical-systems logical-system-name firewall family family-name service-filter filter-name], [edit logical-systems logical-system-name firewall family family-name simple-filter filter-name]</pre>
Release Information	<p>Statement introduced before JUNOS Release 7.4.</p> <p>filter option introduced in JUNOS Release 7.6.</p> <p>Logical systems support introduced in JUNOS Release 9.3.</p>
Description	Define a firewall filter term.
Options	<p>actions—(Optional) An action to take if conditions match. If you do not specify an action, the packets that match the conditions in the from statement are accepted. The actions are described in Configuring Actions in Firewall Filter Terms.</p> <p>action-modifiers—(Optional) One or more actions to perform on a packet. The action modifiers are described in Configuring Actions in Firewall Filter Terms.</p> <p>filter-name—(Optional) A filter within a filter. This term references another filter.</p> <p>from—(Optional) Match packet fields to values. If not included, all packets are considered to match and the actions and action modifiers in the then statement are taken.</p> <p>match-conditions—One or more conditions to use to make a match. The conditions are described in Overview of Match Conditions in Firewall Filter Terms, Overview of Match Conditions in Firewall Filter Terms, and Overview of Match Conditions in Firewall Filter Terms.</p> <p>term-name—Name that identifies the term. The name can contain letters, numbers, and hyphens (-), and can be up to 64 characters long. To include spaces in the name, enclose it in quotation marks (" ").</p>

then—(Optional) Actions to take on matching packets. If not included and a packet matches all the conditions in the **from** statement, the packet is accepted.

Usage Guidelines See Configuring Standard Firewall Filters and “Example: Configuring CoS for a PBB Network on MX Series Routers” on page 84.

Required Privilege Level firewall—To view this statement in the configuration.
 firewall-control—To add this statement to the configuration.

traffic-control-profiles

Syntax traffic-control-profiles *profile-name* {
 delay-buffer-rate (percent *percentage* | *rate*);
 excess-rate percent *percentage*;
 guaranteed-rate (percent *percentage* | *rate*);
 [Unresolved xref] *map-name*;
 [Unresolved xref] (percent *percentage* | *rate*);
 }

Hierarchy Level [edit class-of-service]

Release Information Statement introduced in JUNOS Release 7.6.
 excess-rate statement introduced in JUNOS Release 9.3.

Description For Gigabit Ethernet IQ, Channelized IQ PICs, and AS PIC FRF.16 LSQ interfaces only, configure traffic shaping and scheduling profiles. For Enhanced EQ PICs only, you can include the **excess-rate** statement.

Options *profile-name*—Name of the traffic-control profile.

The remaining statements are explained separately.

Usage Guidelines See Oversubscribing Interface Bandwidth.

Required Privilege Level interface—To view this statement in the configuration.
 interface-control—To add this statement to the configuration.

Related Topics

- output-traffic-control-profile
- Example: Configuring CoS for a PBB Network on MX Series Routers on page 84

transmit-rate

Syntax	transmit-rate (<i>rate</i> percent <i>percentage</i> remainder) <exact rate-limit>;
Hierarchy Level	[edit class-of-service [Unresolved xref] <i>scheduler-name</i>]
Release Information	Statement introduced before JUNOS Release 7.4. rate-limit option introduced in JUNOS Release 8.3. Applied to the Multiservices PICs in JUNOS Release 9.4.
Description	Specify the transmit rate or percentage for a scheduler.
Default	If you do not include this statement, the default scheduler transmission rate and buffer size percentages for queues 0 through 7 are 95, 0, 0, 5, 0, 0, 0, and 0 percent.
Options	<p>exact—(Optional) Enforce the exact transmission rate. Under sustained congestion, a rate-controlled queue that goes into negative credit fills up and eventually drops packets. This value should never exceed the rate-controlled amount.</p> <p>percent <i>percentage</i>—Percentage of transmission capacity. A percentage of zero drops all packets in the queue. Range: 0 through 100 percent</p> <p><i>rate</i>—Transmission rate, in bps. 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). Range: 3200 through 160,000,000,000 bps</p> <p>rate-limit—(Optional) Limit the transmission rate to the rate-controlled amount. In contrast to the exact option, the scheduler with the rate-limit option shares unused bandwidth above the rate-controlled amount.</p> <p>remainder—Use remaining rate available.</p>
Usage Guidelines	See [Unresolved xref] and “Example: Configuring CoS for a PBB Network on MX Series Routers” on page 84.
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>

Chapter 8

Interface Set Statements

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* and “Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX series Routers” on page 17.

Required Privilege Level interface—To view this statement in the configuration.
 interface-control—To add this statement to the configuration.

interface-set

Syntax `interface-set interface-set-name {
 excess-bandwidth-share (proportional value | equal);
 internal-node;
 output-traffic-control-profile profile-name;
 output-traffic-control-profile-remaining profile-rem-name;
}`

Hierarchy Level [edit class-of-service interfaces]

Release Information Statement introduced in JUNOS Release 8.5.

Description For MX Series routers with Enhanced Queuing DPCs, configure hierarchical schedulers.

Options *interface-set-name*—Name of the interface set.

The remaining statements are explained separately.

Usage Guidelines See Configuring Hierarchical Schedulers for CoS.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Part 3

Administration

- PBB Monitoring Commands on page 217
- CoS Monitoring Commands on page 237
- Connectivity Fault Management Monitoring Commands on page 255

Chapter 9

PBB Monitoring Commands

show bridge mac-table

Syntax	<pre>show bridge mac-table <brief count detail extensive> <bridge-domain (all <i>bridge-domain-name</i>)> <global-count> <interface <i>interface-name</i>> <mac-address> <vlan-id (all-vlan <i>vlan-id</i>)></pre>
Release Information	Command introduced in JUNOS Release 8.4.
Description	(MX Series routers only) Display Layer 2 MAC address information.
Options	<p>none—Display all learned Layer 2 MAC address information.</p> <p>brief count detail extensive—(Optional) Display the specified level of output.</p> <p>bridge-domain (all <i>bridge-domain-name</i>)—(Optional) Display learned Layer 2 MAC addresses for all bridging domains or for the specified bridging domain.</p> <p>global-count—(Optional) Display the total number of learned Layer 2 MAC addresses on the system.</p> <p>instance <i>instance-name</i>—(Optional) Display learned Layer 2 MAC addresses for the specified routing instance.</p> <p>interface <i>interface-name</i>—(Optional) Display learned Layer 2 MAC addresses for the specified interface.</p> <p>mac-address—(Optional) Display the specified learned Layer 2 MAC address information.</p> <p>vlan-id (all-vlan <i>vlan-id</i>)—(Optional) Display learned Layer 2 MAC addresses for all VLANs or for the specified VLAN.</p>
Additional Information	When Layer 2 protocol tunneling is enabled, the tunneling MAC address 01:00:0c:cd:cd:d0 is installed in the MAC table. When the Cisco Discovery Protocol (CDP), Spanning Tree Protocol (STP), or VLAN Trunk Protocol (VTP) is configured for Layer 2 protocol tunneling on an interface, the corresponding protocol MAC address is installed in the MAC table.
Required Privilege Level	view
List of Sample Output	<pre>show bridge mac-table on page 219 show bridge mac-table brief on page 219 show brief mac-table count on page 220 show bridge mac-table detail on page 220</pre>
Output Fields	Table 14 on page 219 describes the output fields for the <code>show bridge mac-table</code> command. Output fields are listed in the approximate order in which they appear.

Table 14: show bridge mac-table Output fields

Field Name	Field Description
Routing instance	Name of the routing instance.
Bridging domain	Name of the bridging domain.
MAC address	MAC address or addresses learned on a logical interface.
MAC flags	Status of MAC address learning properties for each interface: <ul style="list-style-type: none"> ■ S—Static MAC address is configured. ■ D—Dynamic MAC address is configured. ■ SE—MAC accounting is enabled. ■ NM—Non-configured MAC.
Logical interface	Name of the logical interface.
MAC count	Number of MAC addresses learned on the specific routing instance or interface.
Learning interface	Name of the logical interface on which the MAC address was learned.
Learning VLAN	VLAN ID of the routing instance or bridge domain in which the MAC address was learned.
Layer 2 flags	Debugging flags signifying that the MAC address is present in various lists.
Epoch	Spanning Tree Protocol epoch number identifying when the MAC address was learned. Used for debugging.
Sequence number	Sequence number assigned to this MAC address. Used for debugging.
Learning mask	Mask of the Packet Forwarding Engines where this MAC address was learned. Used for debugging.
IPC generation	Creation time of the logical interface when this MAC address was learned. Used for debugging.

```

show bridge mac-table user@host> show bridge mac-table
MAC flags (S -static MAC, D -dynamic MAC,
          SE -Statistics enabled, NM -Non configured MAC)

```

```

Routing instance : vs1
Bridging domain : vlan100, VLAN : 100
  Learning MAC          MAC          Logical
  VLAN      address      flags      interface
    00:00:00:19:1c:db    D          ge-11/0/3.0
    00:00:00:59:3a:2f    D          xe-10/2/0.100

```

```

show bridge mac-table brief user@host> show bridge mac-table brief
MAC flags (S -static MAC, D -dynamic MAC,
          SE -Statistics enabled, NM -Non configured MAC)

```

```

Routing instance : vs1
Bridging domain : vlan100, VLAN : 100
  Learning MAC          MAC          Logical
  VLAN      address      flags      interface

```

```

00:00:00:19:1c:db D ge-11/0/3.0
00:00:00:59:3a:2f D xe-10/2/0.100

```

```

show brief mac-table user@host> show bridge mac-table count
count 2 MAC address learned in routing instance vs1 bridge domain vlan100

```

MAC address count per interface within routing instance:

Logical interface	MAC count
ge-11/0/3.0	1
ge-11/1/4.100	0
ge-11/1/1.100	0
ge-11/1/0.100	0
xe-10/2/0.100	1
xe-10/0/0.100	0

MAC address count per learn VLAN within routing instance:

Learn VLAN ID	MAC count
0	2

0 MAC address learned in routing instance vs1 bridge domain vlan200

MAC address count per interface within routing instance:

Logical interface	MAC count
ge-11/1/0.200	0
ge-11/1/1.200	0
ge-11/1/4.200	0
xe-10/0/0.200	0
xe-10/2/0.200	0

MAC address count per learn VLAN within routing instance:

Learn VLAN ID	MAC count
0	0

```

show bridge mac-table user@host> show bridge mac-table detail
detail MAC address: 00:00:00:19:1c:db
Routing instance: vs1
Bridging domain: vlan100
Learning interface: ge-11/0/3.0 Learning VLAN: 0
Layer 2 flags: in_ifd, in_ifl, in_vlan, kernel
Epoch: 4 Sequence number: 0
Learning mask: 0x800 IPC generation: 0

MAC address: 00:00:00:59:3a:2f
Routing instance: vs1
Bridging domain: vlan100
Learning interface: xe-10/2/0.100 Learning VLAN: 0
Layer 2 flags: in_ifd, in_ifl, in_vlan, kernel
Epoch: 7 Sequence number: 0
Learning mask: 0x400 IPC generation: 0

```

show interfaces (Gigabit Ethernet)

Syntax `show interfaces ge-fpc/pic/port`
`<brief | detail | extensive | terse>`
`<descriptions>`
`<media>`
`otn-options {`
`bytes {`
`transmit-payload-type number;`
`}`
`}`
`<snmp-index snmp-index>`
`<statistics>`

Release Information Command introduced before JUNOS Release 7.4.

Description (M Series, T Series, and MX Series routers only) Display status information about the specified Gigabit Ethernet interface.

Options *ge-fpc/pic/port*—Display standard information about the specified Gigabit Ethernet interface.

brief | detail | extensive | terse—(Optional) Display the specified level of output.

descriptions—(Optional) Display interface description strings.

media—(Optional) Display media-specific information about network interfaces.

snmp-index snmp-index—(Optional) Display information for the specified SNMP index of the interface.

statistics—(Optional) Display static interface statistics.

Required Privilege Level view

List of Sample Output `show interfaces` (Gigabit Ethernet) on page 221
`show interfaces` (Gigabit Ethernet on MX Series Router) on page 222
`show interfaces brief` (Gigabit Ethernet) on page 222
`show interfaces detail` (Gigabit Ethernet) on page 223
`show interfaces extensive` (Gigabit Ethernet IQ2) on page 224
`show interfaces` (Gigabit Ethernet Unnumbered Interface) on page 227

Output Fields See [\[Unresolved xref\]](#) for the output fields for the `show interfaces` (Fast Ethernet and Gigabit Ethernet) command. For Gigabit Ethernet IQ and IQE PICs, the traffic and MAC statistics vary by interface type. For more information, see [\[Unresolved xref\]](#).

show interfaces (Gigabit Ethernet)

```
user@host> show interfaces ge-3/0/2
Physical interface: ge-3/0/2, Enabled, Physical link is Up
  Interface index: 167, SNMP ifIndex: 35
  Link-level type: 52, MTU: 1522, Speed: 1000Mbps, Loopback: Disabled,
  Source filtering: Disabled, Flow control: Enabled, Auto-negotiation: Enabled
  Remote fault: Online
  Device flags      : Present Running
  Interface flags:  SNMP-Traps Internal: 0x4000
```

```

CoS queues      : 4 supported, 4 maximum usable queues
Current address: 00:05:85:4a:e9:7c, Hardware address: 00:05:85:4a:e9:7c
Last flapped   : 2006-08-10 17:25:10 PDT (00:01:08 ago)
Input rate      : 0 bps (0 pps)
Output rate     : 0 bps (0 pps)
Ingress rate at Packet Forwarding Engine : 0 bps (0 pps)
Ingress drop rate at Packet Forwarding Engine : 0 bps (0 pps)
Active alarms   : None
Active defects  : None

Logical interface ge-3/0/2.0 (Index 72) (SNMP ifIndex 69)
  Flags: SNMP-Traps 0x4000
  VLAN-Tag [ 0x8100.512 0x8100.513 ] In(pop-swap 0x8100.530) Out(swap-push
    0x8100.512 0x8100.513)
  Encapsulation: VLAN-CCC
  Input packets : 0
  Output packets: 0
  Protocol ccc, MTU: 1522
  Flags: Is-Primary

```

**show interfaces
(Gigabit Ethernet on
MX Series Router)**

```

user@host> show interfaces ge-2/2/2
Physical interface: ge-2/2/2, Enabled, Physical link is Up
  Interface index: 156, SNMP ifIndex: 188
  Link-level type: Ethernet, MTU: 1514, Speed: 1000mbps, MAC-REWRITE Error: None,
  Loopback: Disabled,
  Source filtering: Disabled, Flow control: Enabled, Auto-negotiation: Enabled,
  Remote fault: Online
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000
  Link flags     : None
  CoS queues     : 8 supported, 4 maximum usable queues
  Schedulers     : 0
  Current address: 00:1f:12:b7:d7:c0, Hardware address: 00:1f:12:b7:d6:76
  Last flapped   : 2008-09-05 16:44:30 PDT (3d 01:04 ago)
  Input rate      : 0 bps (0 pps)
  Output rate     : 0 bps (0 pps)
  Active alarms   : None
  Active defects  : None

Logical interface ge-2/2/2.0 (Index 82) (SNMP ifIndex 219)
  Flags: SNMP-Traps 0x20000000 Encapsulation: Ethernet-Bridge
  Input packets : 0
  Output packets: 0
  Protocol aenet, AE bundle: ae0.0   Link Index: 4

```

**show interfaces brief
(Gigabit Ethernet)**

```

user@host> show interfaces ge-3/0/2 brief
Physical interface: ge-3/0/2, Enabled, Physical link is Up
  Link-level type: 52, MTU: 1522, Speed: 1000mbps, Loopback: Disabled,
  Source filtering: Disabled, Flow control: Enabled, Auto-negotiation: Enabled,
  Remote fault: Online
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000
  Link flags     : None

Logical interface ge-3/0/2.0
  Flags: SNMP-Traps 0x4000
  VLAN-Tag [ 0x8100.512 0x8100.513 ] In(pop-swap 0x8100.530) Out(swap-push
    0x8100.512 0x8100.513)
  Encapsulation: VLAN-CCC
  ccc

```

Logical interface ge-3/0/2.32767
 Flags: SNMP-Traps 0x4000 VLAN-Tag [0x0000.0] Encapsulation: ENET2

**show interfaces detail
 (Gigabit Ethernet)**

```
user@host> show interfaces ge-3/0/2 detail
Physical interface: ge-3/0/2, Enabled, Physical link is Up
  Interface index: 167, SNMP ifIndex: 35, Generation: 177
  Link-level type: 52, MTU: 1522, Speed: 1000Mbps, Loopback: Disabled,
  Source filtering: Disabled, Flow control: Enabled, Auto-negotiation: Enabled,
  Remote fault: Online
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000
  Link flags     : None
  CoS queues    : 4 supported, 4 maximum usable queues
  Hold-times    : Up 0 ms, Down 0 ms
  Current address: 00:05:85:4a:e9:7c, Hardware address: 00:05:85:4a:e9:7c
  Last flapped  : 2006-08-09 17:17:00 PDT (01:31:33 ago)
  Statistics last cleared: Never
  Traffic statistics:
    Input bytes   : 0          0 bps
    Output bytes  : 0          0 bps
    Input packets : 0          0 pps
    Output packets: 0          0 pps
  Ingress traffic statistics at Packet Forwarding Engine:
    Input bytes   : 0          0 bps
    Input packets : 0          0 pps
    Drop bytes    : 0          0 bps
    Drop packets  : 0          0 pps
  Ingress queues: 4 supported, 4 in use
  Queue counters:
    Queued packets  Transmitted packets  Dropped packets

    0 best-effort    0          0          0
    1 expedited-fo   0          0          0
    2 assured-forw    0          0          0
    3 network-cont    0          0          0

  Egress queues: 4 supported, 4 in use
  Queue counters:
    Queued packets  Transmitted packets  Dropped packets

    0 best-effort    0          0          0
    1 expedited-fo   0          0          0
    2 assured-forw    0          0          0
    3 network-cont    0          0          0

  Active alarms : None
  Active defects: None

  Logical interface ge-3/0/2.0 (Index 72) (SNMP ifIndex 69) (Generation 140)
  Flags: SNMP-Traps 0x4000
  VLAN-Tag [0x8100.512 0x8100.513 ] In(pop-swap 0x8100.530)
  Out(swap-push 0x8100.512 0x8100.513)
  Encapsulation: VLAN-CCC
  Traffic statistics:
    Input bytes   : 0
    Output bytes  : 0
```

```

Input packets:          0
Output packets:         0
Local statistics:
Input bytes :           0
Output bytes :          0
Input packets:          0
Output packets:         0
Transit statistics:
Input bytes :           0          0 bps
Output bytes :          0          0 bps
Input packets:          0          0 pps
Output packets:         0          0 pps
Protocol ccc, MTU: 1522, Generation: 149, Route table: 0
Flags: Is-Primary

```

```

Logical interface ge-3/0/2.32767 (Index 71) (SNMP ifIndex 70)
(Generation 139)
Flags: SNMP-Traps 0x4000 VLAN-Tag [ 0x0000.0 ] Encapsulation: ENET2
Traffic statistics:
Input bytes :           0
Output bytes :          0
Input packets:          0
Output packets:         0
Local statistics:
Input bytes :           0
Output bytes :          0
Input packets:          0
Output packets:         0
Transit statistics:
Input bytes :           0          0 bps
Output bytes :          0          0 bps
Input packets:          0          0 pps
Output packets:         0          0 pps

```

**show interfaces
extensive
(Gigabit Ethernet IQ2)**

```

user@host> show interfaces extensive ge-7/1/3
Physical interface: ge-7/1/3, Enabled, Physical link is Up
Interface index: 170, SNMP ifIndex: 70, Generation: 171
Link-level type: Ethernet, MTU: 1514, Speed: 1000mbps, Loopback: Disabled,
Source filtering: Disabled, Flow control: Enabled, Auto-negotiation: Enabled,
Remote fault: Online
Device flags : Present Running
Interface flags: SNMP-Traps Internal: 0x4004000
Link flags : None
CoS queues : 8 supported, 4 maximum usable queues
Schedulers : 256
Hold-times : Up 0 ms, Down 0 ms
Current address: 00:14:f6:30:5e:74, Hardware address: 00:14:f6:30:5e:74
Last flapped : 2007-11-07 21:31:41 PST (02:03:33 ago)
Statistics last cleared: Never
Traffic statistics:
Input bytes :          38910844056          7952 bps
Output bytes :           7174605          8464 bps
Input packets:         418398473           11 pps
Output packets:          78903           12 pps
IPv6 transit statistics:
Input bytes :           0
Output bytes :           0
Input packets:          0
Output packets:          0
Ingress traffic statistics at Packet Forwarding Engine:
Input bytes :          38910799145          7952 bps

```

```

Input packets:          418397956          11 pps
Drop bytes :            0          0 bps
Drop packets:           0          0 pps
Input errors:
  Errors: 0, Drops: 0, Framing errors: 0, Runts: 0, Policed discards: 0,
  L3 incompletes: 0, L2 channel errors: 0, L2 mismatch timeouts: 0,
  FIFO errors: 0, Resource errors: 0
Output errors:
  Carrier transitions: 1, Errors: 0, Drops: 0, Collisions: 0, Aged packets: 0,

  FIFO errors: 0, HS link CRC errors: 0, MTU errors: 0, Resource errors: 0
Ingress queues: 4 supported, 4 in use
Queue counters:      Queued packets  Transmitted packets      Dropped packets

  0 best-effort          418390823          418390823          0

  1 expedited-fo              0              0              0

  2 assured-forw              0              0              0

  3 network-cont          7133          7133          0

Egress queues: 4 supported, 4 in use
Queue counters:      Queued packets  Transmitted packets      Dropped packets

  0 best-effort          1031          1031          0

  1 expedited-fo              0              0              0

  2 assured-forw              0              0              0

  3 network-cont          77872          77872          0

Active alarms : None
Active defects : None
MAC statistics:
  Receive      Transmit
  Total octets  38910844056  7174605
  Total packets  418398473    78903
  Unicast packets  408021893366    1026
  Broadcast packets      10      12
  Multicast packets  418398217    77865
  CRC/Align errors      0      0
  FIFO errors           0      0
  MAC control frames    0      0
  MAC pause frames      0      0
  Oversized frames      0
  Jabber frames         0
  Fragment frames       0
  VLAN tagged frames    0
  Code violations       0 OTN Received Overhead Bytes:
  APS/PCC0: 0x02, APS/PCC1: 0x11, APS/PCC2: 0x47, APS/PCC3: 0x58
  Payload Type: 0x08
OTN Transmitted Overhead Bytes:
  APS/PCC0: 0x00, APS/PCC1: 0x00, APS/PCC2: 0x00, APS/PCC3: 0x00
  Payload Type: 0x08
Filter statistics:
  Input packet count          418398473
  Input packet rejects        479
  Input DA rejects            479
  Input SA rejects            0
  Output packet count          78903

```

```

Output packet pad count                                0
Output packet error count                              0
CAM destination filters: 0, CAM source filters: 0
Autonegotiation information:
Negotiation status: Complete
Link partner:
  Link mode: Full-duplex, Flow control: Symmetric/Asymmetric,
  Remote fault: OK
Local resolution:
  Flow control: Symmetric, Remote fault: Link OK
Packet Forwarding Engine configuration:
Destination slot: 7
Direction : Output
CoS transmit queue      Bandwidth      Buffer      Priority      Limit
                        %          bps      %          usec
0 best-effort           95      950000000  95           0
low  none
3 network-control       5       50000000  5            0
low  none
Direction : Input
CoS transmit queue      Bandwidth      Buffer      Priority      Limit
                        %          bps      %          usec
0 best-effort           95      950000000  95           0
low  none
3 network-control       5       50000000  5            0
low  none

Logical interface ge-7/1/3.0 (Index 70) (SNMP ifIndex 85) (Generation 150)
Flags: SNMP-Traps Encapsulation: ENET2
Traffic statistics:
Input bytes :      812400
Output bytes :    1349206
Input packets:      9429
Output packets:    9449
IPv6 transit statistics:
Input bytes :      0
Output bytes :      0
Input packets:      0
Output packets:      0
Local statistics:
Input bytes :      812400
Output bytes :    1349206
Input packets:      9429
Output packets:    9449
Transit statistics:
Input bytes :      0          7440 bps
Output bytes :      0          7888 bps
Input packets:      0          10 pps
Output packets:      0          11 pps
IPv6 transit statistics:
Input bytes :      0
Output bytes :      0
Input packets:      0
Output packets:      0
Protocol inet, MTU: 1500, Generation: 169, Route table: 0
Flags: Is-Primary, Mac-Validate-Strict
Mac-Validate Failures: Packets: 0, Bytes: 0
Addresses, Flags: Is-Preferred Is-Primary
Input Filters: F1-ge-3/0/1.0-in, F3-ge-3/0/1.0-in
Output Filters: F2-ge-3/0/1.0-out (53)
Destination: 10.74.2/24, Local: 10.74.2.2, Broadcast: 10.74.2.255,

```



```

Generation: 196
Protocol multiservice, MTU: Unlimited, Generation: 170, Route table: 0
Flags: Is-Primary
Policer: Input: __default_arp_policer__

```

NOTE: For Gigabit Ethernet intelligent queuing 2 (IQ2) interfaces, the logical interface egress statistics displayed in the **show interfaces** command output might not accurately reflect the traffic on the wire when output shaping is applied. Traffic management output shaping might drop packets after they are tallied by the interface counters. For detailed information, see the description of the logical interface **Transit statistics** fields in [\[Unresolved xref\]](#).

show interfaces
(Gigabit Ethernet
Unnumbered Interface)

```

user@host> show interfaces ge-3/2/0
Physical interface: ge-3/2/0, Enabled, Physical link is Up
  Interface index: 148, SNMP ifIndex: 50
  Link-level type: Ethernet, MTU: 1514, Speed: 1000mbps, Loopback: Disabled,
  Source filtering: Disabled, Flow control: Enabled, Auto-negotiation: Enabled,
  Remote fault: Online
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000
  Link flags     : None
  CoS queues     : 8 supported, 4 maximum usable queues
  Current address: 00:14:f6:11:26:f8, Hardware address: 00:14:f6:11:26:f8
  Last flapped   : 2006-10-27 04:42:23 PDT (08:01:52 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 624 bps (1 pps)
  Active alarms  : None
  Active defects : None

Logical interface ge-3/2/0.0 (Index 67) (SNMP ifIndex 85)
  Flags: SNMP-Traps Encapsulation: ENET2
  Input packets : 0
  Output packets: 6
  Protocol inet, MTU: 1500
  Flags: Unnumbered
  Donor interface: lo0.0 (Index 64)
  Preferred source address: 22.22.22.22

```

show l2-learning backbone-instance

Syntax	show l2-learning backbone-instance <bridge-domain-name> <isid [isid-number] all-isid> <instance [instance-name]> <logical-system [system-name all]>
Release Information	(MX Series routers only) Command introduced in JUNOS Release 10.0.
Description	Displays the remote backbone edge bridges in a PBBN network.
Options	<p><i>bridge-domain-name</i>—(Optional) Display information for a specified bridge domain.</p> <p><i>isid isid-number</i>—(Optional) Display MAC addresses learned on a specified service identifier (I-SID). The I-SID value can be from 256 through 16777215.</p> <p><i>all-isid</i>—Display MAC addresses learned on all I-SIDs.</p> <p><i>instance instance-name</i>—(Optional) Display information for a specified instance.</p> <p><i>logical-system [system-name all]</i>—(Optional) Display information for a specified logical system or all systems.</p>
Required Privilege Level	view
Related Topics	<ul style="list-style-type: none"> ■ show l2-learning remote-backbone-edge-bridge ■ show l2-learning provider-instance ■ Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX series Routers on page 17
List of Sample Output	<p>show l2-learning backbone-instance on page 229</p> <p>show l2-learning backbone-instance instance on page 229</p> <p>show l2-learning backbone-instance isid on page 230</p> <p>show l2-learning backbone-instance logical-system on page 230</p>
Output Fields	Table 15 on page 228 describes the output fields for the show l2-learning instance command. Output fields are listed in the approximate order in which they appear.

Table 15: show l2-learning instance Output Fields

Field Name	Field Description
PBN Routing Instance	Name of PBN routing instance.
bridging domain	Name of bridging domain.
Index	Number associated with the routing instance or bridging domain.
Logical System	Name of the logical system or Default if no logical system is configured.

Table 15: show l2-learning instance Output Fields (continued)

Field Name	Field Description
Routing instance flags	Status of Layer 2 learning properties for each routing instance: <ul style="list-style-type: none"> ■ P2P—Point-to-point service (E-LINE). ■ MP—Multi-point service (E-LAN). ■ M1—Many service VLANs (S-VLANs) to one I-SID. ■ O1—One S-VLAN to one I-SID.
MAC limit	Maximum number of MAC addresses that can be learned from each interface in the routing instance or bridging domain.

**show l2-learning
backbone-instance**

```

user@host> show l2-learning backbone-instance
Backbone Routing Instance : vin2, PBBN-ID: 0
Backbone Bridging domain : bd2, VLAN-ID : 200

Flags (P2P -ELINE service,          MP -ELAN service)
      M1 -Many svlans to 1 isid, O1 -One svlan to 1 isid)

ISID      PBN      Provider      S-VLAN  Flags  Backbone
Routing   Bridging   Bridging   Destination
Instance  Domain
300      vin1      bd1        100     M1,MP  01:1e:86:00:01:2c

Backbone Routing Instance : vin2, PBBN-ID: 0
Backbone Bridging domain : bd201, VLAN-ID : 201

Flags (P2P -ELINE service,          MP -ELAN service)
      M1 -Many svlans to 1 isid, O1 -One svlan to 1 isid)

ISID      PBN      Provider      S-VLAN  Flags  Backbone
Routing   Bridging   Bridging   Destination
Instance  Domain
301      vin1      bd101      101     M1,MP  01:1e:86:00:01:2d

```

**show l2-learning
backbone-instance
instance**

```

user@host> show l2-learning backbone-instance vin2
Backbone Routing Instance : vin2, PBBN-ID: 0
Backbone Bridging domain : bd2, VLAN-ID : 200

Flags (P2P -ELINE service,          MP -ELAN service)
      M1 -Many svlans to 1 isid, O1 -One svlan to 1 isid)

ISID      PBN      Provider      S-VLAN  Flags  Backbone
Routing   Bridging   Bridging   Destination
Instance  Domain
300      vin1      bd1        100     M1,MP  01:1e:86:00:01:2c

Backbone Routing Instance : vin2, PBBN-ID: 0
Backbone Bridging domain : bd201, VLAN-ID : 201

Flags (P2P -ELINE service,          MP -ELAN service)
      M1 -Many svlans to 1 isid, O1 -One svlan to 1 isid)

ISID      PBN      Provider      S-VLAN  Flags  Backbone

```

	Routing Instance	Bridging Domain			Destination MAC
301	vin1	bd101	101	M1,MP	01:1e:86:00:01:2d

**show I2-learning
backbone-instance isid**

```
user@host> show I2-learning backbone-instance isid 301
```

```
Backbone Routing Instance : vin2, PBBN-ID: 0
```

```
Backbone Bridging domain : bd201, VLAN-ID : 201
```

```
Flags (P2P -ELINE service,          MP -ELAN service)
      M1 -Many svlans to 1 isid, 01 -One svlan to 1 isid)
```

ISID	PBN Routing Instance	Provider Bridging Domain	S-VLAN	Flags	Backbone Destination MAC
301	vin1	bd101	101	M1,MP	01:1e:86:00:01:2d

**show I2-learning
backbone-instance
logical-system**

```
user@host> show I2-learning backbone-instance logical-system all
```

```
Backbone Routing Instance : vin2, PBBN-ID: 0
```

```
Backbone Bridging domain : bd2, VLAN-ID : 200
```

```
Flags (P2P -ELINE service,          MP -ELAN service)
      M1 -Many svlans to 1 isid, 01 -One svlan to 1 isid)
```

ISID	PBN Routing Instance	Provider Bridging Domain	S-VLAN	Flags	Backbone Destination MAC
300	vin1	bd1	100	M1,MP	01:1e:86:00:01:2c

```
Backbone Routing Instance : vin2, PBBN-ID: 0
```

```
Backbone Bridging domain : bd201, VLAN-ID : 201
```

```
Flags (P2P -ELINE service,          MP -ELAN service)
      M1 -Many svlans to 1 isid, 01 -One svlan to 1 isid)
```

ISID	PBN Routing Instance	Provider Bridging Domain	S-VLAN	Flags	Backbone Destination MAC
301	vin1	bd101	101	M1,MP	01:1e:86:00:01:2d

show l2-learning provider-instance

Syntax	show l2-learning provider-instance <isid [<i>isid-number</i>] all-isid> <instance [<i>instance-name</i>]> <logical-system [<i>system-name</i> all]>
Release Information	(MX Series routers only) Command introduced in JUNOS Release 10.0.
Description	Displays the provider instance (I-component).
Options	<p>none—Display information for all authenticator ports.</p> <p>isid <i>isid-number</i>—(Optional) Display MAC addresses learned on a specified service identifier (I-SID). The I-SID value can be from 256 through 16777215.</p> <p>all-isid—Display MAC addresses learned on all I-SIDs.</p> <p>instance <i>instance-name</i>—(Optional) Display information for a specified instance.</p> <p>logical-system [<i>system-name</i> all]—(Optional) Display information for a specified logical system or all systems.</p>
Required Privilege Level	view
Related Topics	<ul style="list-style-type: none"> ■ show l2-learning backbone-instance ■ show l2-learning remote-backbone-edge-bridge ■ Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX series Routers on page 17
List of Sample Output	<p>show l2-learning provider-instance on page 232</p> <p>show l2-learning provider-instance instance on page 232</p> <p>show l2-learning provider-instance isid on page 232</p> <p>show l2-learning provider-instance instance logical-system on page 233</p>
Output Fields	Table 15 on page 228 describes the output fields for the show l2-learning instance command. Output fields are listed in the approximate order in which they appear.

Table 16: show l2-learning instance Output Fields

Field Name	Field Description
PBN Routing Instance	Name of the PBN routing instance.
bridging domain	Name of the bridging domain.
Index	Number associated with the routing instance or bridging domain.
Logical System	Name of the logical system or Default if no logical system is configured.

Table 16: show I2-learning instance Output Fields (continued)

Field Name	Field Description
Routing instance flags	Status of the Layer 2 learning properties for each routing instance: <ul style="list-style-type: none"> ■ P2P—Point-to-point service (E-LINE). ■ MP—Multi-point service (E-LAN). ■ M1—Many service VLANs (S-VLANs) to one I-SID. ■ O1—One S-VLAN to one I-SID.
MAC limit	Maximum number of MAC addresses that can be learned from each interface in the routing instance or bridging domain.

**show I2-learning
provider-instance**

```

user@host> show I2-learning provider-instance
PBN Routing Instance: pbn-3-for-elan
Flags (P2P -ELINE service,      MP -ELAN service,
      M1 -Many svlans to 1 isid, O1 -One svlan to 1 isid)

PBN          S-VLAN  ISID      PBBN          B-VLAN  Flags
Bridging
Domain
elan-svlans-vlan-1300 1300 10300  elan-bvlan    3350    M1,MP
elan-svlans-vlan-1400 1400 10400  elan-bvlan    3350    M1,MP

PBN Routing Instance: pbn-3-for-eline
Flags (P2P -ELINE service,      MP -ELAN service,
      M1 -Many svlans to 1 isid, O1 -One svlan to 1 isid)

PBN          S-VLAN  ISID      PBBN          B-VLAN  Flags
Bridging
Domain
eline-svlans-vlan-1200 1200 10200  eline-bvlan   3150    M1,P2P
eline-svlans-vlan-2100 2100 10100  eline-bvlan   3150    M1,P2P

```

**show I2-learning
provider-instance
instance**

```

user@host> show I2-learning provider-instance instance vin1
PBN Routing Instance: vin1
Flags (P2P -ELINE service,      MP -ELAN service,
      M1 -Many svlans to 1 isid, O1 -One svlan to 1 isid)

PBN          S-VLAN  ISID      PBBN          B-VLAN  Flags
Bridging
Domain
bd1           100      300      bd2            200      M1,MP
bd101         101      301      bd201          201      M1,MP

```

**show I2-learning
provider-instance isid**

```

user@host> show I2-learning provider-instance isid 300
PBN Routing Instance: vin1
Flags (P2P -ELINE service,      MP -ELAN service,
      M1 -Many svlans to 1 isid, O1 -One svlan to 1 isid)

PBN          S-VLAN  ISID      PBBN          B-VLAN  Flags
Bridging
Domain
bd1           100      300      bd2            200      M1,MP

```

**show l2-learning
provider-instance
instance logical-system**

```
user@host> show l2-learning provider-instance logical-system all
PBN Routing Instance: vin1
Flags (P2P -ELINE service,          MP -ELAN service,
      M1 -Many svlans to 1 isid, 01 -One svlan to 1 isid)

PBN          S-VLAN  ISID      PBBN          B-VLAN  Flags
Bridging
Domain
bd1           100     300      bd2           200      M1,MP
bd101         101     301      bd201         201      M1,MP

user@host> show l2-learning provider-instance logical-system bd1
PBN Routing Instance: vin1
Flags (P2P -ELINE service,          MP -ELAN service,
      M1 -Many svlans to 1 isid, 01 -One svlan to 1 isid)

PBN          S-VLAN  ISID      PBBN          B-VLAN  Flags
Bridging
Domain
bd1           100     300      bd2           200      M1,MP
```

show l2-learning remote-backbone-edge-bridge

Syntax	show l2-learning remote-backbone-edge-bridge <remote-beb-mac-address> <instance [<i>instance-name</i>]> <logical-system [<i>system-name</i> all]>
Release Information	(MX Series routers only) Command introduced in JUNOS Release 10.0.
Description	Displays the remote backbone edge bridges in a PBBN network.
Options	<p><i>remote-beb-mac-address</i>—(Optional) Display information for a remote backbone edge bridge MAC address.</p> <p><i>instance</i><i>instance-name</i>—(Optional) Display information for a specified instance.</p> <p><i>logical-system</i> [<i>system-name</i> all]—(Optional) Display information for a specified logical system or all systems.</p>
Required Privilege Level	view
Related Topics	<ul style="list-style-type: none"> ■ show l2-learning remote-backbone-edge-bridge ■ show l2-learning provider-instance ■ Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX series Routers on page 17
List of Sample Output	<p>show l2-learning backbone-instance on page 235</p> <p>show l2-learning remote-backbone-edge-bridge instance on page 235</p> <p>show l2-learning remote-backbone-edge-bridge logical-system on page 235</p>
Output Fields	Table 15 on page 228 describes the output fields for the show l2-learning instance command. Output fields are listed in the approximate order in which they appear.

Table 17: show l2-learning instance Output Fields

Field Name	Field Description
PBN Routing Instance	Name of the PBN routing instance.
bridging domain	Name of the bridging domain.
Index	Number associated with the routing instance or bridging domain.
Logical System	Name of the logical system or Default if no logical system is configured.
Routing instance flags	<p>Status of Layer 2 learning properties for each routing instance:</p> <ul style="list-style-type: none"> ■ P2P—Point-to-point service (E-LINE). ■ MP—Multi-point service (E-LAN). ■ M1—Many service VLANs (S-VLANs) to one I-SID. ■ O1—One S-VLAN to one I-SID.

Table 17: show l2-learning instance Output Fields (continued)

Field Name	Field Description
MAC limit	Maximum number of MAC addresses that can be learned from each interface in the routing instance or bridging domain.

```

show l2-learning backbone-instance user@host> show l2-learning backbone-instance
Backbone Routing Instance : vin2, PBBN-ID: 0
Backbone Bridging domain : bd2, VLAN-ID : 200

Flags (P2P -ELINE service,          MP -ELAN service)
      M1 -Many svlans to 1 isid, 01 -One svlan to 1 isid)

ISID      PBN      Provider      S-VLAN  Flags  Backbone
Routing   Instance Bridging   Destination
Instance  Domain
300      vin1      bd1        100     M1,MP  01:1e:86:00:01:2c

Backbone Routing Instance : vin2, PBBN-ID: 0
Backbone Bridging domain : bd201, VLAN-ID : 201

Flags (P2P -ELINE service,          MP -ELAN service)
      M1 -Many svlans to 1 isid, 01 -One svlan to 1 isid)

ISID      PBN      Provider      S-VLAN  Flags  Backbone
Routing   Instance Bridging   Destination
Instance  Domain
301      vin1      bd101       101     M1,MP  01:1e:86:00:01:2d

show l2-learning remote-backbone-edge-bridge instance user@host> show l2-learning remote-backbone-edge-bridge instance vin2
Remote backbone edge bridge information per provider backbone bridge network
(PBBN)

RBEB flags (S -Static)

PBBN Routing instance : vin2

RBEB MAC      Time before      Flags
Address        expiry (SS:MS)
00:aa:00:00:00:00 :

show l2-learning remote-backbone-edge-bridge logical-system user@host> show l2-learning remote-backbone-edge-bridge logical-system all
Remote backbone edge bridge information per provider backbone bridge network
(PBBN)

RBEB flags (S -Static)

PBBN Routing instance : vin2

RBEB MAC      Time before      Flags
Address        expiry (SS:MS)
00:aa:00:00:00:00 :

```


Chapter 10

CoS Monitoring Commands

show class-of-service interface-set

Syntax	show class-of-service interface-set <i><interface-set-name></i>
Release Information	Command introduced in JUNOS Release 9.4.
Description	Display the configured shaping rate and the adjusted shaping rate for each logical interface set configured for hierarchical class of service (CoS).
Options	none—Display CoS associations for all logical interface sets. <i>interface-set-name</i> —(Optional) Display CoS associations for the specified interface set.
Required Privilege Level	view
List of Sample Output	show class-of-service interface-set on page 239
Output Fields	Table 18 on page 238 lists the output fields for the show class-of-service interface-set command. Output fields are listed in the approximate order in which they appear.

Table 18: show class-of-service interface-set Output Fields

Field Name	Field Description
Interface-set	Name of a logical interface set composed of one or more logical interfaces for which hierarchical scheduling is enabled.
Index	Index of this interface set or the internal index of this object.
Physical interface	Name of a physical interface.
Queues supported	Number of queues you can configure on the interface.
Queues in use	Number of queues currently configured.
Output traffic control profile	Name of the output traffic-control profile attached to the logical interface set.
Adjusting application	<p>Name of the application that communicates shaping-rate adjustment information to the JUNOS class-of-service process (cosd) on the broadband services router (BSR). The BSR uses the information from this application to perform shaping-rate adjustments on the scheduler node that manages the interface set. The adjusting application can be one of the following:</p> <p>ancp LS-0—JUNOS Access Node Control Profile process (ancpd) that performs shaping-rate adjustments on schedule nodes that are logical interface sets configured to represent subscriber local loops. When the synchronization speed of the DSL line changes, ancpd communicates the local loop speed to cosd over the default logical system, LS-0, and then the BSR throttles the shaping rate on the scheduler node to the loop speed.</p>

Table 18: show class-of-service interface-set Output Fields *(continued)*

Field Name	Field Description
Adjustment type	Type of shaping-rate adjustment performed by the BSR on the scheduler node. The type of adjustment can be one of the following: absolute—The configured shaping rate is adjusted by an absolute value as opposed to by a percentage of the configured rate.
Configured shaping rate	The maximum transmission rate on the physical interface as configured by the output traffic-control profile attached to the scheduler node.
Adjustment value	Value of the shaping-rate adjustment information sent by the adjusting application to cosd.

```

show class-of-service interface-set user@host> show class-of-service interface-set example-ifset-ge-4/0/0-7
Interface-set: example-ifset-ge-4/0/0-7, Index: 8
Physical interface: ge-4/0/0, Index: 270
Queues supported: 8, Queues in use: 8
Output traffic control profile: example-tcp-basic-rate, Index: 11395
Adjusting application: ancp LS-0
Adjustment type: absolute
Configured shaping rate: 50000000
Adjustment value: 888000

```

show class-of-service scheduler-map

Syntax	show class-of-service scheduler-map <i><name></i>
Release Information	Command introduced before JUNOS Release 7.4.
Description	Display the mapping of schedulers to forwarding classes and a summary of scheduler parameters for each entry.
Options	<p>none—Display all scheduler maps.</p> <p><i>name</i>—(Optional) Display a summary of scheduler parameters for each forwarding class to which the named scheduler is assigned.</p>
Required Privilege Level	view
List of Sample Output	show class-of-service scheduler-map on page 241
Output Fields	Table 19 on page 240 describes the output fields for the show class-of-service scheduler-map command. Output fields are listed in the approximate order in which they appear.

Table 19: show class-of-service scheduler-map Output Fields

Field Name	Field Description
Scheduler map	Name of the scheduler map.
Index	Index of the indicated object. Objects having indexes in this output include scheduler maps, schedulers, and drop profiles.
Scheduler	Name of the scheduler.
Forwarding class	Classification of a packet affecting the forwarding, scheduling, and marking policies applied as the packet transits the router.
Transmit rate	Configured transmit rate of the scheduler (in bps). The rate is a percentage of the total interface bandwidth, or the keyword remainder , which indicates that the scheduler receives the remaining bandwidth of the interface.
Rate Limit	Rate limiting configuration of the queue. Possible values are none , meaning no rate limiting, and exact , meaning the queue only transmits at the configured rate.
Maximum buffer delay	Amount of transmit delay (in milliseconds) or the buffer size of the queue. The buffer size is shown as a percentage of the total interface buffer allocation, or by the keyword remainder to indicate that the buffer is sized according to what remains after other scheduler buffer allocations.
Priority	Scheduling priority: low or high .
Drop profiles	Table displaying the assignment of drop profile by name and index to a given loss priority and protocol pair.
Loss priority	Packet loss priority for drop profile assignment.

Table 19: show class-of-service scheduler-map Output Fields (continued)

Field Name	Field Description
Protocol	Transport protocol for drop profile assignment.
Name	Name of the drop profile.

```

show class-of-service scheduler-map user@host> show class-of-service scheduler-map
Scheduler map: dd-scheduler-map, Index: 84

Scheduler: aa-scheduler, Index: 8721, Forwarding class: aa-forwarding-class
Transmit rate: 30 percent, Rate Limit: none, Maximum buffer delay: 39 ms,
Priority: high
Drop profiles:
  Loss priority  Protocol  Index  Name
  Low           non-TCP   8724   aa-drop-profile
  Low           TCP      9874   bb-drop-profile
  High          non-TCP   8833   cc-drop-profile
  High          TCP      8484   dd-drop-profile

Scheduler: bb-scheduler, Forwarding class: aa-forwarding-class
Transmit rate: 40 percent, Rate limit: none, Maximum buffer delay: 68 ms,
Priority: high
Drop profiles:
  Loss priority  Protocol  Index  Name
  Low           non-TCP   8724   aa-drop-profile
  Low           TCP      9874   bb-drop-profile
  High          non-TCP   8833   cc-drop-profile
  High          TCP      8484   dd-drop-profile

```

show class-of-service traffic-control-profile

Syntax	show class-of-service traffic-control-profile <i><profile-name></i>
Release Information	Command introduced before JUNOS Release 7.4.
Description	For Gigabit Ethernet IQ and Channelized IQ PICs only, display traffic shaping and scheduling profiles.
Options	none—Display all profiles. <i>profile-name</i> —(Optional) Display information about a single profile.
Required Privilege Level	view
List of Sample Output	show class-of-service traffic-control-profile on page 242
Output Fields	Table 20 on page 242 describes the output fields for the show class-of-service traffic-control-profile command. Output fields are listed in the approximate order in which they appear.

Table 20: show class-of-service traffic-control-profile Output Fields

Field Name	Field Description
Traffic control profile	Name of the traffic-control profile.
Index	Index number of the traffic-control profile.
Scheduler map	Name of the associated scheduler map.
Delay Buffer rate	Configured delay-buffer rate, in bps.
Guaranteed rate	Configured guaranteed rate, in bps.

```

show class-of-service traffic-control-profile
user@host> show class-of-service traffic-control-profile
Traffic control profile: Profile1, Index: 57625
  Scheduler map: m1
  Delay Buffer rate: 500000
  Guaranteed rate: 1000000

Traffic control profile: Profile2, Index: 57624
  Scheduler map: m2
  Delay Buffer rate: 600000
  Guaranteed rate: 2000000

Traffic control profile: Profile3, Index: 57627
  Scheduler map: m3
  Delay Buffer rate: 800000
  Guaranteed rate: 3000000

Traffic control profile: Profile4, Index: 57626

```



```
Scheduler map: m4  
Delay Buffer rate: 750000  
Guaranteed rate: 4000000
```

show firewall

Syntax	show firewall <filter <i>filter-name</i> > <counter <i>counter-name</i> > <logical-system (<i>logical-system-name</i> all)>
Release Information	Command introduced before JUNOS Release 7.4. The logical-system option introduced in JUNOS Release 9.3.
Description	Display statistics about configured firewall filters.
Options	<i>filter-name</i> —(Optional) Name of a configured filter. counter <i>counter-name</i> —(Optional) Name of a filter counter. logical-system (<i>logical-system-name</i> all)—(Optional) Perform this operation on all logical systems or on a particular system.
Required Privilege Level	view
Related Topics	■ clear firewall
List of Sample Output	show firewall filter on page 246 show firewall filter (Dynamic Input Filter) on page 246 show firewall (Logical Systems) on page 246
Output Fields	Table 21 on page 244 lists the output fields for the show firewall command. Output fields are listed in the approximate order in which they appear.

Table 21: show firewall Output Fields

Field Name	Field Description
Filter	<p>Name of a filter that has been configured with the filter statement at the [edit firewall] hierarchy level.</p> <p>When an interface-specific filter is displayed, the name of the filter is followed by the full interface name and by either -i for an input filter, or -o for an output filter.</p> <p>When dynamic filters are displayed, the name of the filter is followed by the full interface name and by either -in for an input filter, or -out for an output filter. When a logical system-specific filter is displayed, the name of the filter is prefixed with two underscore (__) characters and the name of the logical system (for example, __ls1/filter1).</p>
Counters	<p>Display filter counter information:</p> <ul style="list-style-type: none"> ■ Name—Name of a filter counter that has been configured with the counter firewall filter action. ■ Bytes—Number of bytes that match the filter term under which the counter action is specified. ■ Packets—Number of packets that matched the filter term under which the counter action is specified.

Table 21: show firewall Output Fields *(continued)*

Field Name	Field Description
Policers	<p>Display policer information:</p> <ul style="list-style-type: none">■ Name—Name of policer.■ Packets—Number of packets that matched the filter term under which the policer action is specified. This is only the number of out-of-spec packet counts, not all packets policed by the policer.

show firewall filter user@host> show firewall filter test

Filter: test

Counters:

Name	Bytes	Packets
Counter-1	0	0
Counter-2	0	0

Policers:

Name	Packets
Policer-1	0

show firewall filter user@host> show firewall filter dfwd-ge-5/0/0.1-in
(Dynamic Input Filter) Filter: dfwd-ge-5/0/0.1-in

Counters:

Name	Bytes	Packets
c1-ge-5/0/0.1-in	0	0

show firewall (Logical user@host>show firewall
Systems)

Filter: __lr1/test

Counters:

Name	Bytes	Packets
icmp	420	5

Filter: __default_bpdu_filter__

Filter: __lr1/inet_filter1

Counters:

Name	Bytes	Packets
inet_tcp_count	0	0
inet_udp_count	0	0

Filter: __lr1/inet_filter2

Counters:

Name	Bytes	Packets
inet_icmp_count	0	0
inet_pim_count	0	0

Filter: __lr2/inet_filter1

Counters:

Name	Bytes	Packets
inet_tcp_count	0	0
inet_udp_count	0	0

show interfaces interface-set queue

Syntax	show interfaces interface-set queue <i>interface-set-name</i> <aggregate remaining-traffic> <forwarding-class <i>class-name</i> >
Release Information	Command introduced in JUNOS Release 8.5.
Description	Display information about the gigabit or 10-Gigabit Ethernet interface set queue. Supported in MX Series routers with enhanced queuing DPCs.
Options	<p><i>interface-set-name</i>—(Optional) Display information about the specified gigabit or 10-Gigabit Ethernet interface set. Wildcard values can be used in the interface set name.</p> <p><i>aggregate</i>—(Optional) Display the aggregated queuing statistics of all member logical interfaces for interface sets that have traffic-control profiles configured.</p> <p><i>both-ingress-egress</i>—(Optional) On Gigabit Ethernet Intelligent Queuing 2 (IQ2) PICs, display both ingress and egress queue statistics.</p> <p><i>egress</i>—(Optional) Display egress queue statistics.</p> <p><i>forwarding-class class-name</i>—(Optional) Display queuing statistics for the specified forwarding class.</p> <p><i>ingress</i>—(Optional) On Gigabit Ethernet IQ2 PICs, display ingress queue statistics.</p> <p><i>remaining-traffic</i>—(Optional) Display the queuing statistics of all member logical interfaces for interface sets that do not have traffic-control profiles configured.</p>
Required Privilege Level	view
Related Topics	Example: Configuring E-LINE and E-LAN Services for a PBB Network on MX series Routers on page 17
List of Sample Output	<p>show interfaces interface-set queue (Gigabit Ethernet) on page 248</p> <p>show interfaces interface-set queue both-ingress-egress (Enhanced DPC) on page 249</p> <p>show interfaces interface-set queue egress (Enhanced DPC) on page 251</p> <p>show interfaces interface-set queue forwarding-class (Gigabit Ethernet) on page 252</p> <p>show interfaces interface-set queue (Enhanced DPC) on page 253</p> <p>show interfaces interface-set queue remaining-traffic (Gigabit Ethernet) on page 253</p>
Output Fields	<p>See [Unresolved xref] for the output fields for the show interfaces (Fast Ethernet and Gigabit Ethernet) command.</p> <p>Table 22 on page 248 describes the information for the show interfaces interface-set queue command.</p>

Table 22: Ethernet show interfaces interface-set queue Output Fields

Field Name	Field Description	Level of Output
Physical Interface		
Interface set	Name of the interface set.	All levels
Interface set index	Index number of the interface set.	All levels
Forwarding classes supported	Total number of forwarding classes supported on the specified interface set.	All levels
Forwarding classes in use	Total number of forwarding classes used on the specified interface set.	All levels
Egress queues supported	Total number of egress queues supported on the specified interface set.	All levels
Egress queues in use	Total number of egress queues used on the specified interface set.	All levels
Ingress queues supported	Total number of ingress queues supported on the specified interface set.	
Ingress queues in use	Total number of ingress queues used on the specified interface set.	
Queue	Egress or ingress queue number for the statistics being displayed.	All levels
Forwarding classes	Forwarding class name for the statistics being displayed.	All levels
Queued	Packet and Byte statistics for the specified queue.	All levels
	<ul style="list-style-type: none"> ■ Packets—Number of packets queued and input rate in packets per second. ■ Bytes—Number of bytes queued and input rate in bytes per second. 	
Transmitted	Packet and Byte statistics for the specified forwarding class.	All levels
	■ Packets—Number of packets transmitted and transmit rate in packets per second.	
	■ Bytes—Number of bytes transmitted and transmit rate in bytes per second.	
	■ Tail-dropped packets—Number of packets tail dropped.	
	■ RED-dropped packets—Number of RED-dropped packets for the low, medium-low, medium-high, and high loss priorities.	
	■ RED-dropped bytes—Number of RED-dropped bytes for the low, medium-low, medium-high, and high loss priorities.	

**show interfaces
interface-set queue
(Gigabit Ethernet)**

```
user@host> show interfaces interface-set queue ge-2/2/0-0
```

```
Interface set: ge-2/2/0-0
```

```
Interface set index: 3
```

```
Forwarding classes: 8 supported, 4 in use
```

```
Egress queues: 4 supported, 4 in use
```

```
Queue: 0, Forwarding classes: best-effort
```

```
Queued:
```

```
Packets : 3998482
```

```
1 pps
```

```

      Bytes                :                271896884                688 bps
Transmitted:
  Packets                :                1077474                1 pps
  Bytes                  :                73268340                688 bps
  Tail-dropped packets :                0                0 pps
  RED-dropped packets  :                2921008                0 pps
    Low                  :                2921008                0 pps
    Medium-low           :                0                0 pps
    Medium-high          :                0                0 pps
    High                 :                0                0 pps
  RED-dropped bytes    :                198628544                0 bps
    Low                  :                198628544                0 bps
    Medium-low           :                0                0 bps
    Medium-high          :                0                0 bps
    High                 :                0                0 bps
Queue: 2, Forwarding classes: assured-forwarding
  Queued:
    Packets                :                0                0 pps
    Bytes                  :                0                0 bps
  Transmitted:
...

```

**show interfaces
interface-set queue
both-ingress-egress
(Enhanced DPC)**

```

user@host> show interfaces interface-set queue ge-2/2/0-0 both-ingress-egress
Interface set: ge-2/2/0-0
Interface set index: 3
Forwarding classes: 16 supported, 4 in use
Ingress queues: 4 supported, 4 in use
Queue: 0, Forwarding classes: best-effort
  Queued:
    Packets                :                185968478                473161 pps
    Bytes                  :                10042313520                204441336 bps
  Transmitted:
    Packets                :                5441673                13780 pps
    Bytes                  :                293850342                5952960 bps
    Tail-dropped packets :                0                0 pps
    RED-dropped packets  :                180526772                459372 pps
    RED-dropped bytes    :                9748446282                198451512 bps
Queue: 1, Forwarding classes: expedited-forwarding
  Queued:
    Packets                :                0                0 pps
    Bytes                  :                0                0 bps
  Transmitted:
    Packets                :                0                0 pps
    Bytes                  :                0                0 bps
    Tail-dropped packets :                0                0 pps
    RED-dropped packets  :                0                0 pps
    RED-dropped bytes    :                0                0 bps
Queue: 2, Forwarding classes: assured-forwarding
  Queued:
    Packets                :                522021472                473602 pps
    Bytes                  :                28190332480                204599944 bps
  Transmitted:
    Packets                :                5791772                4055 pps
    Bytes                  :                312755688                1751976 bps
    Tail-dropped packets :                0                0 pps
    RED-dropped packets  :                516227139                469546 pps
    RED-dropped bytes    :                27876265560                202843872 bps
Queue: 3, Forwarding classes: network-control
  Queued:
    Packets                :                0                0 pps
    Bytes                  :                0                0 bps

```

```

Transmitted:
Packets          :          0          0 pps
Bytes            :          0          0 bps
Tail-dropped packets :          0          0 pps
RED-dropped packets :          0          0 pps
RED-dropped bytes  :          0          0 bps
Forwarding classes: 16 supported, 4 in use
Egress queues: 4 supported, 4 in use
Queue: 0, Forwarding classes: best-effort
Queued:
Packets          :          5417304      13797 pps
Bytes            :          368429508    7506096 bps
Transmitted:
Packets          :          5014996      12769 pps
Bytes            :          341019728    6946560 bps
Tail-dropped packets :          0          0 pps
RED-dropped packets :          402189      1028 pps
  Low            :          402189      1028 pps
  Medium-low     :          0          0 pps
  Medium-high    :          0          0 pps
  High           :          0          0 pps
RED-dropped bytes :          27348852    559536 bps
  Low            :          27348852    559536 bps
  Medium-low     :          0          0 bps
  Medium-high    :          0          0 bps
  High           :          0          0 bps
Queue: 1, Forwarding classes: expedited-forwarding
Queued:
Packets          :          0          0 pps
Bytes            :          0          0 bps
Transmitted:
Packets          :          0          0 pps
Bytes            :          0          0 bps
Tail-dropped packets :          0          0 pps
RED-dropped packets :          0          0 pps
  Low            :          0          0 pps
  Medium-low     :          0          0 pps
  Medium-high    :          0          0 pps
  High           :          0          0 pps
RED-dropped bytes :          0          0 bps
  Low            :          0          0 bps
  Medium-low     :          0          0 bps
  Medium-high    :          0          0 bps
  High           :          0          0 bps
Queue: 2, Forwarding classes: assured-forwarding
Queued:
Packets          :          5770534      3963 pps
Bytes            :          396943252    2156144 bps
Transmitted:
Packets          :          3945152      1457 pps
Bytes            :          268270336    792608 bps
Tail-dropped packets :          0          0 pps
RED-dropped packets :          1815141      2506 pps
  Low            :          1815141      2506 pps
  Medium-low     :          0          0 pps
  Medium-high    :          0          0 pps
  High           :          0          0 pps
RED-dropped bytes :          123429524    1363536 bps
  Low            :          123429524    1363536 bps
  Medium-low     :          0          0 bps
  Medium-high    :          0          0 bps

```



```

      High                :                0                0 bps
Queue: 3, Forwarding classes: network-control
Queued:
  Packets                :                0                0 pps
  Bytes                  :                0                0 bps
Transmitted:
  Packets                :                0                0 pps
  Bytes                  :                0                0 bps
  Tail-dropped packets :                0                0 pps
  RED-dropped packets  :                0                0 pps
    Low                  :                0                0 pps
    Medium-low          :                0                0 pps
    Medium-high         :                0                0 pps
    High                 :                0                0 pps
  RED-dropped bytes     :                0                0 bps
    Low                  :                0                0 bps
    Medium-low          :                0                0 bps
    Medium-high         :                0                0 bps
    High                 :                0                0 bps

```

show interfaces
interface-set queue
egress (Enhanced DPC)

```

user@host> show interfaces interface-set queue ge-2/2/0-0 egress
Interface set: ge-2/2/0-0
Interface set index: 3
Forwarding classes: 16 supported, 4 in use
Egress queues: 4 supported, 4 in use
Queue: 0, Forwarding classes: best-effort
Queued:
  Packets                :            3958253            13822 pps
  Bytes                  :          269217592          7519712 bps
Transmitted:
  Packets                :            3665035            12729 pps
  Bytes                  :          249222380          6924848 bps
  Tail-dropped packets :                0                0 pps
  RED-dropped packets  :            293091            1093 pps
    Low                  :            293091            1093 pps
    Medium-low          :                0                0 pps
    Medium-high         :                0                0 pps
    High                 :                0                0 pps
  RED-dropped bytes     :          19930188          594864 bps
    Low                  :          19930188          594864 bps
    Medium-low          :                0                0 bps
    Medium-high         :                0                0 bps
    High                 :                0                0 bps
Queue: 1, Forwarding classes: expedited-forwarding
Queued:
  Packets                :                0                0 pps
  Bytes                  :                0                0 bps
Transmitted:
  Packets                :                0                0 pps
  Bytes                  :                0                0 bps
  Tail-dropped packets :                0                0 pps
  RED-dropped packets  :                0                0 pps
    Low                  :                0                0 pps
    Medium-low          :                0                0 pps
    Medium-high         :                0                0 pps
    High                 :                0                0 pps
  RED-dropped bytes     :                0                0 bps
    Low                  :                0                0 bps
    Medium-low          :                0                0 bps
    Medium-high         :                0                0 bps
    High                 :                0                0 bps

```

Queue: 2, Forwarding classes: assured-forwarding

Queued:

Packets	:	5350989	3904 pps
Bytes	:	368412924	2124048 bps

Transmitted:

Packets	:	3790469	1465 pps
Bytes	:	257751892	796960 bps
Tail-dropped packets	:	0	0 pps
RED-dropped packets	:	1550282	2439 pps
Low	:	1550282	2439 pps
Medium-low	:	0	0 pps
Medium-high	:	0	0 pps
High	:	0	0 pps
RED-dropped bytes	:	105419176	1327088 bps
Low	:	105419176	1327088 bps
Medium-low	:	0	0 bps
Medium-high	:	0	0 bps
High	:	0	0 bps

Queue: 3, Forwarding classes: network-control

Queued:

Packets	:	0	0 pps
Bytes	:	0	0 bps

Transmitted:

Packets	:	0	0 pps
Bytes	:	0	0 bps
Tail-dropped packets	:	0	0 pps
RED-dropped packets	:	0	0 pps
Low	:	0	0 pps
Medium-low	:	0	0 pps
Medium-high	:	0	0 pps
High	:	0	0 pps
RED-dropped bytes	:	0	0 bps
Low	:	0	0 bps
Medium-low	:	0	0 bps
Medium-high	:	0	0 bps
High	:	0	0 bps

show interfaces
interface-set queue
forwarding-class
(Gigabit Ethernet)

user@host> **show interfaces interface-set queue ge-2/2/0-0 forwarding-class best-effort**

Interface set: ge-2/2/0-0

Interface set index: 3

Forwarding classes: 8 supported, 4 in use

Egress queues: 4 supported, 4 in use

Queue: 0, Forwarding classes: best-effort

Queued:

Packets	:	101857694	1420083 pps
Bytes	:	6927234456	772532320 bps

Transmitted:

Packets	:	3984693	55500 pps
Bytes	:	270959592	30192512 bps
Tail-dropped packets	:	0	0 pps
RED-dropped packets	:	97870952	1364583 pps
Low	:	97870952	1364583 pps
Medium-low	:	0	0 pps
Medium-high	:	0	0 pps
High	:	0	0 pps
RED-dropped bytes	:	6655225776	742339808 bps
Low	:	6655225776	742339808 bps
Medium-low	:	0	0 bps
Medium-high	:	0	0 bps
High	:	0	0 bps

```

show interfaces      user@host> show interfaces interface-set queue ge-2/2/0-0 ingress
interface-set queue Interface set: foo
(Enhanced DPC)      Interface set index: 3
                      Forwarding classes: 16 supported, 4 in use
                      Ingress queues: 4 supported, 4 in use
                      Queue: 0, Forwarding classes: best-effort
                        Queued:
                          Packets      :          149036817          473711 pps
                          Bytes        :          8048003934        204642936 bps
                        Transmitted:
                          Packets      :           4360749          13891 pps
                          Bytes        :          235480446        6000912 bps
                          Tail-dropped packets :           0              0 pps
                          RED-dropped packets :          144676035        459820 pps
                          RED-dropped bytes  :          7812506592      198642024 bps
                      Queue: 1, Forwarding classes: expedited-forwarding
                        Queued:
                          Packets      :           0              0 pps
                          Bytes        :           0              0 bps
                        Transmitted:
                          Packets      :           0              0 pps
                          Bytes        :           0              0 bps
                          Tail-dropped packets :           0              0 pps
                          RED-dropped packets :           0              0 pps
                          RED-dropped bytes  :           0              0 bps
                      Queue: 2, Forwarding classes: assured-forwarding
                        Queued:
                          Packets      :           485089207          473605 pps
                          Bytes        :          26195987476        204597576 bps
                        Transmitted:
                          Packets      :           5480799           3959 pps
                          Bytes        :          295963146        1710504 bps
                          Tail-dropped packets :           0              0 pps
                          RED-dropped packets :          479605853        469646 pps
                          RED-dropped bytes  :          25898716170      202887072 bps
                      Queue: 3, Forwarding classes: network-control
                        Queued:
                          Packets      :           0              0 pps
                          Bytes        :           0              0 bps
                        Transmitted:
                          Packets      :           0              0 pps
                          Bytes        :           0              0 bps
                          Tail-dropped packets :           0              0 pps
                          RED-dropped packets :           0              0 pps
                          RED-dropped bytes  :           0              0 bps

show interfaces      user@host> show interfaces interface-set queue ge-2/2/0-0 remaining-traffic
interface-set queue Interface set: ge-2/2/0-0
remaining-traffic   Interface set index: 12
(Gigabit Ethernet) Forwarding classes: 8 supported, 4 in use
                      Egress queues: 4 supported, 4 in use
                      Queue: 0, Forwarding classes: best-effort
                        Queued:
                          Packets      :           2201552           0 pps
                          Bytes        :          149705536           0 bps
                        Transmitted:
                          Packets      :           609765           0 pps
                          Bytes        :          41464020           0 bps
                          Tail-dropped packets :           0           0 pps
                          RED-dropped packets :          1591787           0 pps
                          Low          :          1591787           0 pps

```

Medium-low	:	0	0 pps
Medium-high	:	0	0 pps
High	:	0	0 pps
RED-dropped bytes	:	108241516	0 bps
Low	:	108241516	0 bps
Medium-low	:	0	0 bps
Medium-high	:	0	0 bps
High	:	0	0 bps

Chapter 11

Connectivity Fault Management Monitoring Commands

show class-of-service interface-set

Syntax	show class-of-service interface-set <interface-set-name>
Release Information	Command introduced in JUNOS Release 9.4.
Description	Display the configured shaping rate and the adjusted shaping rate for each logical interface set configured for hierarchical class of service (CoS).
Options	none—Display CoS associations for all logical interface sets. <i>interface-set-name</i> —(Optional) Display CoS associations for the specified interface set.
Required Privilege Level	view
List of Sample Output	show class-of-service interface-set on page 257
Output Fields	Table 18 on page 238 lists the output fields for the show class-of-service interface-set command. Output fields are listed in the approximate order in which they appear.

Table 23: show class-of-service interface-set Output Fields

Field Name	Field Description
Interface-set	Name of a logical interface set composed of one or more logical interfaces for which hierarchical scheduling is enabled.
Index	Index of this interface set or the internal index of this object.
Physical interface	Name of a physical interface.
Queues supported	Number of queues you can configure on the interface.
Queues in use	Number of queues currently configured.
Output traffic control profile	Name of the output traffic-control profile attached to the logical interface set.
Adjusting application	<p>Name of the application that communicates shaping-rate adjustment information to the JUNOS class-of-service process (cosd) on the broadband services router (BSR). The BSR uses the information from this application to perform shaping-rate adjustments on the scheduler node that manages the interface set. The adjusting application can be one of the following:</p> <p>ancp LS-0—JUNOS Access Node Control Profile process (ancpd) that performs shaping-rate adjustments on schedule nodes that are logical interface sets configured to represent subscriber local loops. When the synchronization speed of the DSL line changes, ancpd communicates the local loop speed to cosd over the default logical system, LS-0, and then the BSR throttles the shaping rate on the scheduler node to the loop speed.</p>

Table 23: show class-of-service interface-set Output Fields *(continued)*

Field Name	Field Description
Adjustment type	Type of shaping-rate adjustment performed by the BSR on the scheduler node. The type of adjustment can be one of the following: absolute—The configured shaping rate is adjusted by an absolute value as opposed to by a percentage of the configured rate.
Configured shaping rate	The maximum transmission rate on the physical interface as configured by the output traffic-control profile attached to the scheduler node.
Adjustment value	Value of the shaping-rate adjustment information sent by the adjusting application to cosd.

```

show class-of-service interface-set user@host> show class-of-service interface-set example-ifset-ge-4/0/0-7
Interface-set: example-ifset-ge-4/0/0-7, Index: 8
Physical interface: ge-4/0/0, Index: 270
Queues supported: 8, Queues in use: 8
Output traffic control profile: example-tcp-basic-rate, Index: 11395
Adjusting application: ancp LS-0
Adjustment type: absolute
Configured shaping rate: 50000000
Adjustment value: 888000

```

show oam ethernet connectivity-fault-management interfaces

Syntax	show oam ethernet connectivity-fault-management interfaces <ethernet-interface-name> <level md-level> <brief detail extensive>
Release Information	Command introduced in JUNOS Release 8.4. Support for ITU-T Y.1731 frame delay measurement added in JUNOS Release 9.5.
Description	On M320, MX Series, T320, and T640 routers, display IEEE 802.1ag Operation, Administration, and Management (OAM) connectivity fault management (CFM) database information for Ethernet interfaces. In addition, for Ethernet interfaces on Dense Port Concentrators (DPCs) in MX Series routers only, also display any ITU-T Y.1731 frame delay measurement (ETH-DM) frame counts when detail or extensive mode is specified.
Options	brief detail extensive —(Optional) Display the specified level of output. ethernet-interface-name —(Optional) Display CFM information only for CFM entities attached to the specified Ethernet interface. level md-level —(Optional) Display CFM information for CFM identities enclosed within a maintenance domain of the specified level.
Required Privilege Level	view
Related Topics	<ul style="list-style-type: none"> ■ clear oam ethernet connectivity-fault-management statistics ■ show oam ethernet connectivity-fault-management delay-statistics ■ show oam ethernet connectivity-fault-management mep-database ■ show oam ethernet connectivity-fault-management mep-statistics
List of Sample Output	show oam ethernet connectivity-fault-management interfaces on page 261 show oam ethernet connectivity-fault-management interfaces detail on page 261 show oam ethernet connectivity-fault-management interfaces detail (One-Way ETH-DM) on page 262 show oam ethernet connectivity-fault-management interfaces extensive on page 263 show oam ethernet connectivity-fault-management interfaces level on page 263
Output Fields	Table 24 on page 258 lists the output fields for the show oam ethernet connectivity-fault-management interfaces command. Output fields are listed in the approximate order in which they appear.

Table 24: show oam ethernet connectivity-fault-management interfaces Output Fields

Field Name	Field Description	Level of Output
Interface	Interface identifier.	All levels

Table 24: show oam ethernet connectivity-fault-management interfaces Output Fields (continued)

Field Name	Field Description	Level of Output
Interface status	Local interface status.	All levels
Link status	Local link status. Up, down, or oam-down.	All levels
Maintenance domain name	Maintenance domain name.	detail extensive
Format (Maintenance domain)	Maintenance domain name format configured.	detail extensive
Level	Maintenance domain level configured.	All levels
Maintenance association name	Maintenance association name.	detail extensive
Format (Maintenance association)	Maintenance association name format configured.	detail extensive
Continuity-check status	Continuity-check status.	detail extensive
Interval	Continuity-check message interval.	detail extensive
Loss-threshold	Lost continuity-check message threshold.	detail extensive
MEP identifier	Maintenance association end point (MEP) identifier.	All levels
Neighbours	Number of MEP neighbors.	All levels
Direction	MEP direction configured.	detail extensive
MAC address	MAC address configured for the MEP.	detail extensive
MEP status	Indicates the status of the Connectivity Fault Management (CFM) protocol running on the MEP: Running, inactive, disabled, or unsupported.	detail extensive
Remote MEP not receiving CCM	Whether the remote MEP is not receiving connectivity check messages (CCMs).	detail extensive
Erroneous CCM received	Whether erroneous CCMs have been received.	detail extensive
Cross-connect CCM received	Whether cross-connect CCMs have been received.	detail extensive
RDI sent by some MEP	Whether the remote defect indication (RDI) bit is set in messages that have been received. The absence of the RDI bit in a CCM indicates that the transmitting MEP is receiving CCMs from all configured MEPs.	detail extensive
CCMs sent	Number of CCMs transmitted.	detail extensive

Table 24: show oam ethernet connectivity-fault-management interfaces Output Fields (continued)

Field Name	Field Description	Level of Output
CCMs received out of sequence	Number of CCMs received out of sequence.	detail extensive
LBM sent	Number of loopback request messages (LBMs) sent.	detail extensive
Valid in-order LBRs received	Number of loopback response messages (LBRs) received that were valid messages and in sequence.	detail extensive
Valid out-of-order LBRs received	Number of LBRs received that were valid messages and not in sequence.	detail extensive
LBRs received with corrupted data	Number of LBRs received that were corrupted.	detail extensive
LBRs sent	Number of LBRs transmitted.	detail extensive
LTM sent	Linktrace messages (LTMs) transmitted.	detail extensive
LTM received	Linktrace messages received.	detail extensive
LTR sent	Linktrace responses (LTRs) transmitted.	detail extensive
LTR received	Linktrace responses received.	detail extensive
Sequence number of next LTM request	Sequence number of next LTM request to be transmitted.	detail extensive
1DMs sent	<p>If the interface is attached to an initiator MEP for a one-way ETH-DM session: Number of one-way delay measurement (1DM) PDU frames sent to the peer MEP in this session.</p> <p>For all other cases, this field displays 0.</p>	detail extensive
Valid 1DMs received	<p>If the interface is attached to a receiver MEP for a one-way ETH-DM session: Number of valid 1DM frames received.</p> <p>For all other cases, this field displays 0.</p>	detail extensive
Invalid 1DMs received	<p>If the interface is attached to a receiver MEP for a one-way ETH-DM session: Number of invalid 1DM frames received.</p> <p>For all other cases, this field displays 0.</p>	detail extensive
DMMs sent	<p>If the interface is attached to an initiator MEP for a two-way ETH-DM session: Number of Delay Measurement Message (DMM) PDU frames sent to the peer MEP in this session.</p> <p>For all other cases, this field displays 0.</p>	detail extensive
DMRs sent	<p>If the interface is attached to a responder MEP for a two-way ETH-DM session: Number of Delay Measurement Reply (DMR) frames sent.</p> <p>For all other cases, this field displays 0.</p>	detail extensive

Table 24: show oam ethernet connectivity-fault-management interfaces Output Fields (continued)

Field Name	Field Description	Level of Output
Valid DMRs received	If the interface is attached to an initiator MEP for a two-way ETH-DM session: Number of valid DMRs received. For all other cases, this field displays 0.	detail extensive
Invalid DMRs received	If the interface is attached to an initiator MEP for a two-way ETH-DM session: Number of invalid DMRs received. For all other cases, this field displays 0.	detail extensive
Remote MEP count	Number of remote MEPs.	extensive
Identifier (remote MEP)	MEP identifier of the remote MEP.	extensive
MAC address (remote MEP)	MAC address of the remote MEP.	extensive
State (remote MEP)	State of the remote MEP.	extensive
Interface (remote MEP)	Interface of the remote MEP.	extensive

```

show oam ethernet connectivity-fault-management interfaces
user@host> show oam ethernet connectivity-fault-management interfaces
Interface      Link      Status      Level      MEP      Neighbours
Identifier
ge-1/1/0.0     Up        Active      0          2        1
ge-1/1/0.1     Up        Active      0          2        1
ge-1/1/0.10    Up        Active      0          2        1
ge-1/1/0.100   Up        Active      0          2        1
ge-1/1/0.101   Up        Active      0          2        1
ge-1/1/0.102   Up        Active      0          2        1
ge-1/1/0.103   Up        Active      0          2        1
ge-1/1/0.104   Up        Active      0          2        1
ge-1/1/0.105   Up        Active      0          2        1
ge-1/1/0.106   Up        Active      0          2        1
...

show oam ethernet connectivity-fault-management interfaces detail
user@host> show oam ethernet connectivity-fault-management interfaces detail
Interface name: ge-5/2/9.0, Interface status: Active, Link status: Up
Maintenance domain name: md0, Format: string, Level: 5
Maintenance association name: ma1, Format: string
Continuity-check status: enabled, Interval: 100ms, Loss-threshold: 3 frames
MEP identifier: 1, Direction: down, MAC address: 00:90:69:0b:4b:94
MEP status: running
Defects:
  Remote MEP not receiving CCM                : no
  Erroneous CCM received                      : yes
  Cross-connect CCM received                  : no
  RDI sent by some MEP                       : yes
Statistics:
  CCMs sent                                  : 76

```

```

CCMs received out of sequence          : 0
LBMs sent                              : 0
Valid in-order LBRs received            : 0
Valid out-of-order LBRs received        : 0
LBRs received with corrupted data       : 0
LBRs sent                               : 0
LTMs sent                               : 0
LTMs received                           : 0
LTRs sent                               : 0
LTRs received                           : 0
Sequence number of next LTM request     : 0
1DMs sent                               : 0
Valid 1DMs received                     : 0
Invalid 1DMs received                   : 0
DMMs sent                               : 0
DMRs sent                               : 0
Valid DMRs received                     : 0
Invalid DMRs received                   : 0
Remote MEP count: 2
Identifier    MAC address      State   Interface
2001         00:90:69:0b:7f:71  ok     ge-5/2/9.0
4001         00:90:69:0b:09:c5  ok     ge-5/2/9.0

```

**show oam ethernet
connectivity-fault-
management interfaces
detail (One-Way
ETH-DM)**

```

user@host show oam ethernet connectivity-fault-management interfaces detail
Interface name: ge-0/2/5.0, Interface status: Active, Link status: Up
Maintenance domain name: md6, Format: string, Level: 6
Maintenance association name: ma6, Format: string
Continuity-check status: enabled, Interval: 100ms, Loss-threshold: 3 frames
MEP identifier: 101, Direction: down, MAC address: 00:90:69:0a:48:57
MEP status: running
Defects:
  Remote MEP not receiving CCM          : no
  Erroneous CCM received                 : no
  Cross-connect CCM received             : no
  RDI sent by some MEP                   : no
Statistics:
  CCMs sent                             : 1590
  CCMs received out of sequence          : 0
  LBMs sent                              : 0
  Valid in-order LBRs received            : 0
  Valid out-of-order LBRs received        : 0
  LBRs received with corrupted data       : 0
  LBRs sent                               : 0
  LTMs sent                               : 0
  LTMs received                           : 0
  LTRs sent                               : 0
  LTRs received                           : 0
  Sequence number of next LTM request     : 0
  1DMs sent                               : 10
  Valid 1DMs received                     : 0
  Invalid 1DMs received                   : 0
  DMMs sent                               : 0
  DMRs sent                               : 0
  Valid DMRs received                     : 0
  Invalid DMRs received                   : 0
Remote MEP count: 1
Identifier    MAC address      State   Interface
201          00:90:69:0a:43:94  ok     ge-0/2/5.0

```

```

show oam ethernet connectivity-fault-management interfaces extensive
user@host> show oam ethernet connectivity-fault-management interfaces extensive
Interface name: ge-5/2/9.0, Interface status: Active, Link status: Up
Maintenance domain name: md0, Format: string, Level: 5
Maintenance association name: ma1, Format: string
Continuity-check status: enabled, Interval: 100ms, Loss-threshold: 3 frames
MEP identifier: 1, Direction: down, MAC address: 00:90:69:0b:4b:94
MEP status: running
Defects:
  Remote MEP not receiving CCM                : no
  Erroneous CCM received                      : yes
  Cross-connect CCM received                  : no
  RDI sent by some MEP                        : yes
Statistics:
  CCMs sent                                  : 76
  CCMs received out of sequence               : 0
  LBMs sent                                  : 0
  Valid in-order LBRs received                : 0
  Valid out-of-order LBRs received            : 0
  LBRs received with corrupted data           : 0
  LBRs sent                                   : 0
  LTMs sent                                  : 0
  LTMs received                              : 0
  LTRs sent                                  : 0
  LTRs received                              : 0
  Sequence number of next LTM request         : 0
  1DMs sent                                   : 0
  Valid 1DMs received                        : 0
  Invalid 1DMs received                      : 0
  DMMs sent                                  : 0
  DMRs sent                                  : 0
  Valid DMRs received                       : 0
  Invalid DMRs received                     : 0
Remote MEP count: 2
  Identifier  MAC address  State  Interface
  2001       00:90:69:0b:7f:71  ok    ge-5/2/9.0
  4001       00:90:69:0b:09:c5  ok    ge-5/2/9.0

show oam ethernet connectivity-fault-management interfaces level
user@host> show oam ethernet connectivity-fault-management interfaces level 7
Interface  Link    Status    Level  MEP Identifier  Neighbours
ge-3/0/0.0  Up      Active    7      201            0
xe-0/0/0.0  Up      Active    7      203            1

```

show oam ethernet connectivity-fault-management mep-database

Syntax show oam ethernet connectivity-fault-management mep-database
 maintenance-domain *domain-name*
 maintenance-association *ma-name*
 <local-mep *local-mep-id*>
 <remote-mep *remote-mep-id*>

Release Information Command introduced in JUNOS Release 8.4.
 Support for ITU-T Y.1731 frame delay measurement added in JUNOS Release 9.5.

Description On M320, M120, MX Series, T320, and T640 routers, display IEEE 802.1ag Operation, Administration, and Management (OAM) connectivity fault management (CFM) database information for CFM maintenance association end points (MEPs) in a CFM session.

In addition, on M120, M320, and MX series routers, also displays port status TLV, interface status TLV, and action profile information.

In addition, for Ethernet interfaces on Dense Port Concentrators (DPCs) in MX Series routers only, also display any ITU-T Y.1731 frame delay measurement (ETH-DM) frame counts.

Options maintenance-association *ma-name*—Display connectivity fault management information for the specified maintenance association.

maintenance-domain *domain-name*—Display connectivity fault management information for the specified maintenance domain.

local-mep *local-mep-id*—(Optional) Display connectivity fault management information for the specified local MEP only.

remote-mep *remote-mep-id*—(Optional) Display connectivity fault management information for the specified remote MEP only.

Required Privilege Level view

Related Topics

- clear oam ethernet connectivity-fault-management statistics
- show oam ethernet connectivity-fault-management delay-statistics
- show oam ethernet connectivity-fault-management interfaces
- show oam ethernet connectivity-fault-management mep-statistics

List of Sample Output show oam ethernet connectivity-fault-management mep-database on page 267
 show oam ethernet connectivity-fault-management mep-database (One-Way ETH-DM) on page 268
 show oam ethernet connectivity-fault-management mep-database local-mep remote-mep on page 269
 show oam ethernet connectivity-fault-management mep-database remote-mep (Action Profile Event) on page 269

Output Fields Table 25 on page 265 lists the output fields for the `show oam ethernet connectivity-fault-management mep-database` command. Output fields are listed in the approximate order in which they appear.

Table 25: show oam ethernet connectivity-fault-management mep-database Output Fields

Field Name	Field Description
Maintenance domain name	Maintenance domain name.
Format (Maintenance domain)	Maintenance domain name format configured.
Level	Maintenance domain level configured.
Maintenance association name	Maintenance association name.
Format (Maintenance association)	Maintenance association name format configured.
Continuity-check status	Continuity-check status.
Interval	Continuity-check message interval.
Loss-threshold	Lost continuity-check message threshold.
MEP identifier	Maintenance association end point (MEP) identifier.
Direction	MEP direction configured.
MAC address	MAC address configured for the MEP.
Auto-discovery	Whether automatic discovery is enabled or disabled.
Priority	Priority used for CCMs and linktrace messages transmitted by the MEP.
Interface name	Interface identifier.
Interface status	Local interface status.
Link status	Local link status.
Remote MEP not receiving CCM	Whether the remote MEP is not receiving CCMs.
Erroneous CCM received	Whether erroneous CCMs have been received.
Cross-connect CCM received	Whether cross-connect CCMs have been received.
RDI sent by some MEP	Whether the remote defect indication (RDI) bit is set in messages that have been received. The absence of the RDI bit in a CCM indicates that the transmitting MEP is receiving CCMs from all configured MEPs.
CCMs sent	Number of CCMs transmitted.

Table 25: show oam ethernet connectivity-fault-management mep-database Output Fields (continued)

Field Name	Field Description
CCMs received out of sequence	Number of CCMs received out of sequence.
LBMs sent	Number of loopback messages (LBMs) sent.
Valid in-order LBRs received	Number of loopback response messages (LBRs) received that were valid messages and in sequence.
1DMs sent	If the MEP is an initiator for a one-way ETH-DM session: Number of one-way delay measurement (1DM) PDU frames sent to the peer MEP in this session. For all other cases, this field displays 0.
Valid 1DMs received	If the MEP is a receiver for a one-way ETH-DM session: Number of valid 1DM frames received. For all other cases, this field displays 0.
Invalid 1DMs received	If the MEP is a receiver for a one-way ETH-DM session: Number of invalid 1DM frames received. For all other cases, this field displays 0.
DMMs sent	If the MEP is an initiator for a two-way ETH-DM session: Number of Delay Measurement Message (DMM) PDU frames sent to the peer MEP in this session. For all other cases, this field displays 0.
DMRs sent	If the MEP is a responder for a ETH-DM session: Number of Delay Measurement Reply (DMR) frames sent. For all other cases, this field displays 0.
Valid DMRs received	If the MEP is an initiator for a two-way ETH-DM session: Number of valid DMRs received. For all other cases, this field displays 0.
Invalid DMRs received	If the MEP is an initiator for a two-way ETH-DM session: Number of invalid DMRs received. For all other cases, this field displays 0.
Valid out-of-order LBRs received	Number of LBRs received that were valid messages and not in sequence.
LBRs received with corrupted data	Number of LBRs received that were corrupted.
LBRs sent	Number of LBRs transmitted.
LTMs sent	Linktrace messages (LTMs) transmitted.
LTMs received	Linktrace messages received.
LTRs sent	Linktrace responses (LTRs) transmitted.
LTRs received	Linktrace responses received.

Table 25: show oam ethernet connectivity-fault-management mep-database Output Fields (continued)

Field Name	Field Description
Sequence number of next LTM request	Sequence number of the next linktrace message request to be transmitted.
Remote MEP identifier	MEP identifier of the remote MEP.
State (remote MEP)	State of the remote MEP: <i>idle</i> , <i>start</i> , <i>ok</i> , or <i>failed</i> .
MAC address	MAC address of the remote MEP.
Type	Whether the remote MEP MAC address was learned using automatic discovery or configured.
Interface	Interface of the remote MEP. A seven-digit number is appended if CFM is configured to run on a routing instance of type VPLS.
Last flapped	Date, time, and how long ago the remote MEP interface went from down to up. The format is Last flapped: year-month-day hours:minutes:seconds timezone (hours:minutes:seconds ago) . For example, Last flapped: 2002-04-26 10:52:40 PDT (04:33:20 ago) .
Remote defect indication	Whether the remote defect indication (RDI) bit is set in messages that have been received or transmitted.
Port status TLV	<ul style="list-style-type: none"> ■ In the Maintenance domain section, displays the last transmitted port status TLV value. ■ In the Remote MEP section, displays the last value of port status TLV received from the remote MEP. <p>In the Action profile section, displays, the last occurred event port-status-tlv blocked event. This event occurred due to the reception of blocked value in the port status TLV from remote MEP.</p>
Interface status TLV	<ul style="list-style-type: none"> ■ In the Maintenance domain section, displays the last transmitted interface status TLV value. ■ In the Remote MEP section, displays the last value of interface status TLV received from the remote MEP. <p>In the Action profile section, if displays, the last occurred event interface-status-tlv event (either lower-layer-down or down). This event occurred due to the reception of either lower or down value in the interface status TLV from remote MEP.</p>
Action profile	Name of the action profile occurrence associated with a remote MEP.
Last event	When an action profile occurs, displays the last event that triggered it.
Last event cleared	When all the configured and occurred events (under action profile) are cleared, then the action taken gets reverted (such as down interface is made up) and the corresponding time is noted and displayed.
Action	Action taken and the corresponding time of the action occurrence.

**show oam ethernet
connectivity-fault-
management
mep-database**

```

user@host> show oam ethernet connectivity-fault-management mep-database
maintenance-domain vpls-vlan2000 maintenance-association vpls-vlan200
Maintenance domain name: vpls-vlan2000, Format: string, Level: 5
Maintenance association name: vpls-vlan200, Format: string
Continuity-check status: enabled, Interval: 100ms, Loss-threshold: 3 frames
MEP identifier: 200, Direction: up, MAC address: 00:19:e2:b0:74:01
Auto-discovery: enabled, Priority: 0
Interface name: ge-0/0/1.0, Interface status: Active, Link status: Up

```

```

Defects:
  Remote MEP not receiving CCM          : no
  Erroneous CCM received                 : no
  Cross-connect CCM received            : no
  RDI sent by some MEP                  : no
Statistics:
  CCMS sent                             : 1476
  CCMS received out of sequence         : 0
  LBMS sent                             : 85
  Valid in-order LBRs received          : 78
  Valid out-of-order LBRs received      : 0
  LBRs received with corrupted data     : 0
  LBRs sent                             : 0
  LTMS sent                             : 1
  LTMS received                         : 0
  LTRs sent                             : 0
  LTRs received                         : 1
  Sequence number of next LTM request   : 1
  1DMs sent                             : 0
  Valid 1DMs received                   : 0
  Invalid 1DMs received                 : 0
  DMMs sent                             : 0
  DMRs sent                             : 0
  Valid DMRs received                   : 0
  Invalid DMRs received                 : 0
Remote MEP count: 1
  Identifier  MAC address      State  Interface
    100      00:19:e2:b2:81:4b   ok    vt-0/1/10.1049088

```

```

show oam ethernet connectivity-fault-
management mep-database (One-Way
ETH-DM) user@host> show oam ethernet connectivity-fault-management mep-database
maintenance-domain md6 maintenance-domain ma6
Maintenance domain name: md6, Format: string, Level: 6
Maintenance association name: ma6, Format: string
Continuity-check status: enabled, Interval: 100ms, Loss-threshold: 3 frames
MEP identifier: 101, Direction: down, MAC address: 00:90:69:0a:48:57
Auto-discovery: enabled, Priority: 0
Interface name: ge-0/2/5.0, Interface status: Active, Link status: Up
Defects:
  Remote MEP not receiving CCM          : no
  Erroneous CCM received                 : no
  Cross-connect CCM received            : no
  RDI sent by some MEP                  : no
Statistics:
  CCMS sent                             : 1590
  CCMS received out of sequence         : 0
  LBMS sent                             : 0
  Valid in-order LBRs received          : 0
  Valid out-of-order LBRs received      : 0
  LBRs received with corrupted data     : 0
  LBRs sent                             : 0
  LTMS sent                             : 0
  LTMS received                         : 0
  LTRs sent                             : 0
  LTRs received                         : 0
  Sequence number of next LTM request   : 0
  1DMs sent                             : 10
  Valid 1DMs received                   : 0
  Invalid 1DMs received                 : 0
  DMMs sent                             : 0
  DMRs sent                             : 0
  Valid DMRs received                   : 0

```

```

Invalid DMRs received                               : 0
Remote MEP count: 1
Identifier    MAC address    State    Interface
  201        00:90:69:0a:43:94    ok      ge-0/2/5.0

show oam ethernet      user@host> show oam ethernet connectivity-fault-management mep-database
connectivity-fault- maintenance-domain vpls-vlan2000 maintenance-association vpls-vlan200 local-mep
management           200 remote-mep 100
mep-database local-mep
remote-mep           Maintenance domain name: vpls-vlan2000, Format: string, Level: 5
                        Maintenance association name: vpls-vlan200, Format: string
                        Continuity-check status: enabled, Interval: 100ms, Loss-threshold: 3 frames
                        MEP identifier: 200, Direction: up, MAC address: 00:19:e2:b0:74:01
                        Auto-discovery: enabled, Priority: 0
                        Interface name: ge-0/0/1.0, Interface status: Active, Link status: Up

                        Remote MEP identifier: 100, State: ok
                        MAC address: 00:19:e2:b2:81:4b, Type: Learned
                        Interface: vt-0/1/10.1049088
                        Last flapped: Never
                        Remote defect indication: false
                        Port status TLV: none
                        Interface status TLV: none

show oam ethernet      user@host> show oam ethernet connectivity-fault-management mep-database
connectivity-fault- maintenance-domain md5 maintenance-association ma5 remote-mep 200
management           Maintenance domain name: md5, Format: string, Level: 5
mep-database         Maintenance association name: ma5, Format: string
remote-mep           Continuity-check status: enabled, Interval: 1s, Loss-threshold: 3 frames
(Action Profile Event) MEP identifier: 100, Direction: down, MAC address: 00:05:85:73:e8:ad
                        Auto-discovery: enabled, Priority: 0
                        Interface status TLV: none, Port status TLV: none
                        Interface name: ge-1/0/8.0, Interface status: Active, Link status: Up

                        Remote MEP identifier: 200, State: ok
                        MAC address: 00:05:85:73:96:1f, Type: Configured
                        Interface: ge-1/0/8.0
                        Last flapped: Never
                        Remote defect indication: false
                        Port status TLV: none
                        Interface status TLV: lower-layer-down
                        Action profile: juniper
                        Last event: Interface-status-tlv lower-layer-down
                        Action: Interface-down, Time: 2009-03-27 14:25:10 PDT (00:00:02 ago)

```

show oam ethernet connectivity-fault-management mip

Syntax	show oam ethernet connectivity-fault-management mip <qualifier>
Release Information	Command introduced in JUNOS Release 9.4.
Description	On the MX Series routers, display all the Maintenance Intermediate Points (MIPs) created in the system. Qualifiers also available to display specific MIPs.
Options	This command has no options.
Required Privilege Level	View
Output Fields	Table 26 on page 270 lists the output fields for the show oam ethernet connectivity-fault-management mip command. Output fields are listed in the approximate order in which they appear.

Table 26: show oam ethernet connectivity-fault-management mip Output Fields

Field Name	Field Description
MIP information for instance	Header for the MIP information showing the MIP name.
Interface	Interface type-dpc/pic/port.unit-number.
Level	MIP level configured.

```

show oam ethernet user@host> show oam ethernet connectivity-fault-management mip
connectivity-fault MIP information for instance __mip_name__
-management mip MIP information for instance default-switch bd1

                    Interface      Level
                    ge-3/0/0.0      7
                    ge-3/0/1.0      6
                    ge-3/0/3.0      6
MIP information for instance vpls-1

                    Interface      Level
                    ge-3/0/2.0      7
                    ge-3/0/4.0      6

```

traceroute ethernet

Syntax traceroute ethernet (*mac-address* | *mep-id*)
 maintenance-association *ma-name*
 maintenance-domain *md-name*
 ttl *value*
 <wait *seconds*>

Release Information Command introduced in JUNOS Release 9.0.
 mep-id option introduced in JUNOS Release 9.1.

Description Triggers the linktrace protocol to trace the route between two maintenance points. The result of the traceroute protocol is stored in the path database. To display the path database, use the `show oam ethernet connectivity-fault-management path-database` command.

Before using the traceroute command, you can verify the remote MEP's MAC address using the `show oam ethernet connectivity-fault-management path-database` command.

Options *mac-address*—Destination unicast MAC address of the remote maintenance point.

mep-id—MEP identifier of the remote maintenance point. The range of values is 1 through 8191.

maintenance-association ma-name—Specifies an existing maintenance association from the set of configured maintenance associations.

maintenance-domain md-name—Specifies an existing maintenance domain from the set of configured maintenance domains.

ttl value—Number of hops to use in the linktrace request. The range is 1 to 255 hops. The default is 4.

wait seconds—(Optional) Maximum time to wait for a response to the traceroute request. The range is 1 to 255 seconds. The default is 5.

Required Privilege Level network

List of Sample Output traceroute ethernet on page 272

Output Fields Table 27 on page 271 lists the output fields for the `traceroute ethernet` command. Output fields are listed in the approximate order in which they appear.

Table 27: traceroute ethernet Output Fields

Field Name	Field Description
Linktrace to	MAC address of the destination maintenance point.
Interface	Local interface used to send the linktrace message (LTM).
Maintenance Domain	Maintenance domain specified in the traceroute command.

Table 27: traceroute ethernet Output Fields *(continued)*

Field Name	Field Description
Level	Maintenance domain level configured.
Maintenance Association	Maintenance association specified in the traceroute command.
Local Mep	The local maintenance end point identifier.
Transaction Identifier	4-byte identifier maintained by the MEP. Each LTM uses a transaction identifier. The transaction identifier is maintained globally across all Maintenance Domains. Use the transaction identifier to match an incoming linktrace response (LTR), with a previously sent LTM.
Hop	Sequential hop count of the linktrace path.
TTL	Number of hops remaining in the linktrace message. The time to live (TTL) is decremented at each hop.
Source MAC address	MAC address of the 802.1ag maintenance point that is sending the linktrace message.
Next-hop MAC address	MAC address of the 802.1ag node that is the next hop in the LTM path.

```

traceroute ethernet user@host> traceroute ethernet maintenance-domain md1 maintenance-association mal
00:90:69:7e:01:ff
Linktrace to 00:01:02:03:04:05, Interface : ge-5/0/0.0
Maintenance Domain: MD1, Level: 7
Maintenance Association: MA1, Local Mep: 1

Hop      TTL      Source MAC address      Next hop MAC address
Transaction Identifier:100001
1         63      00:00:aa:aa:aa:aa      00:00:bb:bb:bb:bb
2         62      00:00:bb:bb:bb:bb      00:00:cc:cc:cc:cc
3         61      00:00:cc:cc:cc:cc      00:01:02:03:04:05
4         60      00:01:02:03:04:05      00:00:00:00:00:00

```

Part 4

Troubleshooting

- Knowledge Base on page 275

Chapter 12

Knowledge Base

Part 5

Index

- Index on page 279

Index

Symbols

10-Gigabit Ethernet interfaces
status information, displaying.....247

A

auto-discovery statement.....181

B

bridge domain
VLAN identifier.....177
bridge-domain statement.....181
bridge-domain-type statement.....153
bridge-domains statement.....152
buffer-size statement.....193

C

CFM statistics
displaying for CFM interfaces.....264
displaying for interfaces.....258
code-point statement.....194
code-points statement.....195
connectivity-fault-management statement.....182
continuity-check statement.....183
CoS
interface sets, displaying.....238, 256
mapping, displaying
schedulers to forwarding classes.....240
scheduler map information, displaying.....240
traffic-control profile information,
displaying.....242

D

default-bvlan statement.....153
default-isid statement.....154
direction statement.....184

E

ETH-DM frame counts (with CFM statistics)
displaying for MEPs by enclosing CFM.....264
displaying for MEPs by interface or domain
level.....258
Ethernet interface set queue
status information, displaying.....247
Ethernet interfaces
CFM statistics
displaying for CFM interfaces.....264
displaying for interfaces.....258
ETH-DM frame counts (with CFM statistics)
displaying for MEPs by enclosing CFM.....264
displaying for MEPs by interface or domain
level.....258
status information, displaying
Gigabit Ethernet.....221
ethernet statement.....185

F

family statement.....155, 161
firewall filter.....196
filter statement
firewall.....197
firewall
statistics
displaying.....244
firewall statement.....198
forwarding-classes statement.....198

G

Gigabit Ethernet interfaces
status information, displaying.....221, 247

I

ieee-802.1 statement.....199
interface statement
IEEE 802.1ag.....187
interface-set statement.....200, 214
interfaces statement.....199
interval statement.....188

isid statement.....159
 isid-list statement.....159, 160

L

Layer 2 bridging
 learning properties, displaying.....228, 231, 234
 MAC address table, displaying.....218
 learning properties
 Layer 2, displaying.....228, 231, 234
 level statement.....188
 linktrace
 tracing.....271

M

MAC address table
 Layer 2, displaying.....218
 mac-address statement.....165
 maintenance-association statement.....189
 maintenance-domain statement.....190
 mip-half-function.....192
 virtual-switch.....192
 mep statement.....191
 mip-half-function statement.....192

O

output-traffic-control-profile statement.....203

P

pbb-options statement.....165
 pbb-service-options statement.....166
 peer-instance statement.....166
 policer statement.....204

R

routing-instances statement.....167

S

scheduler-maps statement
 for most non-ATM2 IQ interfaces.....206, 207
 service-groups statement.....168
 service-type statement.....169
 show bridge mac-table command.....218
 show class-of-service interface-set
 command.....238, 256
 show class-of-service scheduler-map command.....240
 show class-of-service traffic-control-profile
 command.....242
 show firewall command.....244
 show interfaces (Gigabit Ethernet) command.....221
 show interfaces interface-set queue command.....247

show l2-learning backbone-instance command.....228
 show l2-learning provider-instance command.....231
 show l2-learning remote-backbone-edge-bridge
 command.....234
 show oam ethernet connectivity-fault-management
 interfaces command.....258
 show oam ethernet connectivity-fault-management
 mep-database command.....264

T

term statement
 firewall.....209
 traceroute ethernet.....271
 traceroute ethernet command.....271
 traffic-control-profiles statement.....210
 transmit-rate statement.....211

U

unit statement
 logical interfaces.....170

V

virtual switch
 VLAN identifier.....177
 virtual-switch statement.....192
 vlan-id statement.....176, 177