



Junos[®] OS

CoS Features and Limitations for Specific Transports

Release

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Junos® OS CoS Features and Limitations for Specific Transports

13.1

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Table of Contents

	About the Documentation	xi
	Documentation and Release Notes	xi
	Supported Platforms	xi
	Using the Examples in This Manual	xi
	Merging a Full Example	xii
	Merging a Snippet	xii
	Documentation Conventions	xiii
	Documentation Feedback	xv
	Requesting Technical Support	xv
	Self-Help Online Tools and Resources	xv
	Opening a Case with JTAC	xvi
Part 1	Overview	
Chapter 1	Overview of CoS on Specific Transports	3
	Limitations on CoS for Aggregated Interfaces	3
	CoS on ATM Interfaces Overview	5
	CoS for L2TP Tunnels on Ethernet Interface Overview	6
	CoS for MPLS Overview	7
Part 2	Configuration	
Chapter 2	CoS Configuration on Aggregated Interfaces	11
	Configuring Schedulers on Aggregated Interfaces	11
	Examples: Configuring CoS on Aggregated Interfaces	12
	Example: Configuring Scheduling Modes on Aggregated Interfaces	14
Chapter 3	CoS Configuration on ATM Interfaces	21
	Configuring Linear RED Profiles on ATM Interfaces	21
	Configuring Scheduler Maps on ATM Interfaces	22
	Enabling Eight Queues on ATM Interfaces	24
	Example: Enabling Eight Queues on ATM2 IQ Interfaces	25
	Verifying the Configuration	29
	Configuring VC CoS Mode on ATM Interfaces	29
	Copying the PLP Setting to the CLP Bit on ATM Interfaces	30
	Applying Scheduler Maps to Logical ATM Interfaces	30
	Configuring CoS for L2TP Tunnels on ATM Interfaces	31

	Configuring IEEE 802.1p BA Classifiers for Ethernet VPLS Over ATM	33
	Configuring ATM Scheduler Support for Ethernet VPLS over ATM Bridged Interfaces	34
	Example: Configuring CoS for ATM2 IQ VC Tunnels	35
	Example: Combine Layer 2 and Layer 3 Classification on the Same ATM Physical Interface	36
	Example: Configuring ATM Scheduler Support for Ethernet VPLS over ATM Bridged Interfaces	37
Chapter 4	CoS Configuration on Ethernet Interfaces	39
	Configuring CoS for L2TP Tunnels on Ethernet Interfaces	39
	Configuring LNS CoS for Link Redundancy	40
	Example: L2TP LNS CoS Support for Link Redundancy	41
Chapter 5	CoS Configuration for MPLS Traffic	45
	Configuring CoS for MPLS Traffic	45
Chapter 6	Configuration Statements	47
	address (CoS on ATM Interfaces)	47
	atm-options	48
	atm-scheduler-map	49
	atm-service	50
	buffer-size (Schedulers)	51
	cbr	52
	destination (Interfaces)	53
	drop-profile (Schedulers)	54
	drop-profile-map (Schedulers)	54
	egress-shaping-overhead	55
	epd-threshold	56
	excess-priority	57
	excess-rate	58
	family (CoS on ATM Interfaces)	59
	forwarding-class (ATM2 IQ Scheduler Maps)	60
	forwarding-class (Interfaces)	60
	high-plp-max-threshold	61
	high-plp-threshold	61
	ingress-shaping-overhead	62
	interfaces	63
	linear-red-profile	65
	linear-red-profiles	66
	loss-priority (Scheduler Drop Profiles)	67
	low-plp-max-threshold	68
	low-plp-threshold	69
	max-burst-size	70
	max-queues-per-interface	70
	mode (Layer 2 Tunneling Protocol Shaping)	71
	peak-rate	72
	per-session-scheduler	72
	plp-to-clp	73
	priority (ATM2 IQ Schedulers)	73

	priority (Schedulers)	74
	protocol (Schedulers)	75
	queue-depth	76
	rtvbr	77
	scheduler-map (Interfaces and Traffic-Control Profiles)	78
	scheduler-maps (For ATM2 IQ Interfaces)	79
	scheduler-maps (For Most Interface Types)	79
	schedulers (Class of Service)	80
	shaping	81
	sustained-rate	82
	traffic-manager	82
	transmit-rate (Schedulers)	83
	transmit-weight	85
	unit	86
	vbr	87
	vc-cos-mode	88
	vci	89
Chapter 7	Operational Mode Commands	91
	show class-of-service l2tp-session	92
Part 3	Index	
	Index	97

List of Figures

Part 2	Configuration	
Chapter 2	CoS Configuration on Aggregated Interfaces	11
	Figure 1: Scaled Mode for Aggregated Ethernet Interfaces	18
	Figure 2: Replicated Mode for Aggregated Ethernet Interfaces	19
Chapter 3	CoS Configuration on ATM Interfaces	21
	Figure 3: Example Topology for Router with Eight Queues	25
Chapter 4	CoS Configuration on Ethernet Interfaces	39
	Figure 4: Topology to Verify Link Redundancy Support for L2TP LNS CoS	42

List of Tables

	About the Documentation	xi
	Table 1: Notice Icons	xiii
	Table 2: Text and Syntax Conventions	xiii
Part 1	Overview	
Chapter 1	Overview of CoS on Specific Transports	3
	Table 3: LSR Default Classification	7
Part 2	Configuration	
Chapter 7	Operational Mode Commands	91
	Table 4: show class-of-service l2tp-session Output Fields	92

About the Documentation

- Documentation and Release Notes on page xi
- Supported Platforms on page xi
- Using the Examples in This Manual on page xi
- Documentation Conventions on page xiii
- Documentation Feedback on page xv
- Requesting Technical Support on page xv

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If the information in the latest release notes differs from the information in the documentation, follow the product Release Notes.

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Supported Platforms

For the features described in this document, the following platforms are supported:

- M Series
- MX Series
- T Series
- PTX Series

Using the Examples in This Manual

If you want to use the examples in this manual, you can use the **load merge** or the **load merge relative** command. These commands cause the software to merge the incoming configuration into the current candidate configuration. The example does not become active until you commit the candidate configuration.

If the example configuration contains the top level of the hierarchy (or multiple hierarchies), the example is a *full example*. In this case, use the **load merge** command.

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

Merging a Full Example

To merge a full example, follow these steps:

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

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

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

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

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

Merging a Snippet

To merge a snippet, follow these steps:

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

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

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

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

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

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

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

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

Documentation Conventions

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

Table 1: Notice Icons

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

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

Table 2: Text and Syntax Conventions

Convention	Description	Examples
Bold text like this	Represents text that you type.	To enter configuration mode, type the configure command: user@host> configure
Fixed-width text like this	Represents output that appears on the terminal screen.	user@host> show chassis alarms No alarms currently active

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

Convention	Description	Examples
<i>Italic text like this</i>	<ul style="list-style-type: none"> Introduces or emphasizes important new terms. Identifies book names. Identifies RFC and Internet draft titles. 	<ul style="list-style-type: none"> A policy <i>term</i> is a named structure that defines match conditions and actions. <i>Junos OS System Basics Configuration Guide</i> RFC 1997, <i>BGP Communities Attribute</i>
<i>Italic text like this</i>	Represents variables (options for which you substitute a value) in commands or configuration statements.	Configure the machine's domain name: [edit] root@# set system domain-name <i>domain-name</i>
Text like this	Represents names of configuration statements, commands, files, and directories; configuration hierarchy levels; or labels on routing platform components.	<ul style="list-style-type: none"> To configure a stub area, include the stub statement at the [edit protocols ospf area area-id] hierarchy level. The console port is labeled CONSOLE.
< > (angle brackets)	Enclose optional keywords or variables.	stub <default-metric metric>;
(pipe symbol)	Indicates a choice between the mutually exclusive keywords or variables on either side of the symbol. The set of choices is often enclosed in parentheses for clarity.	broadcast multicast <i>(string1 string2 string3)</i>
# (pound sign)	Indicates a comment specified on the same line as the configuration statement to which it applies.	rsvp { # Required for dynamic MPLS only
[] (square brackets)	Enclose a variable for which you can substitute one or more values.	community name members [community-ids]
Indentation and braces ({ })	Identify a level in the configuration hierarchy.	[edit] routing-options { static { route default { nexthop <i>address</i> ; retain; } } }
;(semicolon)	Identifies a leaf statement at a configuration hierarchy level.	
J-Web GUI Conventions		
Bold text like this	Represents J-Web graphical user interface (GUI) items you click or select.	<ul style="list-style-type: none"> In the Logical Interfaces box, select All Interfaces. To cancel the configuration, click Cancel.
> (bold right angle bracket)	Separates levels in a hierarchy of J-Web selections.	In the configuration editor hierarchy, select Protocols>Ospf .

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- Document or topic name
- URL or page number
- Software release version (if applicable)

Requesting Technical Support

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- Search for known bugs: <http://www2.juniper.net/kb/>
- Find product documentation: <http://www.juniper.net/techpubs/>
- Find solutions and answer questions using our Knowledge Base: <http://kb.juniper.net/>
- Download the latest versions of software and review release notes: <http://www.juniper.net/customers/csc/software/>
- Search technical bulletins for relevant hardware and software notifications: <https://www.juniper.net/alerts/>

- Join and participate in the Juniper Networks Community Forum:
<http://www.juniper.net/company/communities/>
- Open a case online in the CSC Case Management tool: <http://www.juniper.net/cm/>

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

Opening a Case with JTAC

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

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

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

PART 1

Overview

- [Overview of CoS on Specific Transports on page 3](#)

CHAPTER 1

Overview of CoS on Specific Transports

- [Limitations on CoS for Aggregated Interfaces on page 3](#)
- [CoS on ATM Interfaces Overview on page 5](#)
- [CoS for L2TP Tunnels on Ethernet Interface Overview on page 6](#)
- [CoS for MPLS Overview on page 7](#)

Limitations on CoS for Aggregated Interfaces

Both Ethernet and SONET/SDH interfaces can be aggregated. The limitations covered here apply to both.

There are some restrictions when you configure CoS on aggregated Ethernet and SONET/SDH interfaces:

- Chassis scheduling, described in [Applying Scheduler Maps to Packet Forwarding Component Queues](#), is not supported on aggregated interfaces, because a chassis scheduler applies to the entire PIC and not just to one interface.
- An aggregated interface is a pseudo-interface. Therefore, CoS queues are not associated with the aggregated interface. Instead, CoS queues are associated with the member link interfaces of the aggregated interface.
- When you apply CoS parameters to the aggregated interface, they are applied to the CoS queues of the member link interfaces. You can apply CoS classifiers and rewrite rules directly to the member link interfaces, and the software uses the values you configure.
- You cannot apply a scheduler map to a member link of an aggregate interface.

When the scheduler map of the aggregate interface has schedulers configured for absolute transmit rate, the scheduler for the member link interfaces is scaled to the speed of each member link interface. Each member link interface has an automatic scheduler map that is not visible in the CLI. This scheduler map is allocated when the member link is added to the aggregate interface and is deleted when the member link is removed from the aggregate interface.

- If you configure the scheduler transmit rate of the aggregate interface as an absolute rate, the software uses the following formula to scale the transmit rate of each member link:

transmit rate of member link interface =
(configured transmit rate of aggregate interface /
total speed of aggregate interface) *
(total speed of member link interface / total configured percent) * 100

- If you configure the scheduler transmit rate of the aggregate interface as a percentage, the software uses the following formula to scale the transmit rate of each member link:

transmit rate percent of member link interface =
(configured transmit rate percent of aggregate interface /
total configured percent) * 100

The total configured percent is the sum of the configured transmit rate of all schedulers in terms of percentage of the total speed of the aggregate interface.

For more information, see [“Examples: Configuring CoS on Aggregated Interfaces” on page 12](#).

- All the other parameters for the schedulers, including priority, drop profile, and buffer size, are copied without change from the scheduler of the aggregated interface to the member link interfaces.
- The configuration related to the logical interfaces, including classifiers and rewrite rules, is copied from the aggregated logical interface configuration to the member link logical interfaces.
- For the scheduler map applied to an aggregated interface, if you configure a transmission rate in absolute terms, then the traffic of all the member link interfaces might be affected if any of the member link interfaces go up or down.

When applying CoS configurations to bundles, you must apply the CoS configuration directly to the bundle, not to the physical ports that are part of the bundle. The device may give you a false commit if you apply a CoS configuration directly to a physical port that is part of a bundle. This limitation applies if you attempt to configure a physical port that is already a member of a bundle or if you attempt to add a physical port to a bundle that already has a CoS configuration applied to it.

If you want to add a physical port to a bundle that already has a CoS configuration, you must:

1. Remove the CoS configuration from the port.
2. Commit your changes on the device.
3. Add the port to the bundle. The CoS configurations that are present on the bundle will be applied to the port you are adding to the bundle.
4. Commit your changes on the device.

In addition, if you want to remove a physical port from a bundle and ensure the physical port has the appropriate CoS configurations, you must:

1. Remove the port from the bundle.
2. Commit your changes on the device.

3. Apply the applicable CoS configuration to the port.
4. Commit your changes on the device.

CoS on ATM Interfaces Overview

The ATM2 intelligent queuing (IQ) interface allows multiple IP queues into each virtual circuit (VC). On Juniper Networks M Series Multiservice Edge Routers (except the M320 router), a VC tunnel can support four class-of-service (CoS) queues. On M320 routers and T Series Core Routers, for all ATM2 IQ PICs except the OC48 PIC, a VC tunnel can support eight CoS queues. Within a VC tunnel, the weighted round-robin (WRR) algorithm schedules the cell transmission of each queue. You can configure the queue admission policies, such as early packet discard (EPD) or weighted random early detection (WRED), to control the queue size during congestion.

For information about CoS components that apply generally to all interfaces, see CoS Overview. For general information about configuring ATM interfaces, see the Junos® OS Network Interfaces.

To configure ATM2 IQ VC tunnel CoS components, include the following statements at the `[edit interfaces at-fpc/pic/port]` hierarchy level:

```
[edit chassis fpc slot-number pic pic-number]
max-queues-per-interface number;

[edit interfaces at-fpc/pic/port]
atm-options {
  linear-red-profiles profile-name {
    high-plp-max-threshold percent;
    low-plp-max-threshold percent;
    queue-depth cells high-plp-threshold percent low-plp-threshold percent;
  }
  plp-to-clp;
  scheduler-maps map-name {
    forwarding-class class-name {
      epd-threshold cells plp1 cells;
      linear-red-profile profile-name;
      priority (high | low);
      transmit-weight (cells number | percent number);
    }
    vc-cos-mode (alternate | strict);
  }
}
unit logical-unit-number {
  atm-scheduler-map (map-name | default);
  family family {
    address address {
      destination address;
    }
  }
  plp-to-clp;
  shaping {
    (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained rate burst
    length);
```

```
}  
vci vpi-identifier.vci-identifier;  
}
```

CoS for L2TP Tunnels on Ethernet Interface Overview

For effective packet tunneling, CoS is implemented over L2TP tunnels. For Ethernet interfaces, CoS is supported for L2TP session traffic to a LAC on platforms configured as an LNS that include egress IQ2 or IQ2E PICs.

This feature is supported on the following platforms:

- M7i and M10i routers
- M120 routers

To enable session-aware CoS on an L2TP interface, include the **per-session-scheduler** statement at the **[edit interfaces unit *logical-unit-number*]** hierarchy level.

After CoS is configured on an L2TP tunnel, Junos OS dynamically creates a traffic shaper for the traffic-shaping-profile and the L2TP tunnel based on the tunnel identification number. This ensures that the packets are monitored at the LAC and classified to allow the traffic flow to be adjusted on congested networks.

This feature has the following limitations:

- Only 991 shapers are supported on each IQ2 or IQ2E PIC.
- For a 4-port IQ2E PIC, you can configure up to 1976 shapers for an 8-queue session and 3952 shapers for a 4-queue session.
- For an 8-port IQ2E PIC, you can configure up to 1912 shapers for an 8-queue session and up to 3824 shapers for a 4-queue session.
- Sessions in excess of the maximum supported values specified for the PICs cannot be shaped (but they can be policed).
- There is no support for PPP multilinks.
- The overall traffic rate cannot exceed the L2TP traffic rate, or else random drops result.
- There is no support for logical interface scheduling and shaping at the ingress because all schedulers are now reserved for L2TP.
- There is no support for physical interface rate shaping at the ingress.
- You cannot delete or deactivate the primary Ethernet interface on which the tunnel is established.

You can provide policing support for sessions with more than the maximum supported value on each IQ2 or IQ2E PIC. Each session can have four or eight different classes of traffic (queues). Each class needs its own policer; for example, one for voice and one for data traffic.

Related Documentation

- [Configuring CoS for L2TP Tunnels on Ethernet Interfaces on page 39](#)

- [Configuring LNS CoS for Link Redundancy on page 40](#)
- [Example: L2TP LNS CoS Support for Link Redundancy on page 41](#)

CoS for MPLS Overview

When IP traffic enters a label-switched path (LSP) tunnel, the ingress router marks all packets with a class-of-service (CoS) value, which is used to place the traffic into a transmission priority queue. On the router, each interface has up to eight transmit queues. The CoS value is encoded as part of the Multiprotocol Label Switching (MPLS) header and remains in the packets until the MPLS header is removed when the packets exit from the egress router. The routers within the LSP utilize the CoS value set at the ingress router. The CoS value is encoded by means of the CoS bits (also known as the EXP or experimental bits).

MPLS class of service works in conjunction with the router's general CoS functionality. If you do not configure any CoS features, the default general CoS settings are used. For MPLS class of service, you might want to prioritize how the transmit queues are serviced by configuring weighted round-robin, and to configure congestion avoidance using random early detection (RED).

The next-hop label-switching router (LSR) uses the default classification shown in [Table 3 on page 7](#).

Table 3: LSR Default Classification

Code Point	Forwarding Class	Loss Priority
000	best-effort	low
001	best-effort	high
010	expedited-forwarding	low
011	expedited-forwarding	high
100	assured-forwarding	low
101	assured-forwarding	high
110	network-control	low
111	network-control	high

PART 2

Configuration

- [CoS Configuration on Aggregated Interfaces on page 11](#)
- [CoS Configuration on ATM Interfaces on page 21](#)
- [CoS Configuration on Ethernet Interfaces on page 39](#)
- [CoS Configuration for MPLS Traffic on page 45](#)
- [Configuration Statements on page 47](#)
- [Operational Mode Commands on page 91](#)

CHAPTER 2

CoS Configuration on Aggregated Interfaces

- [Configuring Schedulers on Aggregated Interfaces on page 11](#)
- [Examples: Configuring CoS on Aggregated Interfaces on page 12](#)
- [Example: Configuring Scheduling Modes on Aggregated Interfaces on page 14](#)

Configuring Schedulers on Aggregated Interfaces

You can apply a class-of-service (CoS) configuration to aggregated Ethernet and aggregated SONET/SDH interfaces. The CoS configuration applies to all member links included in the aggregated interface. You cannot apply different CoS configurations to the individual member links.

You can configure shaping for aggregated Ethernet interfaces that use interfaces originating from Gigabit Ethernet IQ2 PICs. However, you cannot enable shaping on aggregated Ethernet interfaces when there is a mixture of ports from Intelligent Queuing (IQ) and Intelligent Queuing 2 (IQ2) PICs in the same bundle.

You cannot configure a shaping rate and guaranteed rate on an aggregated Ethernet interface with member interfaces on IQ or IQ2 PICs. The commit will fail. These statements are allowed only when the member interfaces are Enhanced Queuing DPC Gigabit Ethernet interfaces.

To view the summation of the queue statistics for the member links of an aggregate interface, issue the **show interfaces queue** command. To view the queue statistics for each member link, issue the **show interfaces queue aggregated-interface-name** command.

To configure CoS schedulers on aggregated interfaces, include the following statements at the **[edit class-of-service]** hierarchy level:

```
[edit class-of-service]
interfaces {
  interface-name {
    scheduler-map map-name;
    unit logical-unit-number {
      scheduler-map map-name;
    }
  }
}
```

```
}
scheduler-maps {
  map-name {
    forwarding-class class-name scheduler scheduler-name;
  }
}
schedulers {
  scheduler-name {
    buffer-size (percent percentage | remainder | temporal microseconds);
    drop-profile-map loss-priority (any | low | medium-low | medium-high | high) protocol
      (any | non-tcp | tcp) drop-profile profile-name;
    excess-priority (low | high);
    excess-rate percent percentage;
    priority priority-level;
    transmit-rate (rate | percent percentage | remainder) <exact>;
  }
}
```

Examples: Configuring CoS on Aggregated Interfaces

This example illustrates how CoS scheduler parameters are configured and applied to aggregated interfaces.

Applying Scaling Formula to Absolute Rates

Configure queues as follows when the total speed of member link interfaces is 100 Mbps (the available bandwidth is 100 Mbps):

```
[edit class-of-service]
schedulers {
  be {
    transmit-rate 10m;
  }
  af {
    transmit-rate 20m;
  }
  ef {
    transmit-rate 80m;
  }
  nc {
    transmit-rate 30m;
  }
}
```

The total configured transmit rates of the aggregated interface is **10m + 20m + 80m + 30m** = 140 Mbps, meaning the transmit rate is overconfigured by 40 percent. Therefore, the software scales down the configuration to match the 100 Mbps of available bandwidth, as follows:

```
be = (10/140) * 100 = 7 percent of 100 Mbps = 7 Mbps
af = (20/140) * 100 = 14 percent of 100 Mbps = 14 Mbps
ef = (80/140) * 100 = 57 percent of 100 Mbps = 57 Mbps
nc = (30/140) * 100 = 21 percent of 100 Mbps = 21 Mbps
```

Applying Scaling Formula to Mixture of

Configure the following mixture of percent and absolute rates:

```
[edit class-of-service]
```

Percent and Absolute Rates

```
schedulers {
  be {
    transmit-rate 20 percent;
  }
  af {
    transmit-rate 40 percent;
  }
  ef {
    transmit-rate 150m;
  }
  nc {
    transmit-rate 10 percent;
  }
}
```

Assuming 300 Mbps of available bandwidth, the configured percentages correlate with the following absolute rates:

```
schedulers {
  be {
    transmit-rate 60m;
  }
  af {
    transmit-rate 120m;
  }
  ef {
    transmit-rate 150m;
  }
  nc {
    transmit-rate 30m;
  }
}
```

The software scales the bandwidth allocation as follows:

```
be = (60/360) * 100 = 17 percent of 300 Mbps = 51 Mbps
af = (120/360) * 100 = 33 percent of 300 Mbps = 99 Mbps
ef = (150/360) * 100 = 42 percent of 300 Mbps = 126 Mbps
nc = (30/360) * 100 = 8 percent of 300 Mbps = 24 Mbps
```

Configuring an Aggregated Ethernet Interface

Configure an aggregated Ethernet interface with the following scheduler map:

```
[edit class-of-service]
scheduler-maps {
  aggregated-sched {
    forwarding-class be scheduler be;
    forwarding-class af scheduler af;
    forwarding-class ef scheduler ef;
    forwarding-class nc scheduler nc;
  }
}
schedulers {
  be {
    transmit-rate percent 10;
    buffer-size percent 25;
  }
  af {
```

```
        transmit-rate percent 20;
        buffer-size percent 25;
    }
    ef {
        transmit-rate 80m;
        buffer-size percent 25;
    }
    nc {
        transmit-rate percent 30;
        buffer-size percent 25;
    }
}
```

In this case, the transmission rate for the member link scheduler map is as follows:

- **be**—7 percent
- **af**—14 percent
- **ef**—57 percent
- **nc**—21 percent

If you add a Fast Ethernet interface to the aggregate, the aggregate bandwidth is 200 Mbps, and the transmission rate for the member link scheduler map is as follows:

- **be**—10 percent
- **af**—20 percent
- **ef**—40 percent
- **nc**—30 percent

Example: Configuring Scheduling Modes on Aggregated Interfaces

You can configure class-of-service parameters, such as queuing or shaping parameters on aggregated interfaces, in either link-protect or non-link-protect mode. You can configure these parameters for per-unit schedulers, hierarchical schedulers, or shaping at the physical and logical interface level. You can control the way these parameters are applied by configuring the aggregated interface to operate in **scale** or **replicate** mode.

You can apply these parameters on the following routers:

- MX Series router interfaces on EQ DPCs
- MX Series router interfaces on MICs or MPCs through Junos OS release 10.2 (non-link-protect mode only)
- M120 or M320 routers
- T Series router interfaces on IQ2 PICs
- PTX Series Packet Transport Switches

You can configure the applied parameters for aggregated interfaces operating in non-link-protected mode. In link-protected mode, only one link in the bundle is active at

a time (the other link is a backup link) so schedulers cannot be scaled or replicated. In non-link-protected mode, all the links in the bundle are active and send traffic; however, there is no backup link. If a link fails or is added to the bundle in non-link-protected mode, the links' traffic is redistributed among the active links.

To set the scheduling mode for aggregated interfaces, include the **scale** or **replicate** option of the **member-link-scheduler** statement at the **[edit class-of-service interfaces ean]** hierarchy level, where *n* is the configured number of the interface:

```
[edit class-of-service interfaces ean]
member-link-scheduler (replicate | scale);
```

By default, if you do not include the **member-link-scheduler** statement, scheduler parameters are applied to the member links in the **scale** mode (also called “equal division mode”).

The aggregated Ethernet interfaces are otherwise configured as usual. For more information on configuring aggregated Ethernet interfaces, see the Junos® OS Network Interfaces.

The following examples set **scale** mode on the **ae0** interface and **replicate** mode on the **ae1** interface.

```
[edit class-of-service]
interfaces ae0 {
  member-link-scheduler scale;
}

[edit class-of-service]
interfaces ae1 {
  member-link-scheduler replicate;
}
```



NOTE: The **member-link-scheduler** statement only appears for aggregated interfaces. You configure this statement for aggregated interfaces in non-link-protected mode. For more information about link protection modes, see the *Network Interfaces Configuration Guide*.

Aggregated interfaces support both hierarchical and per-unit schedulers. For more information about configuring schedulers, see *Configuring Schedulers*.



NOTE: The **traffic-control-profiles** statement is not supported for PTX Series Packet Transport Switches.

When interface parameters are using the **scale** option of the **member-link-scheduler** statement, the following parameters under the **[edit class-of-service traffic-control-profiles traffic-control-profile-name]** configuration are scaled on egress when hierarchical schedulers are configured:

- **shaping-rate** (PIR)

- **guaranteed-rate** (CIR)
- **delay-buffer-rate**

When interface parameters are using the **scale** option of the **member-link-scheduler** statement, the following parameters under the **[edit class-of-service schedulers scheduler-name]** configuration are scaled on egress when per-unit schedulers are configured:

- **transmit-rate**
- **buffer-size**



NOTE: You cannot apply a hierarchical scheduler at the interface set level for an **ae** interface. (Interface sets cannot be configured under an **ae** interface.)

The following configuration parameters are not supported on **ae** interfaces in non-link-protection mode:

- Input scheduler maps
- Input traffic control profiles
- Input shaping rates

The following configuration conventions are also not supported:

- Scaling of the **input-traffic-control-profile-remaining** statement.
- The **scheduler-map-chassis** statement and the **derived** option for the **ae** interface. Chassis scheduler maps should be applied under the physical interfaces.
- Dynamic and demux interfaces are not supported as part of the **ae** bundle.

Depending on whether the **scale** or **replicate** option is configured, the **member-link-scheduler** statement operates in either scaled mode (also called “equal division mode”) or replicated mode, respectively.

In scaled mode, a VLAN can have multiple flows that can be sent over multiple member links of the **ae** interface. Likewise, a member link can receive traffic from any VLAN in the **ae** bundle. In scaled mode, the physical interface bandwidth is divided equally among all member links of the **ae** bundle.

In scaled mode, the following scheduler parameter values are divided equally among the member links:

- When the parameters are configured using traffic control profiles, then the parameters scaled are the shaping rate, guaranteed rate, and delay buffer rate.
- When the parameters are configured using scheduler maps, then the parameters scaled are the transmit rate and buffer size.

For example, consider an **ae** bundle between routers R1 and R2 consisting of three links. These are **ge-0/0/1**, **ge-0/0/2** and **ge-0/0/3** (**ae0**) on R1; and **ge-1/0/0**, **ge-1/0/1**, and **ge-1/0/2** (**ae2**) on R2. Two logical interfaces (units) are also configured on the **ae0** bundle on R1: **ae0.0** and **ae0.1**.

On **ae0**, traffic control profiles on R1 are configured as follows:

- **ae0** (the physical interface level) has a PIR of 450 Mbps.
- **ae0.0** (VLAN 100 at the logical interface level) has a PIR of 150 Mbps and a CIR of 90 Mbps.
- **ae0.1** (VLAN 200 at the logical interface level) has a PIR of 90 Mbps and a CIR of 60 Mbps.

In scaled mode, the **ae0** PIR is first divided among the member physical interfaces. Because there are three members, each receives $450 / 3 = 150$ Mbps as a derived value. So the scaled PIR for the members interfaces is 150 Mbps each.

However, there are also two logical interfaces (**ae0.0** and **ae0.1**) and VLANs (100 and 200) on **ae0**. Traffic can leave on any of the three physical interfaces (**ge-0/0/1**, **ge-0/0/2**, or **ge-0/0/3**) in the bundle. Therefore, two derived logical interfaces are added to the member links to represent the two VLANs.

There are now six logical interfaces on the physical interfaces of the links making up the **ae** bundle, one set for VLAN 100 and the other for VLAN 200:

- **ge-0/0/1.0** and **ge-0/0/1.1**
- **ge-0/0/2.0** and **ge-0/0/2.1**
- **ge-0/0/3.0** and **ge-0/0/3.1**

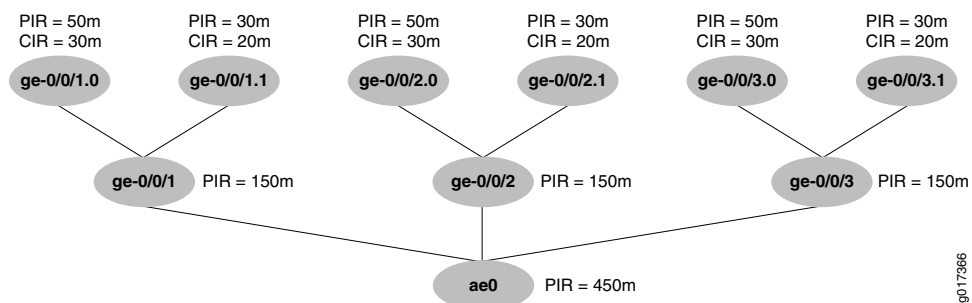
The traffic control profile parameters configured on **ae0.0** are divided across all the underlying logical interfaces (the unit 0s). In the same way, the traffic control profile parameters configured on **ae0.1** are divided across all the underlying logical interfaces (the unit 1s).

Therefore, the derived values of the scaled parameters on the interfaces are:

- For **ge-0/0/1.0** and **ge-0/0/2.0** and **ge-0/0/3.0**, each CIR = $90 / 3 = 30$ Mbps, and each PIR = $150 / 3 = 50$ Mbps.
- For **ge-0/0/1.1** and **ge-0/0/2.1** and **ge-0/0/3.1**, each CIR = $60 / 3 = 20$ Mbps, and each PIR = $90 / 3 = 30$ Mbps.

The scaled values are shown in [Figure 1 on page 18](#).

Figure 1: Scaled Mode for Aggregated Ethernet Interfaces



In scaled mode, when a new member link is added to the bundle, or an existing member link is either removed or fails, then the scaling factor (based on the number of active links) is recomputed and the new scheduler or traffic control profile parameters are reassigned. Only the PIR, CIR, and buffer parameters are recomputed: all other parameters are simply copied at each level.



NOTE: In `show class-of-service scheduler-map` commands, values derived in scaled mode instead of explicitly configured are flagged with `&sf**n` suffix, where *n* indicates the value of the scaling factor.

The following sample shows the output for the scheduler map named `smap-all-abs` with and without a scaling factor:

```

user@host> show class-of-service scheduler-map
Scheduler map: smap-all-abs, Index: 65452

Scheduler: q0_sch_abs, Forwarding class: be, Index: 6775
Transmit rate: 40000000 bps, Rate Limit: none, Buffer size: remainder,
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>

user@host> show class-of-service scheduler-map
Scheduler map: smap-all-abs, Index: 65452

Scheduler: q0_sch_abs&sf**3, Forwarding class: be, Index: 2128
Transmit rate: 13333333 bps, Rate Limit: none, Buffer size: remainder,
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>

```



NOTE: There can be multiple scheduler maps created with different scaling factors, depending on when the child interfaces come up. For example, if there are only two active children on a parent interface, a new scheduler map with a scaling factor of 2 is created. The scheduler map name is **smap-all-abs&***sf**2**.

In replicated mode, in contrast to scaled mode, the configured scheduler parameters are simply replicated, not divided, among all member links of the **ae** bundle.

In replicated mode, the following scheduler parameter values are replicated among the member links and logical interfaces:

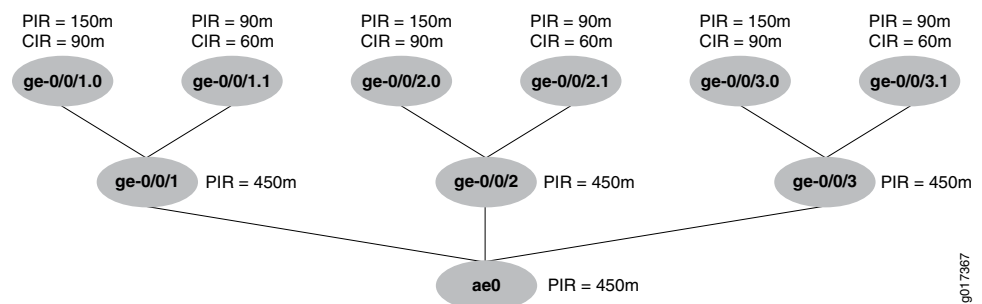
- When the parameters are configured using traffic control profiles, then the parameters replicated are the shaping rate, guaranteed rate, and delay buffer rate.
- When the parameters are configured using scheduler maps, then the parameters replicated are the transmit rate and buffer size.

If the scheduler parameters in the example configuration between routers R1 and R2 are applied with the **member-link-scheduler replicate** statement and option, the following parameters are applied:

- The **ae0** PIR is copied among the member physical interfaces. Each receives 450 Mbps as a PIR.
- For each logical interface unit **.0**, the configured PIR and CIR for **ae0.0** is replicated (copied). Each logical interface unit **.0** receives a PIR of 150 Mbps and a CIR of 90 Mbps.
- For each logical interface unit **.1**, the configured PIR and CIR for **ae0.1** is replicated (copied). Each logical interface unit **.1** receives a PIR of 90 Mbps and a CIR of 60 Mbps.

The replicated values are shown in [Figure 2 on page 19](#).

Figure 2: Replicated Mode for Aggregated Ethernet Interfaces



In replicated mode, when a new member link is added to the bundle, or an existing member link is either removed or fails, the values are either copied or deleted from the required levels.

- Related Documentation**
- [Schedulers Overview](#)
 - [Default Schedulers Overview](#)
 - [Configuring a Scheduler](#)

CHAPTER 3

CoS Configuration on ATM Interfaces

- [Configuring Linear RED Profiles on ATM Interfaces on page 21](#)
- [Configuring Scheduler Maps on ATM Interfaces on page 22](#)
- [Enabling Eight Queues on ATM Interfaces on page 24](#)
- [Configuring VC CoS Mode on ATM Interfaces on page 29](#)
- [Copying the PLP Setting to the CLP Bit on ATM Interfaces on page 30](#)
- [Applying Scheduler Maps to Logical ATM Interfaces on page 30](#)
- [Configuring CoS for L2TP Tunnels on ATM Interfaces on page 31](#)
- [Configuring IEEE 802.1p BA Classifiers for Ethernet VPLS Over ATM on page 33](#)
- [Configuring ATM Scheduler Support for Ethernet VPLS over ATM Bridged Interfaces on page 34](#)
- [Example: Configuring CoS for ATM2 IQ VC Tunnels on page 35](#)
- [Example: Combine Layer 2 and Layer 3 Classification on the Same ATM Physical Interface on page 36](#)
- [Example: Configuring ATM Scheduler Support for Ethernet VPLS over ATM Bridged Interfaces on page 37](#)

Configuring Linear RED Profiles on ATM Interfaces

Linear random early detection (RED) profiles define CoS virtual circuit drop profiles. You can configure up to 32 linear RED profiles per port. When a packet arrives, RED checks the queue fill level. If the fill level corresponds to a nonzero drop probability, the RED algorithm determines whether to drop the arriving packet.

To configure linear RED profiles, include the **linear-red-profiles** statement at the **[edit interfaces at-fpc/pic/port atm-options]** hierarchy level:

```
[edit interfaces at-fpc/pic/port atm-options]
linear-red-profiles profile-name {
  high-plp-max-threshold percent;
  low-plp-max-threshold percent;
  queue-depth cells high-plp-threshold percent low-plp-threshold percent;
}
```

The **queue-depth**, **high-plp-threshold**, and **low-plp-threshold** statements are mandatory.

You can define the following options for each RED profile:

- **high-plp-max-threshold**—Define the drop profile fill-level for the high packet loss priority (PLP) CoS VC. When the fill level exceeds the defined percentage, all packets with high PLP are dropped.
- **low-plp-max-threshold**—Define the drop profile fill-level for the low PLP CoS VC. When the fill level exceeds the defined percentage, all packets with low PLP are dropped.
- **queue-depth**—Define maximum queue depth in the CoS VC drop profile. Packets are always dropped beyond the defined maximum. The range you can configure is from 1 through 64,000 cells.
- **high-plp-threshold**—Define CoS VC drop profile fill-level percentage when linear RED is applied to cells with high PLP. When the fill level exceeds the defined percentage, packets with high PLP are randomly dropped by RED.
- **low-plp-threshold**—Define CoS VC drop profile fill-level percentage when linear RED is applied to cells with low PLP. When the fill level exceeds the defined percentage, packets with low PLP are randomly dropped by RED.

Configuring Scheduler Maps on ATM Interfaces

To define a scheduler map, you associate it with a forwarding class. Each class is associated with a specific queue, as follows:

- **best-effort**—Queue 0
- **expedited-forwarding**—Queue 1
- **assured-forwarding**—Queue 2
- **network-control**—Queue 3



NOTE: For M320 and T Series routers only, you can configure more than four forwarding classes and queues. For more information, see [“Enabling Eight Queues on ATM Interfaces”](#) on page 24.

When you configure an ATM scheduler map, the Junos OS creates these CoS queues for a VC. The Junos OS prefixes each packet delivered to the VC with the next-hop rewrite data associated with each queue.

To configure an ATM scheduler map, include the **scheduler-maps** statement at the **[edit interfaces at-fpc/pic/port atm-options]** hierarchy level:

```
edit interfaces at-fpc/pic/port atm-options]
scheduler-maps map-name {
  forwarding-class class-name {
    epd-threshold cells plp1 cells;
    linear-red-profile profile-name;
    priority (high | low);
    transmit-weight (cells number | percent number);
  }
}
```

```
vc-cos-mode (alternate | strict);
}
```

You can define the following options for each forwarding class:

- **epd-threshold**—An EPD threshold provides a queue of cells that can be stored with tail drop. When a beginning-of-packet (BOP) cell is received, the VC's queue depth is checked against the EPD threshold. If the VC's queue depth exceeds the EPD threshold, the BOP cell and all subsequent cells in the packet are discarded.
- **linear-red-profile**—A linear RED profile defines the number of cells using the **queue-depth** statement within the RED profile. (You configure the **queue-depth** statement at the **[edit interfaces at-fpc/pic/port atm-options linear-red-profile profile-name]** hierarchy level.)

By default, if you include the **scheduler-maps** statement at the **[edit interfaces at-fpc/pic/port atm-options]** hierarchy level, the interface uses an EPD threshold that is determined by the Junos OS based on the available bandwidth and other parameters. You can override the default EPD threshold by setting an EPD threshold or a linear RED profile.

If shaping is enabled, the default EPD threshold is proportional to the shaping rate according to the following formula:

$$\text{default epd-threshold} = \text{number of buffers} * \text{shaping rate} / \text{line rate}$$

The minimum value is 48 cells. If the formula results in an EPD threshold less than 48 cells, the result is ignored, and the minimum value of 48 cells is used.

- **priority**—By default, queue 0 is high priority, and the remaining queues are low priority. You can configure high or low queuing priority for each queue.
- **transmit-weight**—By default, the transmit weight is 95 percent for queue 0, and 5 percent for queue 3. You can configure the transmission weight in number of cells or percentage. Each CoS queue is serviced in WRR mode. When CoS queues have data to send, they send the number of cells equal to their weight before passing control to the next active CoS queue. This allows proportional bandwidth sharing between multiple CoS queues within a rate-shaped VC tunnel. A CoS queue can send from 1 through 32,000 cells or from 5 through 100 percent of queued traffic before passing control to the next active CoS queue within a VC tunnel.

The AAL5 protocol prohibits cells from being interleaved on a VC; therefore, a complete packet is always sent. If a CoS queue sends more cells than its assigned weight because of the packet boundary, the deficit is carried over to the next time the queue is scheduled to transmit. If the queue is empty after the cells are sent, the deficit is waived, and the queue's assigned weight is reset.



NOTE: If you include the `scheduler-maps` statement at the `[edit interfaces at-fpc/pic/port atm-options]` hierarchy level, the `epd-threshold` statement at the `[edit interfaces interface-name unit logical-unit-number]` or `[edit interfaces interface-name unit logical-unit-number address address family family multipoint-destination address]` hierarchy level has no effect because either the default EPD threshold, the EPD threshold setting in the forwarding class, or the linear RED profile takes effect instead.

Enabling Eight Queues on ATM Interfaces

By default, ATM2 IQ PICs on M320 and T Series routers and Circuit Emulation PICs using ATM on the M120 and M320 are restricted to a maximum of four egress queues per interface. You can enable eight egress queues by including the **max-queues-per-interface** statement at the `[edit chassis fpc slot-number pic pic-number]` hierarchy level:

```
[edit chassis fpc slot-number pic pic-number]
max-queues-per-interface (4 | 8);
```

The numerical value can be 4 or 8.

If you include the **max-queues-per-interface** statement, all ports on the PIC use the configured maximum.

When you include the **max-queues-per-interface** statement and commit the configuration, all physical interfaces on the PIC are deleted and re-added. Also, the PIC is taken offline and then brought back online immediately. You do not need to manually take the PIC offline and online. You should change modes between four queues and eight queues only when there is no active traffic going to the PIC.



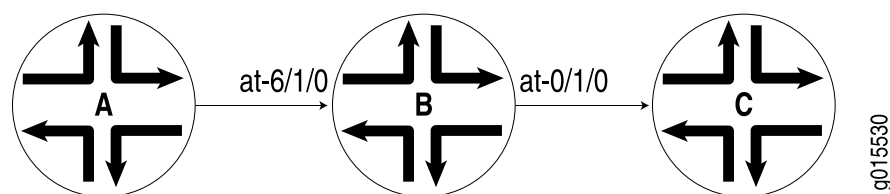
NOTE: When you are considering enabling eight queues on an ATM2 IQ interface, you should note the following:

- ATM2 IQ interfaces using Layer 2 circuit trunk transport mode support only four CoS queues.
- ATM2 IQ interfaces with MLPPP encapsulation support only four CoS queues.
- You can configure only four RED profiles for the eight queues. Thus, queue 0 and queue 4 share a single RED profile, as do queue 1 and queue 5, queue 2 and queue 6, and queue 3 and queue 7. There is no restriction on EPD threshold per queue.
- The default chassis scheduler allocates resources for queue 0 through queue 3, with 25 percent of the bandwidth allocated to each queue. When you configure the chassis to use more than four queues, you must configure and apply a custom chassis scheduler to override the default. To apply a custom chassis scheduler, include the `scheduler-map-chassis` statement at the `[edit class-of-service interfaces at-fpc/pic/*]` hierarchy level. For more information about configuring and applying a custom chassis scheduler, see *Applying Scheduler Maps to Packet Forwarding Component Queues*.

Example: Enabling Eight Queues on ATM2 IQ Interfaces

In Figure 3 on page 25, Router A generates IP packets with different IP precedence settings. Router B is an M320 router or a T Series router with two ATM2 IQ interfaces. On Router B, interface `at-6/1/0` receives traffic from Router A, while interface `at-0/1/0` sends traffic to Router C. This example shows the CoS configuration for Router B.

Figure 3: Example Topology for Router with Eight Queues



On Router B:

```

[edit chassis]
fpc 0 {
  pic 1 {
    max-queues-per-interface 8;
  }
}
fpc 6 {
  pic 1 {
    max-queues-per-interface 8;
  }
}
  
```

```
[edit interfaces]
at-0/1/0 {
  atm-options {
    linear-red-profiles {
      red_1 queue-depth 1k high-plp-threshold 50 low-plp-threshold 80;
      red_2 queue-depth 2k high-plp-threshold 40 low-plp-threshold 70;
      red_3 queue-depth 3k high-plp-threshold 30 low-plp-threshold 60;
      red_4 queue-depth 4k high-plp-threshold 20 low-plp-threshold 50;
    }
    scheduler-maps {
      sch_red {
        vc-cos-mode strict;
        forwarding-class fc_q0 {
          priority high;
          transmit-weight percent 5;
          linear-red-profile red_1;
        }
        forwarding-class fc_q1 {
          priority low;
          transmit-weight percent 10;
          linear-red-profile red_2;
        }
        forwarding-class fc_q2 {
          priority low;
          transmit-weight percent 15;
          linear-red-profile red_3;
        }
        forwarding-class fc_q3 {
          priority low;
          transmit-weight percent 20;
          linear-red-profile red_4;
        }
        forwarding-class fc_q4 {
          priority low;
          transmit-weight percent 5;
          linear-red-profile red_1;
        }
        forwarding-class fc_q5 {
          priority low;
          transmit-weight percent 10;
          linear-red-profile red_2;
        }
        forwarding-class fc_q6 {
          priority low;
          transmit-weight percent 15;
          linear-red-profile red_3;
        }
        forwarding-class fc_q7 {
          priority low;
          transmit-weight percent 20;
          linear-red-profile red_4;
        }
      }
      sch_epd {
        vc-cos-mode alternate;
```

```
forwarding-class fc_q0 {
    priority high;
    transmit-weight percent 5;
    epd-threshold 1024;
}
forwarding-class fc_q1 {
    priority low;
    transmit-weight percent 10;
    epd-threshold 2048;
}
forwarding-class fc_q2 {
    priority low;
    transmit-weight percent 15;
    epd-threshold 3072;
}
forwarding-class fc_q3 {
    priority low;
    transmit-weight percent 20;
    epd-threshold 4096;
}
forwarding-class fc_q4 {
    priority low;
    transmit-weight percent 5;
    epd-threshold 2048;
}
forwarding-class fc_q5 {
    priority low;
    transmit-weight percent 10;
    epd-threshold 3072;
}
forwarding-class fc_q6 {
    priority low;
    transmit-weight percent 15;
    epd-threshold 4096;
}
forwarding-class fc_q7 {
    priority low;
    transmit-weight percent 20;
    epd-threshold 5120;
}
}
}
}
atm-options {
    vpi 0;
}
unit 0 {
    vci 0.100;
    shaping {
        cbr 1920000;
    }
    atm-scheduler-map sch_red;
    family inet {
        address 172.16.0.1/24;
    }
}
```

```
unit 1 {
  vci 0.101;
  shaping {
    vbr peak 1m sustained 384k burst 256;
  }
  atm-scheduler-map sch_epd;
  family inet {
    address 172.16.1.1/24;
  }
}
}
at-6/1/0 {
  atm-options {
    vpi 0;
  }
  unit 0 {
    vci 0.100;
    family inet {
      address 10.10.0.1/24;
    }
  }
  unit 1 {
    vci 0.101;
    family inet {
      address 10.10.1.1/24;
    }
  }
}
}

[edit class-of-service]
classifiers {
  inet-precedence inet_classifier {
    forwarding-class fc_q0 {
      loss-priority low code-points 000;
    }
    forwarding-class fc_q1 {
      loss-priority low code-points 001;
    }
    forwarding-class fc_q2 {
      loss-priority low code-points 010;
    }
    forwarding-class fc_q3 {
      loss-priority low code-points 011;
    }
    forwarding-class fc_q4 {
      loss-priority low code-points 100;
    }
    forwarding-class fc_q5 {
      loss-priority low code-points 101;
    }
    forwarding-class fc_q6 {
      loss-priority low code-points 110;
    }
    forwarding-class fc_q7 {
      loss-priority low code-points 111;
    }
  }
}
```

```

}
forwarding-classes {
  queue 0 fc_q0;
  queue 1 fc_q1;
  queue 2 fc_q2;
  queue 3 fc_q3;
  queue 4 fc_q4;
  queue 5 fc_q5;
  queue 6 fc_q6;
  queue 7 fc_q7;
}
interfaces {
  at-6/1/0 {
    unit * {
      classifiers {
        inet-precedence inet_classifier;
      }
    }
  }
}
[edit routing-options]
static {
  route 10.10.20.2/32 {
    next-hop at-0/1/0.0;
    retain;
    no-readvertise;
  }
  route 10.10.1.2/32 {
    next-hop at-0/1/0.1;
    retain;
    no-readvertise;
  }
}
}

```

Verifying the Configuration

To see the results of this configuration, you can issue the following operational mode commands:

- **show interfaces at-0/1/0 extensive**
- **show interfaces queue at-0/1/0**
- **show class-of-service forwarding-class**

Configuring VC CoS Mode on ATM Interfaces

VC CoS mode defines the CoS queue scheduling priority. By default, the VC CoS mode is alternate. When it is a queue's turn to transmit, the queue transmits up to its weight in cells as specified by the **transmit-weight** statement at the **[edit interfaces at-fpc/pic/port atm-options scheduler-maps map-name forwarding-class class-name]** hierarchy level. The number of cells transmitted can be slightly over the configured or default transmit weight, because the transmission always ends at a packet boundary.

To configure the VC CoS mode, include the **vc-cos-mode** statement at the **[edit interfaces at-fpc/pic/port atm-options scheduler-maps]** hierarchy level:

```
edit interfaces at-fpc/pic/port atm-options scheduler-maps]
  vc-cos-mode (alternate | strict);
```

Two modes of CoS scheduling priority are supported:

- **alternate**—Assign **high** priority to one queue. The scheduling of the queues alternates between the **high** priority queue and the remaining queues. Every other scheduled packet is from the **high** priority queue.
- **strict**—Assign strictly **high** priority to one queue. A queue with strictly **high** priority is always scheduled before the remaining queues. The remaining queues are scheduled in round-robin fashion.

Copying the PLP Setting to the CLP Bit on ATM Interfaces

For a provider-edge (PE) router with customer edge (CE)-facing, egress, ATM2 IQ interfaces configured with standard AAL5 encapsulation, you can enable the PLP setting to be copied into the CLP bit.



NOTE: This configuration setting is not applicable to Layer 2 circuit encapsulations because the control word captures and preserves CLP information. For more information about Layer 2 circuit encapsulations, see the Junos® OS Network Interfaces.

By default, at egress ATM2 IQ interfaces configured with standard AAL5 encapsulation, the PLP information is not copied to the CLP bit. This means the PLP information is not carried beyond the egress interface onto the CE router.

You can enable the PLP information to be copied into the CLP bit by including the **plp-to-clp** statement:

```
plp-to-clp;
```

You can include this statement at the following hierarchy levels:

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

Applying Scheduler Maps to Logical ATM Interfaces

To apply the ATM scheduler map to a logical interface, include the **atm-scheduler-map** statement:

```
atm-scheduler-map (map-name | default);
```

When you add or change a scheduler map, the associated logical interface is taken offline and then brought back online immediately. For ATM CoS to take effect, you must configure the VCI and VPI identifiers and traffic shaping on each VC by including the following statements:

```
vci vpi-identifier.vci-identifier;
shaping {
  (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained rate burst
  length);
}
```

You can include these statements at the following hierarchy levels:

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

For more information, see the Junos® OS Network Interfaces.

You can also apply a scheduler map to the chassis traffic that feeds the ATM interfaces. For more information, see Applying Scheduler Maps to Packet Forwarding Component Queues.

Configuring CoS for L2TP Tunnels on ATM Interfaces

The Layer 2 Tunneling Protocol (L2TP) is often used to carry traffic securely between an L2TP network server (LNS) to an L2TP access concentrator (LAC). CoS is supported for L2TP session traffic to a LAC on platforms configured as an LNS that include egress IQ2 PICs. Supported routers are:

- M7i and M10i routers
- M120 routers

To enable session-aware CoS on an L2TP interface, include the **per-session-scheduler** statement at the [edit interfaces unit *logical-unit-number*] hierarchy level.

```
[edit interfaces interface-name unit logical-unit-number]
per-session-scheduler;
```

You also must set the IQ2 PIC mode for session-aware traffic shaping and set the number of bytes to add to or subtract from the packet before ATM cells are created. To configure these options on the ingress side of the tunnel, include the **ingress-shaping-overhead** and **mode session-shaping** statements at the [edit chassis fpc *slot-number* pic *pic-number* traffic-manager] hierarchy level.

```
[edit chassis fpc slot-number pic pic-number]
traffic-manager {
  ingress-shaping-overhead number;
  mode session-shaping;
}
```

Various limitations apply to this feature:

- Only 991 shapers are supported on each IQ2 PIC.
- Sessions in excess of 991 cannot be shaped (but they can be policed).
- There is no support for PPP multilinks.
- The overall traffic rate cannot exceed the L2TP traffic rate, or else random drops result.
- There is no support for logical interface scheduling and shaping at the ingress because all schedulers are now reserved for L2TP.
- There is no support for physical interface rate shaping at the ingress.

You can provide policing support for sessions with more than the 991 shapers on each IQ2 PIC. Each session can have four or eight different classes of traffic (queues). Each class needs its own policer; for example, one for voice and one for data traffic. The policer is configured within a **simple-filter** statement and only **forwarding class** is supported in the **from** clause. Only one policer can be referenced in each simple filter.

The following example shows a policer within a simple filter applied to two assured forwarding classes:

```
[edit firewall]
policer P1 {
  if-exceeding {
    bandwidth-limit 400k;
    burst-size-limit 1500;
  }
  then discard;
}
family inet {
  simple-filter SF-1 {
    term T-1 {
      from {
        forwarding-class [ af11 af21 ];
      }
      then policer P1;
    }
  }
}
```

You can also set the number of bytes to add to or subtract from the packet at the egress of the tunnel. To configure these options on the egress side of the tunnel, include the **egress-shaping-overhead** and **mode session-shaping** statements at the **[edit chassis fpc slot-number pic pic-number traffic-manager]** hierarchy level.

```
[edit chassis fpc slot-number pic pic-number]
traffic-manager {
  egress-shaping-overhead number;
  mode session-shaping;
}
```


Configuring IEEE 802.1p BA Classifiers for Ethernet VPLS Over ATM

You can apply an IEEE 802.1p behavior aggregate (BA) classifier to VPLS in a bridged Ethernet over ATM environment using ATM (RFC 1483) encapsulation. This extracts the Layer 2 (frame level) IEEE 802.1p information from the cells arriving on the ATM interface. Note that the interface must be configured for the Ethernet VPLS service over ATM links.

This example applies the classifier **atm-ether-vpls-classifier** to an ATM interface using **ether-vpls-over-atm-llc** encapsulation. This is not a complete CoS configuration example.

```
[edit class-of-service interfaces]
at-1/2/3 {
  unit 0 {
    (...) # Other CoS features
    classifiers {
      ieee-802.1 atm-ether-vpls-classifier; # Classifier defined elsewhere
    }
  }
}

[edit]
interface at-1/2/3 {
  atm-options {
    vpi 0;
  }
  unit 0 {
    encapsulation ether-vpls-over-atm-llc; # Required encapsulation type
    vci 0.100;
    family vpls;
  }
}
```

You must configure a routing instance for the VPLS as well:

```
[edit routing-instances]
cos-test-1 {
  instance-type vpls; #This is required
  interface at-1/2/3;
  route-distinguisher 10.10.10.10:1;
  vrf-target target:11111:1;
  protocols {
    vpls {
      site-range 10;
      site cos-test-v1-site1 {
        site-identifier 1;
      }
    }
  }
}
```

The Layer 2 VPN classification on an ATM interface is limited to the Layer 2 granularity, not to each separate VLAN/VPLS instance. In other words, all of the VLAN/VPLS packets arriving on an ATM virtual circuit are classified by a single IEEE 802.1p classifier. The individual flow of each VLAN cannot be identified at this level.

Configuring ATM Scheduler Support for Ethernet VPLS over ATM Bridged Interfaces

You can configure ATM scheduler maps on Ethernet VPLS over bridged ATM interfaces.

Before you begin, you must have done the following tasks:

- Properly configured the router basics
- Verified you have support for VPLS and routing instance configuration
- Installed ATM II IQ PICs

When you configure ATM scheduler maps on Ethernet VPLS over bridged ATM interfaces, you can assign ATM traffic to various forwarding classes and queues. This feature is only available with the ATM II IQ PIC with Ethernet VPLS-over-ATM encapsulation.

The configuration takes place in four steps: define the scheduler map for ATM options on the interface, set the encapsulation type to Ethernet VPLS over ATM LLC, attach the scheduler map to the logical interface (unit), and include the interface in the VPLS routing instance configuration.

To configure ATM scheduler maps on Ethernet VPLS over bridged ATM interfaces:

1. Define the scheduler map for ATM options on the interface:

```
[edit interfaces at-fpc/pic/port]  
user@host# set atm-options pic-type atm2  
user@host# set atm-options vpi vpi-number  
user@host# set atm-options scheduler-maps scheduler-map-name forwarding-class  
    forwarding-class-name forwarding-class-option-statements  
(repeat last set command as necessary)
```

2. Set the encapsulation type to Ethernet VPLS over ATM LLC:

```
[edit interfaces at-fpc/pic/port]  
user@host# set unit unit-number encapsulation ether-vpls-over-atm-llc  
user@host# set unit unit-number vci vci-number
```

3. Attach the scheduler map to the logical interface (unit):

```
[edit interfaces at-fpc/pic/port]  
user@host# set unit unit-number atm-scheduler-map scheduler-map-name
```

4. Include the interface in the VPLS routing instance configuration:

```
[edit interfaces at-fpc/pic/port]  
user@host# top  
[edit]  
user@host# edit routing-instances routing-instance-name  
[edit routing-instances routing-instance-name]  
user@host# set interface at-fpc/pic/port.unit-number  
user@host# set route-distinguisher value  
user@host# set vrf-target target-value  
user@host# set protocols vpls site-range value  
user@host# set protocols vpls site site-name site-identifier number
```

When you are done, the configuration statements you added should look like the listings below.

1. The scheduler map for ATM options on the interface:

```
[edit interfaces at-fpc/pic/port atm-options]
pic-type atm2;
vpi vpi-number;
scheduler-maps {
  scheduler-map-name {
    forwarding-class forwarding-class-name {
      (forwarding-class option statements);
    }
  }
}
```

2. The encapsulation type to Ethernet VPLS over ATM LLC:

```
[edit interfaces at-fpc/pic/port unit unit-number]
encapsulation ether-vpls-over-atm-llc;
vci vci-number;
```

3. The scheduler map to the logical interface (unit):

```
[edit interfaces at-fpc/pic/port unit unit-number]
atm-scheduler-map scheduler-map-name;
```

4. The interface in the VPLS routing instance configuration:

```
[edit routing-instances routing-instance-name]
interface at-fpc/pic/port.unit-number;
route-distinguisher value;
vrf-target target-value;
protocols {
  vpls {
    site-range value;
    site site-name {
      site-identifier number;
    }
  }
}
```

**Related
Documentation**

- [Example: Configuring ATM Scheduler Support for Ethernet VPLS over ATM Bridged Interfaces on page 37](#)

Example: Configuring CoS for ATM2 IQ VC Tunnels

This example configures ATM2 IQ VC tunnel CoS components:

```
[edit interfaces]
at-1/2/0 {
  atm-options {
    vpi 0;
    linear-red-profiles red-profile-1 {
      queue-depth 35000 high-plp-threshold 75 low-plp-threshold 25;
    }
  }
}
```

```
scheduler-maps map-1 {
  vc-cos-mode strict;
  forwarding-class best-effort {
    priority low;
    transmit-weight percent 25;
    linear-red-profile red-profile-1;
  }
}
unit 0 {
  vci 0.128;
  shaping {
    vbr peak 20m sustained 10m burst 20;
  }
  atm-scheduler-map map-1;
  family inet {
    address 192.168.0.100/32 {
      destination 192.168.0.101;
    }
  }
}
```

Example: Combine Layer 2 and Layer 3 Classification on the Same ATM Physical Interface

With the ATM II IQ PIC installed on the M320 router with the Enhanced Type 3 FPC or the M120 router, you can combine Layer 2 and Layer 3 classifiers on the same ATM physical interface. However, you must apply the classifiers to different logical interfaces (units). The Layer 3 interface can belong to a Layer 3 VPN or VPLS routing instance and the Layer 2 interface can belong to a VPLS routing instance. If the Layer 3 interface belongs to a VPLS routing instance, only IPv4 DSCP or Internet precedence classification is supported. When the ATM interface is part of a Layer 3 VPN, both IPv4 and IPv6 DSCP or Internet precedence classification is supported.

This example applies a Layer 3 DSCP classifier named **dscp-1** and a Layer 2 IEEE 802.1 classifier named **ieee-1** to ATM interface **at-4/1/1** units 0 and 1. The **inet-precedence** Layer 3 classification is also supported but is not used in this example.

```
[edit]
class-of-service {
  interfaces {
    at-4/1/1 {
      unit 0 {
        classifiers {
          dscp dscp_1;
        }
      }
      unit 1 {
        classifiers {
          ieee-802.1 ieee;
        }
      }
    }
  }
}
```

Related • BA Classifier Overview
Documentation

Example: Configuring ATM Scheduler Support for Ethernet VPLS over ATM Bridged Interfaces

The following example configures an ATM scheduler map named **cos-vpls** and attaches it to the ATM interface **at-1/0/0.0**, configures **ether-vpls-over-atm-llc** encapsulation, attaches the **cos-vpls** scheduler map to the logical interface (unit), and configures the ATM interface **at-1/0/0.0** as part of a VPLS routing instance named **cos-vpls-1**.

```
[edit]
interfaces {
  at-1/0/0 {
    atm-options {
      pic-type atm2;
      vpi 0;
      scheduler-maps {
        cos0 {
          forwarding-class assured-forwarding {
            priority low;
            transmit-weight percent 10;
          }
          forwarding-class best-effort {
            priority low;
            transmit-weight percent 20;
          }
          forwarding-class expedited-forwarding {
            priority low;
            transmit-weight percent 30;
          }
          forwarding-class network-control {
            priority high;
            transmit-weight percent 40;
          }
        }
      }
    }
  }
  unit 0 {
    encapsulation ether-vpls-over-atm-llc;
    vci 0.1000;
    shaping {
      cbr 33k;
    }
    atm-scheduler-map cos0;
  }
}

[edit]
routing-instances {
  cos-vpls-1 {
    instance-type vpls;
    interface at-1/0/0.0;
```

```
route-distinguisher 10.255.245.51:1;
vrf-target target:1234:1;
protocols {
  vpls {
    site-range 10;
    no-tunnel-services;
    site vpls-1-site-1 {
      site-identifier 1;
    }
  }
}
```

- Related Documentation**
- [Configuring ATM Scheduler Support for Ethernet VPLS over ATM Bridged Interfaces on page 34](#)

CoS Configuration on Ethernet Interfaces

- [Configuring CoS for L2TP Tunnels on Ethernet Interfaces on page 39](#)
- [Configuring LNS CoS for Link Redundancy on page 40](#)
- [Example: L2TP LNS CoS Support for Link Redundancy on page 41](#)

Configuring CoS for L2TP Tunnels on Ethernet Interfaces

The Layer 2 Tunneling Protocol (L2TP) is often used to carry traffic securely between an L2TP Network Server (LNS) to an L2TP Access Concentrator (LAC). CoS is supported for L2TP session traffic to a LAC on platforms configured as an LNS that include egress IQ2 and IQ2E Ethernet PICs. The following routers support this feature:

- M7i and M10i routers
- M120 routers

To configure CoS for L2TP on Ethernet interfaces:

1. Configure L2TP services on the Ethernet interface.

```
[edit interfaces interface-name unit logical-unit-number]
user@host# set per-session-scheduler
```
2. On the Ethernet interface, enable session-aware CoS for L2TP sessions.

```
[edit interfaces interface-name unit logical-unit-number]
user@host# set per-session-scheduler
```
3. Configure the traffic manager in the IQ2 or IQ2E PIC to enable per-session CoS support.

```
[edit chassis fpc slot-number pic pic-number]
user@host# set traffic-manager mode-session-shaping
```
4. (Optional) To fine tune the system, you may also set the traffic-manager mode to session-shaping and configure the value of ingress-shaping-overhead parameter from 50 through 130 depending on your network requirement.

```
[edit chassis fpc slot-number pic pic-number]
user@host# set traffic-manager ingress-shaping-overhead value mode-session-shaping
```



NOTE: If you deactivate or delete the primary Ethernet interface on which the L2TP tunnel is configured, the tunnel with sessions having CoS is torn down.

After CoS is enabled for L2TP tunnels on Ethernet interface, you can run the **show class-of-service l2tp-session** command to verify the mapping of CoS with the configured L2TP session.

**Related
Documentation**

- [L2TP Minimum Configuration](#)
- [Configuring CoS for L2TP Tunnels on ATM Interfaces on page 31](#)
- [CoS for L2TP Tunnels on Ethernet Interface Overview on page 6](#)
- [Example: Configuring CoS for L2TP Tunnels on Ethernet Interfaces](#)
- [Configuring LNS CoS for Link Redundancy on page 40](#)
- [Example: L2TP LNS CoS Support for Link Redundancy on page 41](#)
- [show class-of-service l2tp-session on page 92](#)

Configuring LNS CoS for Link Redundancy

You can configure multiple ports on the same IQ2 and IQ2E PICs to support link redundancy for CoS on L2TP tunnels configured on an Ethernet interface. Link redundancy is useful when the active port is unavailable due to events such as:

- Disconnection of the cable
- Rebooting of the remote end system
- Traffic re-routing through a different port due to network conditions

When link redundancy is enabled in such scenarios, the L2TP tunnels and its session are maintained by switching traffic to another port configured on the same IQ2 or IQ2E PIC.

To configure multiple ports (IQ and IQ2PE PIC) on an Ethernet interface for redundancy with CoS, configure per-session-scheduler for all Ethernet ports:

```
user@host#edit interfaces ge-2/0/0 unit 0 per-session-scheduler
user@host#edit interfaces ge-2/0/1 unit 0 per-session-scheduler
```

You can similarly configure all the ports on the IQ2 or IQ2E PIC to support link redundancy for CoS on L2TP tunnels.



NOTE:

- If one or more redundancy ports is removed from the configuration, the tunnels established through those redundancy ports also go down.
 - You must configure per-session-scheduler for all the ports that are to be used for redundancy. If you do not do so, new tunnels or sessions with CoS do not get established.
-

**Related
Documentation**

- [per-session-scheduler on page 72](#)

Example: L2TP LNS CoS Support for Link Redundancy

This example shows how link redundancy is supported when CoS for L2TP is configured on Ethernet interfaces.



NOTE: In this example, support for link redundancy is demonstrated by manually disabling the interface. However, link redundancy is also supported when the interface goes down due to events such as disconnection of the cable or rebooting of the remote end system.

- [Requirements on page 41](#)
- [Overview on page 41](#)
- [Configuration on page 42](#)
- [Verification on page 43](#)

Requirements

Before you begin:

- Configure service and loopback interfaces.
- Configure CoS for L2TP.

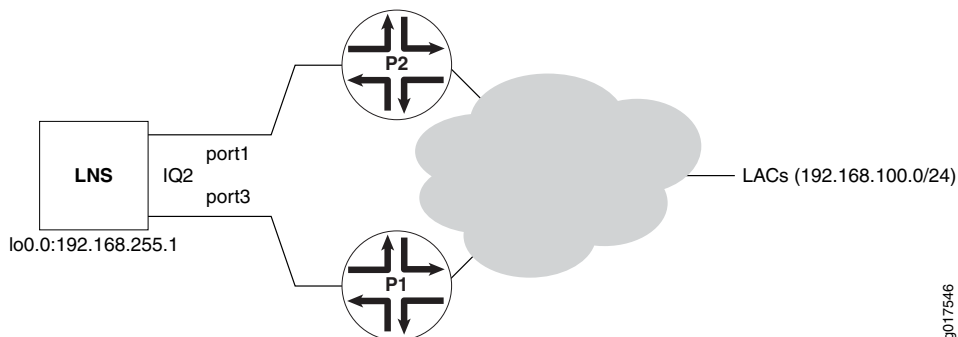
This feature applies to M Series Multiservice Edge Router running Junos OS Release 12.1 or later.

Overview

Junos OS now supports link redundancy for CoS configured on an L2TP LNS. In this example, we verify that an L2TP tunnel does not go down when the Ethernet interface, through which the tunnels and its sessions with CoS are established, goes down.

[Figure 4 on page 42](#) shows a sample scenario in which L2TP access concentrator (LAC) devices operate on one side of an L2TP tunnel. LAC devices are configured with the address range of 192.168.100.0 with a subnet mask of 24. The LAC devices are connected to two backbone routers, P1 and P2. These two routers, P1 and P2, are connected over two Gigabit Ethernet ports on a single Ethernet IQ2 PIC to an L2TP network server (LNS). The LNS device is a router running Junos OS that supports redundancy for terminating L2TP sessions configured with CoS parameters. The CoS settings are applied on the interfaces using a RADIUS server when the L2TP session is set up. One of the Gigabit Ethernet interfaces on the IQ2 PIC present on the LNS device, ge-0/3/1, is connected to P1, while the other interface, ge-0/3/3, is linked to P2. Such a method of connection enables the subscriber sessions that reach the LAC devices to be forwarded to one of the two ports of the IQ2 PIC on the LNS device.

Figure 4: Topology to Verify Link Redundancy Support for L2TP LNS CoS



Configuration

Step-by-Step Procedure

To configure Ethernet interfaces for redundancy:

1. Configure Gigabit Ethernet interfaces.

```
[edit interfaces]
```

```
user@host# set ge-0/3/1 unit 0 family inet address 192.168.1.1/30
```

```
user@host# set ge-0/3/3 unit 0 family inet address 192.168.1.5/30
```

```
user@host# set ge-0/3/1 unit 0 per-session-scheduler
```

```
user@host# set ge-0/3/3 unit 0 per-session-scheduler
```

2. Configure static routing options.

```
[edit routing-options]
```

```
user@host# set static route 192.168.100.0/24 next-hop [ 192.168.1.2 192.168.1.6 ]
```

Step-by-Step Procedure

Verify that CoS is now implemented over L2TP on an Ethernet interface and the LAC is reachable.

1. Verify that LAC is reachable.

```
user@host> show route 192.168.100.1
```

```
inet.0: 14 destinations, 14 routes (14 active, 0 holddown, 0 hidden)
```

```
+ = Active Route, - = Last Active, * = Both
```

```
192.168.100.0/24    *[Static/5] 1d 02:09:09
                   to 192.168.1.2 via ge-0/3/1.0
                   > to 192.168.1.6 via ge-0/3/3.0
```

2. Bring up an L2TP session and verify that L2TP sessions come up.

```
user@host> show services l2tp session
```

```
Interface: sp-1/3/0, Tunnel group: GEN-TUN-GRP-BIO, Tunnel local ID: 44806
```

```
Local Remote Interface State Bundle Username
```

```
ID ID unit
```

```
12491 33795 1 Established - test1
```

3. Send a traffic stream towards the subscriber.

4. Verify that the shaping at the subscriber end is as per the shaping rate configured.

```
user@host# show class-of-service l2tp-session
```

```
L2TP Session Username: test1, Index: 12491
```

```
Physical interface: ge-0/3/3, Index: 131
```

```
Queues supported: 4, Queues in use: 4
```

```
Scheduler map: GEN-SCHED-MAP-EF-65%, Index: 5212
Shaping rate: 2162200 bps
Encapsulation Overhead: 6, Cell Overhead: Enabled
```

In the output of the **show class-of-service l2tp-session** command, ge-0/3/3, index 131 represents the port used to establish the L2TP tunnel to which the current L2TP session belongs. It does not represent the port that was active when the L2TP session came up.

Verification

Verify that, when CoS is configured on an L2TP tunnel, link redundancy works if one of the ports on which the L2TP tunnel is established goes down.

- [Bring Down ge-0/3/3 Interface Through Which the L2TP Tunnel Is Established on page 43](#)
- [Verify LAC Reachability and the Status of L2TP Sessions on page 43](#)

Bring Down ge-0/3/3 Interface Through Which the L2TP Tunnel Is Established

Purpose Bring down the interface through which the L2TP session and its tunnels are established.

Action [edit interfaces]
 user@host# set ge-0/3/3 disable
 user@host# commit

Verify LAC Reachability and the Status of L2TP Sessions

Purpose Verify that link redundancy works and the L2TP session does not go down when the active port on the IQ2 PIC is down. Verify that the traffic flow is unaffected after it is switched to another port configured on the same IQ2 or IQ2E PIC.

Action user@host> show route 192.168.100.1
 inet.0: 14 destinations, 14 routes (14 active, 0 holddown, 0 hidden)
 + = Active Route, - = Last Active, * = Both

```
192.168.100.0/24    *[Static/5] 1d 02:35:09
                   to 192.168.1.2 via ge-0/3/1.0
```

user@host> show services l2tp session

```
Interface: sp-1/3/0, Tunnel group: GEN-TUN-GRP-BIO, Tunnel local ID: 44806
Local Remote Interface State      Bundle Username
ID   ID   unit
12491 33795      1 Established      - test1
```

Related Documentation • [Configuring LNS CoS for Link Redundancy on page 40](#)

CoS Configuration for MPLS Traffic

- [Configuring CoS for MPLS Traffic on page 45](#)

Configuring CoS for MPLS Traffic

To configure CoS for MPLS packets in an LSP, include the **class-of-service** statement with the appropriate CoS value:

```
class-of-service cos-value;
```

If you do not specify a CoS value, the IP precedence bits from the packet's IP header are used as the packet's CoS value.

You can include this statement at the following hierarchy levels:

- [edit protocols mpls]
- [edit protocols mpls interface *interface-name* label-map *label-value*]
- [edit protocols mpls label-switched-path *path-name*]
- [edit protocols mpls label-switched-path *path-name* primary *path-name*]
- [edit protocols mpls label-switched-path *path-name* secondary *path-name*]
- [edit protocols mpls static-path *prefix*]
- [edit protocols rsvp interface *interface-name* link-protection]
- [edit protocols rsvp interface *interface-name* link-protection bypass *destination*]
- [edit logical-systems *logical-system-name* protocols mpls]
- [edit logical-systems *logical-system-name* protocols mpls label-switched-path *path-name*]
- [edit logical-systems *logical-system-name* protocols mpls label-switched-path *path-name* primary *path-name*]
- [edit logical-systems *logical-system-name* protocols mpls label-switched-path *path-name* secondary *path-name*]
- [edit logical-systems *logical-system-name* protocols mpls static-path *prefix*]
- [edit logical-systems *logical-system-name* protocols mpls interface *interface-name* label-map *label-value*]

- [edit logical-systems *logical-system-name* protocols rsvp interface *interface-name* link-protection]
- [edit logical-systems *logical-system-name* protocols rsvp interface *interface-name* link-protection bypass *destination*]

The **class-of-service** statement at the [edit protocols mpls label-switched-path] hierarchy level assigns an initial EXP value for the MPLS shim header of packets in the LSP. This value is initialized at the ingress router only and overrides the rewrite configuration established for that forwarding class. However, the CoS processing (weighted round robin [WRR] and RED) of packets entering the ingress router is not changed by the **class-of-service** statement on an MPLS LSP. Classification is still based on the behavior aggregate (BA) classifier at the [edit class-of-service] hierarchy level or the multifield classifier at the [edit firewall] hierarchy level.

We recommend configuring all routers along the LSP to have the same input classifier for EXP, and, if a rewrite rule is configured, all routers should have the same rewrite configuration. Otherwise, traffic at the next LSR might be classified into a different forwarding class, resulting in a different EXP value being written to the EXP header.

For more information, see the Junos OS MPLS Applications Configuration Guide.

CHAPTER 6

Configuration Statements

address (CoS on ATM Interfaces)

Syntax	<code>address <i>address</i> { <i>destination address</i>; }</code>
Hierarchy Level	[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> <i>family family</i>], [edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> <i>family family</i>]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	For CoS on ATM interfaces, configure the interface address.
Options	<i>address</i> —Address of the interface. The remaining statements are explained separately.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Example: Configuring CoS for ATM2 IQ VC Tunnels on page 35

atm-options

```
Syntax  atm-options {
        cell-bundle-size cells;
        ilmi;
        linear-red-profiles profile-name {
            high-plp-max-threshold percent;
            low-plp-max-threshold percent;
            queue-depth cells high-plp-threshold percent low-plp-threshold percent;
        }
        mpls {
            pop-all-labels {
                required-depth number;
            }
        }
        pic-type (atm1 | atm2);
        plp-to-clp;
        promiscuous-mode {
            vpi vpi-identifier;
        }
        scheduler-maps map-name {
            forwarding-class class-name {
                epd-threshold cells plp1 cells;
                linear-red-profile profile-name;
                priority (high | low);
                transmit-weight (cells number | percent number);
            }
            vc-cos-mode (alternate | strict);
        }
        use-null-cw;
        vpi vpi-identifier {
            maximum-vcs maximum-vcs;
            oam-liveness {
                up-count cells;
                down-count cells;
            }
            oam-period (disable | seconds);
            shaping {
                (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained rate burst
                length);
                queue-length number;
            }
        }
    }
```

Hierarchy Level [edit interfaces *interface-name*]

Release Information Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 12.2 for the ACX Series Universal Access Routers.

Description Configure ATM-specific physical interface properties.

The statements are explained separately.



NOTE: Certain options apply only to specific platforms.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Interface Encapsulations Overview
- multipoint-destination
- [shaping on page 81](#)
- [vci on page 89](#)

atm-scheduler-map

Syntax atm-scheduler-map (*map-name* | default);

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

Release Information Statement introduced before Junos OS Release 7.4.

Description Associate a scheduler map with a virtual circuit on a logical interface.

Options *map-name*—Name of scheduler map that you define at the [edit interfaces *interface-name* [atm-options scheduler-maps](#)] hierarchy level.

default—The default scheduler mapping.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.


Related Documentation

- Configuring ATM2 IQ VC Tunnel CoS Components
- scheduler-maps

atm-service

Syntax	atm-service (cbr rtvbr nrtvbr); atm-service (cbr
Hierarchy Level	[edit class-of-service traffic-control-profiles <i>traffic-control-profile-name</i>] [edit firewall atm-policer <i>atm-policer-name</i>]
Release Information	Statement introduced in Junos OS Release 12.1.
Description	(MX Series routers) Configure the ATM service category on ATM MICs to define bandwidth shaping and utilization. Shaping is based on the ATM service category.
Default	If the ATM service category is not specified, bandwidth utilization is unlimited.
Options	cbr —Use the constant bit rate. nrtvbr —Use the non real-time variable bit rate. rtvbr —Use the real-time variable bit rate.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• show class-of-service traffic-control-profile

buffer-size (Schedulers)

Syntax	buffer-size (percent <i>percentage</i> remainder temporal <i>microseconds</i>);
Hierarchy Level	[edit class-of-service schedulers <i>scheduler-name</i>]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 12.1X48 for PTX Series Packet Transport Switches. Statement introduced in Junos OS Release 12.2 for ACX Series Routers.
Description	Specify buffer size.
	<div>  <p>NOTE: On PTX Series Packet Transport Switches, buffer-size cannot be configured on rate-limited queues.</p> </div>
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, respectively.
Options	<p>percent <i>percentage</i>—Buffer size as a percentage of the total buffer. Range: 0 through 100</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. Range: The ranges vary by platform. See Buffer Size Temporal Value Ranges by Router Type.</p>
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 Documentation	<ul style="list-style-type: none"> Configuring the Scheduler Buffer Size Example: Configuring CoS for a PBB Network on MX Series Routers

cbr

Syntax	<code>cbr rate;</code>
Hierarchy Level	[edit interfaces at- <i>fpc/pic/port</i> atm-options vpi <i>vpi-identifier</i> shaping], [edit interfaces at- <i>fpc/pic/port</i> unit <i>logical-unit-number</i> address <i>address</i> family <i>family</i> multipoint-destination <i>address</i> shaping], [edit interfaces at- <i>fpc/pic/ port</i> unit <i>logical-unit-number</i> shaping], [edit logical-systems <i>logical-system-name</i> interfaces at- <i>fpc/pic/port</i> unit <i>logical-unit-number</i> address <i>address</i> family <i>family</i> multipoint-destination <i>address</i> shaping], [edit logical-systems <i>logical-system-name</i> interfaces at- <i>fpc/pic/port</i> unit <i>logical-unit-number</i> shaping]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	For ATM encapsulation only, define a constant bit rate bandwidth utilization in the traffic-shaping profile.
Default	Unspecified bit rate (UBR); that is, bandwidth utilization is unlimited.
Options	rate —Peak rate, in bits per second (bps) or cells per second (cps). You can specify a value in bits per second either as a complete decimal number or as a decimal number followed by the abbreviation k (1000), m (1,000,000), or g (1,000,000,000). You can also specify a value in cells per second by entering a decimal number followed by the abbreviation c ; values expressed in cells per second are converted to bits per second by means of the formula 1 cps = 384 bps. For ATM1 and ATM2 OC3 interfaces, the maximum available rate is 100 percent of <i>line-rate</i> , or 135,600,000 bps. For ATM1 OC12 interfaces, the maximum available rate is 50 percent of <i>line-rate</i> , or 271,263,396 bps. For ATM2 IQ interfaces, the maximum available rate is 542,526,792 bps.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">Defining the ATM Traffic-Shaping Profilertvbr on page 77shaping on page 81vbr on page 87

destination (Interfaces)

Syntax	<code>destination <i>address</i>;</code>
Hierarchy Level	<pre>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> tunnel] [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet address <i>address</i>], [edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> tunnel] [edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> family inet address <i>address</i>]</pre>
Release Information	Statement introduced before Junos OS Release 7.4.
Description	<p>For CoS on ATM interfaces, specify the remote address of the connection.</p> <p>For point-to-point interfaces only, specify the address of the interface at the remote end of the connection.</p> <p>For tunnel and encryption interfaces, specify the remote address of the tunnel.</p>
Options	<i>address</i> —Address of the remote side of the connection.
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 Documentation	<ul style="list-style-type: none"> • Configuring Linear RED Profiles on ATM Interfaces on page 21 • Multilink and Link Services Logical Interface Configuration Overview • Configuring Encryption Interfaces • Configuring Traffic Sampling • Configuring Flow Monitoring • Configuring Unicast Tunnels

drop-profile (Schedulers)

Syntax	<code>drop-profile <i>profile-name</i>;</code>
Hierarchy Level	[edit class-of-service schedulers <i>scheduler-name</i> drop-profile-map loss-priority (any low medium-low medium-high high) protocol (any non-tcp tcp)]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 12.1X48 for PTX Series Packet Transport Switches. Statement introduced in Junos OS Release 12.2 for ACX Series Routers.
Description	Define drop profiles for RED. When a packet arrives, RED checks the queue fill level. If the fill level corresponds to a nonzero drop probability, the RED algorithm determines whether to drop the arriving packet.
Options	<i>profile-name</i> —Name of the drop profile.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">Configuring Drop Profile Maps for SchedulersRED Drop Profiles Overview

drop-profile-map (Schedulers)

Syntax	<code>drop-profile-map loss-priority (any low medium-low medium-high high) protocol(any non-tcp tcp) drop-profile (Schedulers) <i>profile-name</i>;</code>
Hierarchy Level	[edit class-of-service schedulers <i>scheduler-name</i>]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 12.1X48 for PTX Series Packet Transport Switches. Statement introduced in Junos OS Release 12.2 for ACX Series Routers.
Description	Define the loss-priority value for a drop profile. The statements are explained separately.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">Default Schedulers OverviewConfiguring Drop Profile Maps for Schedulers

egress-shaping-overhead

Syntax	<code>egress-shaping-overhead <i>number</i>;</code>
Hierarchy Level	[edit chassis fpc <i>slot-number</i> pic <i>pic-number</i> traffic-manager], [edit chassis lcc <i>number</i> fpc <i>slot-number</i> pic <i>pic-number</i> traffic-manager]
Release Information	Statement introduced in Junos OS Release 8.3.
Description	Number of bytes to add to packet to determine shaped session packet length.



NOTE: For MIC and MPC interfaces on MX Series routers, by default the value of `egress-shaping-overhead` is configured to 24, which means that the number of class-of-service (CoS) shaping overhead bytes to be added to the packets is 24. The interfaces on DPCs in MX Series routers, the default value is zero. For interfaces on PICs other than the 10-port 10-Gigabit Oversubscribed Ethernet (OSE) Type 4, you should configure `egress-shaping-overhead` to a minimum of 20 bytes to add a shaping overhead of 20 bytes to the packets.



NOTE: When you change the `egress-shaping-overhead` value, the FPC on which it is changed is restarted.

Options *number*—When traffic management (queuing and scheduling) is configured on the egress side, the number of CoS shaping overhead bytes to add to the packets on the egress interface.
Range: –63 through 192.



NOTE: The L2 headers (DA/SA + VLAN tags) are automatically a part of the shaping calculation.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- [Configuring CoS for L2TP Tunnels on ATM Interfaces on page 31](#)
- [ingress-shaping-overhead on page 62](#)
- [mode \(Layer 2 Tunneling Protocol Shaping\) on page 71, ingress-shaping-overhead on page 62](#)
- [traffic-manager on page 82](#)

epd-threshold

Syntax	<code>epd-threshold <i>cells</i> plp1 <i>cells</i>;</code>
Hierarchy Level	[edit interfaces at- <i>fpc/pic/port</i> atm-options scheduler-maps <i>map-name</i> forwarding-class <i>class-name</i>]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	For ATM2 IQ interfaces only, define the EPD threshold on a VC. The EPD threshold is a limit on the number of transmit packets that can be queued. Packets that exceed the limit are discarded.
Default	If you do not include either the epd-threshold or the linear-red-profile statement in the forwarding class configuration, the Junos OS uses an EPD threshold based on the available bandwidth and other parameters.
Options	<p>cells—Maximum number of cells.</p> <p>Range: For 1-port and 2-port OC12 interfaces, 1 through 425,984 cells. For 1-port OC48 interfaces, 1 through 425,984 cells. For 2-port OC3, DS3, and E3 interfaces, 1 through 212,992 cells. For 4-port DS3 and E3 interfaces, 1 through 106,496 cells.</p> <p>plp1 cells—Early packet drop threshold value for PLP 1.</p> <p>Range: For 1-port and 2-port OC12 interfaces, 1 through 425,984 cells. For 1-port OC48 interfaces, 1 through 425,984 cells. For 2-port OC3, DS3, and E3 interfaces, 1 through 212,992 cells. For 4-port DS3 and E3 interfaces, 1 through 106,496 cells.</p>
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring Scheduler Maps on ATM Interfaces on page 22• linear-red-profile on page 65

excess-priority


Syntax	<code>excess-priority [low medium-low medium-high high none];</code>
Hierarchy Level	[edit class-of-service schedulers <i>scheduler-name</i>]
Release Information	Statement introduced in Junos OS Release 9.3. Option none introduced in Junos OS Release 11.4.
Description	Determine the priority of excess bandwidth traffic on a scheduler.



NOTE: For Link Services IQ (LSQ) PICs or Multiservices PIC (MS-PICs), the **excess-priority** statement is allowed for consistency, but ignored. If an explicit priority is not configured for these interfaces, a default low priority is used. This default priority is also used in the excess region.

Options	<p>low—Excess traffic for this scheduler has low priority.</p> <p>medium-low—Excess traffic for this scheduler has medium-low priority.</p> <p>medium-high—Excess traffic for this scheduler has medium-high priority.</p> <p>high—Excess traffic for this scheduler has high priority.</p> <p>none—System does not demote the priority of guaranteed traffic when the bandwidth exceeds the shaping rate or the guaranteed rate.</p>
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 Documentation	<ul style="list-style-type: none"> Configuring Excess Bandwidth Sharing on IQE PICs Bandwidth Sharing on Nonqueueing Packet Forwarding Engines Overview Managing Excess Bandwidth Distribution on Static Interfaces on MICs and MPCs

excess-rate

Syntax	<code>excess-rate (percent <i>percentage</i> proportion <i>value</i>);</code>
Hierarchy Level	[edit class-of-service schedulers <i>scheduler-name</i>], [edit class-of-service traffic-control-profiles <i>traffic-control-profile-name</i>]
Release Information	Statement introduced in Junos OS Release 9.3. Application to the Multiservices PIC added in Junos OS Release 9.5. Application to the MIC and MPC interfaces added in Junos OS Release 10.1. Statement introduced in Junos OS Release 12.1X48R2 for PTX Series Packet Transport Switches.
Description	For an Enhanced IQ PIC interfaces, Multiservices PIC interfaces, or MX Series router interfaces on MPCs or MICs, and T4000 router interfaces on Type 5 FPCs, determine the percentage or proportion of excess bandwidth traffic to share.
<div><div>NOTE: The proportion option provides a greater range of values over the percent option and hence influences the priorities assigned to the queues.</div></div>	
Options	<p>percentage—Percentage of the excess bandwidth to share. Range: 0 through 100 percent Default: Excess bandwidth is shared in proportion to the configured transmit rate of each queue.</p> <p>value—(M Series, MX Series, and T Series routers only) Proportion of the excess bandwidth to share. Option available at the [edit class-of-service traffic-class-profiles <i>traffic-control-profile-name</i>] hierarchy level only. Range: 0 through 1000</p>
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">Configuring Scheduler Transmission RateConfiguring Excess Bandwidth Sharing on IQE PICsAllocating Excess Bandwidth Among Frame Relay DLCIs on Multiservices PICsManaging Excess Bandwidth Distribution on Static Interfaces on MICs and MPCs

family (CoS on ATM Interfaces)

Syntax	<pre>family <i>family</i> { address <i>address</i> { destination <i>address</i>; } }</pre>
Hierarchy Level	<pre>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i>], [edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i>]</pre>
Release Information	Statement introduced before Junos OS Release 7.4.
Description	For CoS on ATM interfaces, configure the protocol family.
Options	<p><i>family</i>—Protocol family:</p> <ul style="list-style-type: none"> • ccc—Circuit cross-connect parameters • inet—IPv4 parameters • inet6—IPv6 protocol parameters • iso—OSI ISO protocol parameters • mlppp—Multilink PPP protocol parameters • mpls—MPLS protocol parameters • tcc—Translational cross-connect parameters • vpls—Virtual private LAN service parameters. <p>The remaining statements are explained separately.</p>
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 Documentation	<ul style="list-style-type: none"> • CoS on ATM Interfaces Overview on page 5

forwarding-class (ATM2 IQ Scheduler Maps)

Syntax	<pre>forwarding-class <i>class-name</i> { epd-threshold <i>cells</i> plp1 <i>cells</i>; linear-red-profile <i>profile-name</i>; priority (high low); transmit-weight (cells <i>number</i> percent <i>number</i>); }</pre>
Hierarchy Level	[edit interfaces <i>at-fpc/pic/port</i> atm-options scheduler-maps <i>map-name</i>]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	For ATM2 IQ interfaces only, define forwarding class name and option values.
Options	<i>class-name</i> —Name of forwarding class. The statements are explained separately.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">Configuring ATM2 IQ VC Tunnel CoS ComponentsConfiguring Scheduler Maps on ATM Interfaces on page 22

forwarding-class (Interfaces)

Syntax	<pre>forwarding-class <i>class-name</i>;</pre>
Hierarchy Level	[edit class-of-service interfaces <i>interface-name</i> unit <i>logical-unit-number</i>]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 12.2 for ACX Series routers.
Description	Associate a forwarding class configuration or default mapping with a specific interface.
Options	<i>class-name</i> —Name of the forwarding class.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">Applying Forwarding Classes to Interfaces

high-plp-max-threshold

Syntax	high-plp-max-threshold <i>percent</i> ;
Hierarchy Level	[edit interfaces at- <i>fpc/pic/port</i> atm-optionslinear-red-profiles <i>profile-name</i>]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	For ATM2 IQ interfaces only, define the drop profile fill-level for the high PLP CoS VC. When the fill level exceeds the defined percentage, all packets are dropped.
Options	<i>percent</i> —Fill-level percentage when linear random early detection (RED) is applied to cells with PLP.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • Configuring Linear RED Profiles on ATM Interfaces on page 21 • low-plp-max-threshold on page 68 • low-plp-threshold on page 69 • queue-depth on page 76

high-plp-threshold

Syntax	high-plp-threshold <i>percent</i> ;
Hierarchy Level	[edit interfaces at- <i>fpc/pic/port</i> atm-optionslinear-red-profiles <i>profile-name</i>]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	For ATM2 IQ interfaces only, define CoS VC drop profile fill-level percentage when linear RED is applied to cells with high PLP. When the fill level exceeds the defined percentage, packets with high PLP are randomly dropped by RED. This statement is mandatory.
Options	<i>percent</i> —Fill-level percentage when linear RED is applied to cells with PLP.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • Configuring Linear RED Profiles on ATM Interfaces on page 21 • high-plp-max-threshold on page 61 • low-plp-max-threshold on page 68 • low-plp-threshold on page 69 • queue-depth on page 76

ingress-shaping-overhead

Syntax	<code>ingress-shaping-overhead <i>number</i>;</code>
Hierarchy Level	<code>[edit chassis fpc <i>slot-number</i> pic <i>pic-number</i> traffic-manager],</code> <code>[edit chassis lcc <i>number</i> fpc <i>slot-number</i> pic <i>pic-number</i> traffic-manager]</code>
Release Information	Statement introduced in Junos OS Release 8.3.
Description	Number of bytes to add to packet to determine shaped session packet length.
Options	<p><i>number</i>—When L2TP session shaping is configured, the number of CoS shaping overhead bytes to add to the packets on the ingress side of the L2TP tunnel to determine the shaped session packet length.</p> <p>When session shaping is not configured and traffic management (queuing and scheduling) is configured on the ingress side, the number of CoS shaping overhead bytes to add to the packets on the ingress interface.</p> <p>Range: –63 through 192</p>
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 Documentation	<ul style="list-style-type: none">• Configuring CoS for L2TP Tunnels on ATM Interfaces on page 31• egress-shaping-overhead on page 55• mode (Layer 2 Tunneling Protocol Shaping) on page 71• traffic-manager on page 82

interfaces

```
Syntax interfaces {
    interface-name {
        classifiers{
            dscp(classifier-name | default) {
            }
            ieee-802.1 (classifier-name | default) vlan-tag (inner | outer | classifier-name);
            inet-precedence (rewrite-name | default);
        }
        input-scheduler-map map-name;
        input-shaping-rate rate;
        irb {
            unit logical-unit-number {
                classifiers {
                    type (classifier-name | default);
                }
                rewrite-rules {
                    dscp (rewrite-name | default);
                    dscp-ipv6 (rewrite-name | default);
                    exp (rewrite-name | default) protocol protocol-types;
                    ieee-802.1 (rewrite-name | default) vlan-tag (outer | outer-and-inner);
                    inet-precedence (rewrite-name | default);
                }
            }
        }
        member-link-scheduler (replicate | scale);
        rewrite-rules {
            dscp (rewrite-name | default);
            ieee-802.1 (rewrite-name | default) vlan-tag (outer);
            inet-precedence (rewrite-name | default);
        }
        scheduler-map map-name;
        scheduler-map-chassis map-name;
        shaping-rate rate;
        unit logical-unit-number {
            classifiers {
                type (classifier-name | default) family (mpls | inet);
            }
            forwarding-class class-name;
            fragmentation-map map-name;
            input-shaping-rate (percent percentage | rate);
            input-traffic-control-profile profile-name shared-instance instance-name;
            output-traffic-control-profile profile-name shared-instance instance-name;
            per-session-scheduler;
            rewrite-rules {
                dscp (rewrite-name | default);
                dscp-ipv6 (rewrite-name | default);
                exp (rewrite-name | default) protocol protocol-types;
                exp-push-push-push default;
                exp-swap-push-push default;
                ieee-802.1 (rewrite-name | default) vlan-tag (outer | outer-and-inner);
                inet-precedence (rewrite-name | default);
            }
        }
    }
}
```

```
    }  
    scheduler-map map-name;  
    shaping-rate rate;  
    translation-table (to-dscp-from-dscp | to-dscp-ipv6-from-dscp-ipv6 | to-exp-from-exp  
        | to-inet-precedence-from-inet-precedence) table-name;  
    }  
}  
interface-set interface-set-name {  
    excess-bandwidth-share;  
    internal-node;  
    output-traffic-control-profile profile-name;  
    output-traffic-control-profile-remaining profile-name;  
}  
}
```

Hierarchy Level [edit class-of-service]

Release Information Statement introduced before Junos OS Release 7.4.
Interface-set level added in Junos OS Release 8.5.

Description Configure interface-specific CoS properties for incoming packets.



NOTE: The `dscp-ipv6` and `ieee-802.1ad` classifier types are not supported on ACX Series routers. For further information about support on ACX Series routers, see [Understanding CoS CLI Configuration Statements on ACX Series Universal Access Routers](#).

Options The remaining statements are explained separately.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Overview of BA Classifier Types
- Configuring Rewrite Rules
- Understanding CoS CLI Configuration Statements on ACX Series Universal Access Routers

linear-red-profile

Syntax	<code>linear-red-profile <i>profile-name</i>;</code>
Hierarchy Level	[edit interfaces at- <i>fpc/pic/port</i> atm-options scheduler-maps <i>map-name</i> forwarding-class <i>class-name</i>]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	For ATM2 IQ interfaces only, assign a linear RED profile to a specified forwarding class. To define the linear RED profiles, include the linear-red-profiles statement at the [edit interfaces at- <i>fpc/pic/port</i> atm-options] hierarchy level.
Default	If you do not include either the epd-threshold or the linear-red-profile statement in the forwarding class configuration, the Junos OS uses an EPD threshold based on the available bandwidth and other parameters.
Options	<i>profile-name</i> —Name of the linear RED profile.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> Configuring an ATM Scheduler Map linear-red-profiles on page 66 Configuring Scheduler Maps on ATM Interfaces on page 22 epd-threshold on page 56

linear-red-profiles

Syntax	<pre>linear-red-profiles <i>profile-name</i> { high-plp-threshold <i>percent</i>; low-plp-threshold <i>percent</i>; queue-depth <i>cells</i>; }</pre>
Hierarchy Level	[edit interfaces <i>at-fpc/pic/port</i> atm-options]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	For ATM2 IQ interfaces only, define CoS virtual circuit drop profiles for RED. When a packet arrives, RED checks the queue fill level. If the fill level corresponds to a nonzero drop probability, the RED algorithm determines whether to drop the arriving packet.
Options	<p><i>profile-name</i>—Name of the drop profile.</p> <p>The statements are explained separately.</p>
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 Documentation	<ul style="list-style-type: none">Configuring ATM2 IQ VC Tunnel CoS ComponentsConfiguring Linear RED Profiles on ATM Interfaces on page 21

loss-priority (Scheduler Drop Profiles)

Syntax	loss-priority (any high low medium-high medium-low);
Hierarchy Level	[edit class-of-service schedulers <i>scheduler-name</i> drop-profile-map]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 12.1X48 for PTX Series Packet Transport Switches. Statement introduced in Junos OS Release 12.2 for ACX Series Routers.
Description	Specify a loss priority to which to apply a drop profile. The drop profile map sets the drop profile for a specific PLP and protocol type. The inputs for the map are the PLP designation and the protocol type. The output is the drop profile.
Options	any —The drop profile applies to packets with any PLP.



NOTE: On ACX Series Routers, only the **any** option is supported when you configure the **non-tcp** option for [protocol](#).

high—The drop profile applies to packets with high PLP.

low—The drop profile applies to packets with low PLP.

medium-high—The drop profile applies to packets with medium-high PLP.

medium-low—The drop profile applies to packets with medium-low PLP.

Required Privilege	interface—To view this statement in the configuration.
Level	interface-control—To add this statement to the configuration.

Related Documentation	<ul style="list-style-type: none"> • Default Schedulers Overview • Configuring Drop Profile Maps for Schedulers • Configuring Schedulers for Priority Scheduling • Configuring Tricolor Marking • protocol (Schedulers) on page 75
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low-plp-max-threshold

Syntax	<code>low-plp-max-threshold percent;</code>
Hierarchy Level	[edit interfaces at- <i>fpc/pic/port</i> atm-options linear-red-profiles profile-name]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	For ATM2 IQ interfaces only, define the drop profile fill-level for the low PLP CoS VC. When the fill level exceeds the defined percentage, all packets are dropped.
Options	<i>percent</i> —Fill-level percentage when linear RED is applied to cells with PLP.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring ATM2 IQ VC Tunnel CoS Components• high-plp-max-threshold• low-plp-threshold on page 69• Configuring Linear RED Profiles on ATM Interfaces on page 21• high-plp-max-threshold on page 61• queue-depth on page 76

low-plp-threshold

Syntax	<code>low-plp-threshold <i>percent</i>;</code>
Hierarchy Level	<code>[edit interfaces at-<i>fpc/pic/port</i> atm-options linear-red-profiles <i>profile-name</i>]</code>
Release Information	Statement introduced before Junos OS Release 7.4.
Description	For ATM2 IQ interfaces only, define the CoS VC drop profile fill-level percentage when linear RED is applied to cells with low PLP. When the fill level exceeds the defined percentage, packets with low PLP are randomly dropped by RED. This statement is mandatory.
Options	<i>percent</i> —Fill-level percentage when linear RED is applied to cells with low PLP.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • Configuring ATM2 IQ VC Tunnel CoS Components • high-plp-max-threshold • high-plp-threshold • Configuring Linear RED Profiles on ATM Interfaces on page 21 • high-plp-max-threshold on page 61 • high-plp-threshold on page 61 • low-plp-max-threshold on page 68 • queue-depth on page 76

max-burst-size

Syntax	<code>max-burst-size <i>max-burst-size</i>;</code>
Hierarchy Level	[edit class-of-service traffic-control-profiles <i>traffic-control-profile-name</i>], [edit firewall atm-policer <i>atm-policer-name</i>]
Release Information	Statement introduced in Junos OS Release 12.1.
Description	(MX Series routers) Define ATM maximum burst size on ATM MICs in cells.
Options	<i>cells</i> —ATM maximum burst size in cells. Range: 1 through 4000 cells
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• show class-of-service traffic-control-profile

max-queues-per-interface

Syntax	<code>max-queues-per-interface (8 4);</code>
Hierarchy Level	[edit chassis fpc <i>slot-number</i> pic <i>pic-number</i>], [edit chassis lcc <i>number</i> fpc <i>slot-number</i> pic <i>pic-number</i>] (Routing Matrix)
Release Information	Statement introduced before Junos OS Release 7.4. Support for TX Matrix and TX Matrix Plus added in Junos OS Release 9.6. On MIC or MPC interfaces on MX Series routers, configure eight egress queues.
Description	On IQ interfaces on M320, T320, T640, TX Matrix, and TX Matrix Plus routers, or on MIC or MPC interfaces on MX Series routers, configure eight egress queues.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring the Junos OS to Support Eight Queues on IQ Interfaces for T Series and M320 Routers• Configuring Up to 16 Forwarding Classes• Enabling Eight Queues on ATM Interfaces on page 24• Configuring the Maximum Number of Queues for Trio MPC/MIC Interfaces

mode (Layer 2 Tunneling Protocol Shaping)

Syntax	<code>mode <i>traffic-manager-mode</i>;</code>
Hierarchy Level	[edit chassis fpc <i>slot-number</i> pic <i>pic-number</i> traffic-manager], [edit chassis lcc <i>number</i> fpc <i>slot-number</i> pic <i>pic-number</i> traffic-manager]
Release Information	Statement introduced in Junos OS Release 8.3.
Description	Enable shaping on an L2TP session.
Options	<p>traffic-manager-mode—Configure CoS traffic manager mode of operation on this interface. This option has the following suboptions:</p> <ul style="list-style-type: none"> • egress-only—Enable CoS queuing and scheduling on the egress side for the PIC that houses the interface. This is the default mode for an Enhanced Queuing (EQ) DPC on MX Series routers. If ingress packet drops are observed at a high rate for an IQ2 or IQ2E PIC, configure the traffic-manager statement to work in the egress-only mode. • ingress-and-egress—Enable CoS queuing and scheduling on both the egress and ingress sides for the PIC. This is the default mode for IQ2 and IQ2E PICs on M Series and T Series routers. Junos OS does not support ingress-and-egress mode on label-switched interfaces (LSIs) configured with VPLS. For EQ DPCs, you must configure the traffic-manager statement with ingress-and-egress mode to enable ingress CoS on the EQ DPC. EQ DPCs have 250 ms of buffering, with only egress queuing (default mode). When ingress-and-egress is configured, the buffer is partitioned as 50 ms for the ingress direction and 200 ms for the egress direction. • session-shaping—(M10i and M120 routers only) Configure the IQ2 PIC mode for session-aware traffic shaping to enable L2TP session shaping.
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 Documentation	<ul style="list-style-type: none"> • Configuring CoS for L2TP Tunnels on ATM Interfaces on page 31 • egress-shaping-overhead on page 55 • ingress-shaping-overhead on page 62 • traffic-manager on page 82

peak-rate

Syntax	<code>peak-rate rate;</code>
Hierarchy Level	[edit class-of-service traffic-control-profiles <i>traffic-control-profile-name</i>]
Release Information	Statement introduced in Junos OS Release 12.1.
Description	(MX Series routers) Define ATM peak cell rate on ATM MICs in cells per second by entering a decimal number followed by the abbreviation c; where 1 cps = 384 bps.
Options	<i>rate</i> —ATM peak rate in cells per second. Range: 61 cps through 353,206 cps.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• show class-of-service traffic-control-profile

per-session-scheduler

Syntax	<code>per-session-scheduler;</code>
Hierarchy Level	[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i>]
Release Information	Statement introduced in Junos OS Release 8.3.
Description	Enable session-aware CoS shaping on this L2TP interface.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring CoS for L2TP Tunnels on ATM Interfaces on page 31• ingress-shaping-overhead on page 62• mode (Layer 2 Tunneling Protocol Shaping) on page 71


plp-to-clp

Syntax	<code>plp-to-clp;</code>
Hierarchy Level	[edit interfaces at- <i>fpc/pic/port</i> atm-options], [edit interfaces at- <i>fpc/pic/port</i> unit <i>logical-unit-number</i>], [edit logical-systems <i>logical-system-name</i> interfaces at- <i>fpc/pic/port</i> unit <i>logical-unit-number</i>]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	For ATM2 IQ interfaces only, enable the PLP setting to be copied to the cell-loss priority (CLP) bit.
Default	If you omit this statement, the Junos OS does not copy the PLP setting to the CLP bit.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> Enabling the PLP Setting to Be Copied to the CLP Bit Copying the PLP Setting to the CLP Bit on ATM Interfaces on page 30

priority (ATM2 IQ Schedulers)

Syntax	<code>priority (high low);</code>
Hierarchy Level	[edit interfaces at- <i>fpc/pic/port</i> atm-options scheduler-maps <i>map-name</i> forwarding-class <i>class-name</i>]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	For ATM2 IQ interfaces only, assign queuing priority to a forwarding class.
Options	<p>low—Forwarding class has low priority.</p> <p>high—Forwarding class has high priority.</p>
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> Configuring Scheduler Maps on ATM Interfaces on page 22

priority (Schedulers)

Syntax	<code>priority <i>priority-level</i>;</code>
Hierarchy Level	[edit class-of-service schedulers <i>scheduler-name</i>]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 12.1X48 for PTX Series Packet Transport Switches. Statement introduced in Junos OS Release 12.2 for ACX Series Routers.
Description	Specify the packet-scheduling priority value.
Options	<p><i>priority-level</i> can be one of the following:</p> <ul style="list-style-type: none">• low—Scheduler has low priority.• medium-low—Scheduler has medium-low priority.• medium-high—Scheduler has medium-high priority.• high—Scheduler has high priority. Assigning high priority to a queue prevents the queue from being underserved.• strict-high—Scheduler has strictly high priority. Configure a high priority queue with unlimited transmission bandwidth available to it. As long as it has traffic to send, the strict-high priority queue receives precedence over low, medium-low, and medium-high priority queues, but not high priority queues. You can configure strict-high priority on only one queue per interface.
<div> NOTE: The strict-high priority level is the only priority level supported on ACX Series Routers. However, multiple strict-high priority queues can be configured per interface on ACX Series Routers.</div>	
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring Schedulers for Priority Scheduling

protocol (Schedulers)

Syntax	<code>protocol (any non-tcp tcp);</code>
Hierarchy Level	[edit class-of-service schedulers <i>scheduler-name</i> drop-profile-map]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 12.1X48 for PTX Series Packet Transport Switches. Statement introduced in Junos OS Release 12.2 for ACX Series Routers.
Description	Specify the protocol type for the specified scheduler.
Options	any —Accept any protocol type. non-tcp —(ACX Series Routers, M Series and T Series (except T4000) routers only) Accept any protocol type other than TCP/IP.



NOTE: On ACX Series Routers, when you configure the **non-tcp** option, only the **any** option is supported for [loss-priority](#).

tcp—(ACX Series Routers, M Series and T Series (except T4000) routers only) Accept TCP/IP protocol type.

Required Privilege	interface—To view this statement in the configuration.
Level	interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> Configuring Schedulers

queue-depth

Syntax	<code>queue-depth <i>cells</i>;</code>
Hierarchy Level	[edit interfaces <i>interface-name</i> atm-options linear-red-profiles <i>profile-name</i>]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	For ATM2 IQ interfaces only, define maximum queue depth in the CoS VC drop profile. Packets are always dropped beyond the defined maximum. This statement is mandatory; there is no default configuration.
Default	Buffer usage is unregulated.
Options	cells —Maximum number of cells the queue can contain. Range: 1 through 64,000 cells
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring ATM2 IQ VC Tunnel CoS Components• Configuring Linear RED Profiles on ATM Interfaces on page 21• high-plp-threshold• low-plp-threshold on page 69

rtvbr

Syntax	<code>rtvbr peak rate sustained rate burst length;</code>
Hierarchy Level	<p>[edit interfaces <i>interface-name</i> atm-options vpi <i>vpi-identifier</i> shaping],</p> <p>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> address <i>address</i> family <i>family</i> multipoint-destination <i>address</i> shaping],</p> <p>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> shaping],</p> <p>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> shaping],</p> <p>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> address <i>address</i> family <i>family</i> multipoint-destination <i>address</i> shaping]</p>
Release Information	Statement introduced before Junos OS Release 7.4.
Description	<p>For ATM2 IQ PICs only, define the real-time variable bandwidth utilization in the traffic-shaping profile.</p> <p>When you configure the real-time bandwidth utilization, you must specify all three options (burst, peak, and sustained). You can specify the rate in bits per second either as a complete decimal number or as a decimal number followed by the abbreviation k (1000), m (1,000,000), or g (1,000,000,000). You can also specify the rate in cells per second by entering a decimal number followed by the abbreviation c; values expressed in cells per second are converted to bits per second using the formula 1 cps = 384 bps.</p>
Default	If the rtvbr statement is not included, bandwidth utilization is unlimited.
Options	<p>burst length—Burst length, in cells. If you set the length to 1, the peak traffic rate is used. Range: 1 through 4000 cells</p> <p>peak rate—Peak rate, in bits per second or cells per second. Range: For ATM2 IQ OC3 and OC12 interfaces, 33 Kbps through 542,526,792 bps. For ATM2 IQ OC48 interfaces, 33 Kbps through 2,170,107,168 bps. For ATM2 IQ DS3 and E3 interfaces, 33 Kbps through the maximum rate, which depends on the ATM encapsulation and framing you configure..</p> <p>sustained rate—Sustained rate, in bps or cps. Range: For ATM2 IQ OC3 and OC12 interfaces, 33 Kbps through 542,526,792 bps. For ATM2 IQ OC48 interfaces, 33 Kbps through 2,170,107,168 bps. For ATM2 IQ DS3 and E3 interfaces, from 33 Kbps through the maximum rate, which depends on the ATM encapsulation and framing you configure.</p>
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 Documentation	<ul style="list-style-type: none"> Configuring ATM CBR Configuring ATM2 IQ Real-Time VBR Applying Scheduler Maps to Logical ATM Interfaces on page 30

- [cbr on page 52](#)
- [vbr on page 87](#)

scheduler-map (Interfaces and Traffic-Control Profiles)

Syntax	<code>scheduler-map <i>map-name</i>;</code>
Hierarchy Level	[edit class-of-service interfaces <i>interface-name</i>], [edit class-of-service interfaces <i>interface-name</i> unit <i>logical-unit-number</i>], [edit class-of-service traffic-control-profiles]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	<p>For Gigabit Ethernet IQ, Channelized IQ PICs, and FRF.15 and FRF.16 LSQ interfaces only, associate a scheduler map name with an interface or with a traffic-control profile.</p> <p>For channelized OC12 intelligent queuing (IQ), channelized T3 IQ, channelized E1 IQ, and Gigabit Ethernet IQ interfaces only, you can associate a scheduler map name with a logical interface.</p>
Options	<i>map-name</i> —Name of the scheduler map.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring Schedulers• Oversubscribing Interface Bandwidth• output-traffic-control-profile

scheduler-maps (For ATM2 IQ Interfaces)

Syntax	<pre>scheduler-maps <i>map-name</i> { forwarding-class (<i>class-name</i> assured-forwarding best-effort expedited-forwarding network-control); vc-cos-mode (alternate strict); }</pre>
Hierarchy Level	[edit interfaces <i>at-fpc/pic/port</i> atm-options]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	For ATM2 IQ interfaces only, define CoS parameters assigned to forwarding classes.
Options	<p><i>map-name</i>—Name of the scheduler map.</p> <p>The remaining statements are explained separately.</p>
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 Documentation	<ul style="list-style-type: none"> • Configuring Scheduler Maps on ATM Interfaces on page 22 • atm-scheduler-map on page 49

scheduler-maps (For Most Interface Types)

Syntax	<pre>scheduler-maps { <i>map-name</i> { forwarding-class <i>class-name</i> scheduler <i>scheduler-name</i>; } }</pre>
Hierarchy Level	[edit class-of-service]
Release Information	Statement introduced before Junos OS 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> <p>See Configuring Schedulers and Example: Configuring CoS for a PBB Network on MX Series Routers.</p>
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	<pre>schedulers { scheduler-name { adjust-minimum <i>rate</i>; adjust-percent <i>percentage</i>; buffer-size (<i>seconds</i> percent <i>percentage</i> remainder temporal <i>microseconds</i>); drop-profile-map loss-priority (any low medium-low medium-high high) <i>protocol</i> (any non-tcp tcp) drop-profile <i>profile-name</i>; excess-priority [low medium-low medium-high high none]; excess-rate (percent <i>percentage</i> proportion <i>value</i>); priority <i>priority-level</i>; shaping-rate (percent <i>percentage</i> <i>rate</i>); transmit-rate (percent <i>percentage</i> <i>rate</i> remainder) <exact rate-limit>; } }</pre>
Hierarchy Level	[edit class-of-service]
Release Information	Statement introduced before Junos OS Release 7.4. Statement introduced in Junos OS Release 12.1X48 for PTX Series switches.
Description	Specify the scheduler name and parameter values.
Options	<p><i>scheduler-name</i>—Name of the scheduler to be configured.</p> <p>The remaining statements are explained separately.</p>
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Schedulers Overview• Default Schedulers Overview• Configuring Schedulers• Configuring a Scheduler• Example: Configuring CoS for a PBB Network on MX Series Routers

shaping

Syntax	<pre>shaping { (cbr rate rtvbr peak rate sustained rate burst length vbr peak rate sustained rate burst length); queue-length number; }</pre>
Hierarchy Level	<pre>[edit interfaces interface-name atm-options vpi vpi-identifier], [edit interfaces interface-name unit logical-unit-number], [edit interfaces interface-name unit logical-unit-number address address family family multipoint-destination address], [edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number], [edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number address address family family multipoint-destination address]</pre>
Release Information	Statement introduced before Junos OS Release 7.4.
Description	<p>For ATM encapsulation only, define the traffic-shaping profile.</p> <p>For Circuit Emulation PICs, specify traffic shaping in the ingress and egress directions.</p> <p>For ATM2 IQ interfaces, changing or deleting VP tunnel traffic shaping causes all logical interfaces on a VP to be deleted and then re-added.</p> <p>VP tunnels are not supported on multipoint interfaces.</p> <p>The statements are explained separately.</p>
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 Documentation	<ul style="list-style-type: none"> Defining Virtual Path Tunnels Defining the ATM Traffic-Shaping Profile Configuring ATM QoS or Shaping Applying Scheduler Maps to Logical ATM Interfaces on page 30

sustained-rate

Syntax	<code>sustained-rate rate;</code>
Hierarchy Level	[edit class-of-service traffic-control-profiles <i>traffic-control-profile-name</i>] [edit firewall atm-policer <i>atm-policer-name</i>]
Release Information	Statement introduced in Junos OS Release 12.1.
Description	(MX Series routers) Define ATM sustained cell rate on ATM MICs in cells per second by entering a decimal number followed by the abbreviation c; where 1 cps = 384 bps.
Options	<i>rate</i> —ATM sustained rate in cells per second. Range: 61 cps through 353,206 cps.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• show class-of-service traffic-control-profile

traffic-manager

Syntax	<pre>traffic-manager { egress-shaping-overhead <i>number</i>; ingress-shaping-overhead <i>number</i>; mode <i>session-shaping</i>; }</pre>
Hierarchy Level	[edit chassis fpc <i>slot-number</i> pic <i>pic-number</i>], [edit chassis lcc <i>number</i> fpc <i>slot-number</i> pic <i>pic-number</i>] (Routing Matrix)
Release Information	Statement introduced in Junos OS Release 8.3.
Description	Enable CoS queuing, scheduling, and shaping on an L2TP session.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring CoS for L2TP Tunnels on ATM Interfaces on page 31• egress-shaping-overhead on page 55• ingress-shaping-overhead on page 62• mode (Layer 2 Tunneling Protocol Shaping) on page 71

transmit-rate (Schedulers)

Syntax	<code>transmit-rate (rate percent <i>percentage</i> remainder) <exact rate-limit>;</code>
Hierarchy Level	[edit class-of-service schedulers <i>scheduler-name</i>]
Release Information	<p>Statement introduced before Junos OS Release 7.4.</p> <p>rate-limit option introduced in Junos OS Release 8.3. Applied to the Multiservices PICs in Junos OS Release 9.4.</p> <p>Statement introduced in Junos OS Release 12.1X48 for PTX Series Packet Transport Switches.</p> <p>Statement introduced in Junos OS Release 12.2 for ACX Series Routers.</p>
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, respectively.
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. For PTX Series Packet Transport Switches, this option is allowed only on the non-strict-high (high, medium-high, medium-low, or low) queues.</p> <p>percent <i>percentage</i>—Percentage of transmission capacity. A percentage of zero drops all packets in the queue.</p> <p>Range: 0 through 100 percent for M, MX and T Series routers; 1 through 100 percent for PTX Series Packet Transport Switches; 0 through 200 percent for the SONET/SDH OC48/STM16 IQE PIC</p>



NOTE:

- On M Series Multiservice Edge Routers, for interfaces configured on 4-port E1 and 4-port T1 PICs only, you can configure a *percentage* value only from 11 through 100. These two PICs do not support transmission rates less than 11 percent.
- The configuration of the `transmit-rate percent 0 exact` statement at the [edit class-of-service `schedulers` *scheduler-name*] hierarchy is ineffective on T4000 routers with Type 5 FPC.
- On MIC and MPC interfaces on MX Series routers, when the transmit rate is configured as a percentage and `exact` or `rate-limit` is enabled on a queue, the shaping rate of the parent node is used to compute the transmit rate. If `exact` or `rate-limit` is not configured, the guaranteed rate of the parent node is used to compute the transmit rate.

rate—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



NOTE: For all MX Series interfaces, the rate can be from 65,535 through 160,000,000,000 bps.

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.



NOTE: For PTX Series Packet Transport Switches, this option is allowed only on the strict-high queue. We recommend that you configure rate limit on strict-high queues because the other queues may not meet their guaranteed bandwidths.



NOTE: The configuration of the **rate-limit** statement is supported on T4000 routers only with a Type 5 FPC.

remainder—Use the remaining rate available.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Configuring Schedulers
- Configuring Scheduler Transmission Rate
- Example: Configuring CoS for a PBB Network on MX Series Routers

transmit-weight

Syntax	transmit-weight (cells <i>number</i> percent <i>number</i>);
Hierarchy Level	[edit interfaces at- <i>fpc</i> / <i>pic</i> / <i>port</i> atm-options scheduler-maps <i>map-name</i> forwarding-class) class-name]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	For ATM2 IQ interfaces only, assign a transmission weight to a forwarding class.
Default	95 percent for queue 0, 5 percent for queue 3.
Options	<p>percent <i>percentage</i>—Transmission weight of the forwarding class as a percentage of the total bandwidth. Range: 5 through 100</p> <p>cells <i>number</i>—Transmission weight of the forwarding class as a number of cells. Range: 0 through 32,000</p>
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 Documentation	<ul style="list-style-type: none"> • Configuring Scheduler Maps on ATM Interfaces on page 22

unit

Syntax `unit logical-unit-number {
 classifiers {
 type (classifier-name | default) family (mpls | all);
 }
 forwarding-class class-name;
 fragmentation-map map-name;
 input-traffic-control-profile profile-name shared-instance instance-name;
 output-traffic-control-profile profile-name shared-instance instance-name;
 per-session-scheduler;
 rewrite-rules {
 dscp (rewrite-name | default);
 dscp-ipv6 (rewrite-name | default);
 exp (rewrite-name | default) protocol protocol-types;
 exp-push-push-push default;
 exp-swap-push-push default;
 ieee-802.1 (rewrite-name | default) vlan-tag (outer | outer-and-inner);
 inet-precedence (rewrite-name | default);
 }
 scheduler-map map-name;
 shaping-rate rate;
 }`

Hierarchy Level [edit class-of-service [interfaces](#) interface-name]

Release Information Statement introduced before Junos OS 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 *logical-unit-number*—Number of the logical unit.

Range: 0 through 16,384

The remaining statements are explained separately.

Required Privilege Level interface—To view this statement in the configuration.
 interface-control—To add this statement to the configuration.

Related Documentation

- Overview of BA Classifier Types
- Configuring Rewrite Rules

vbr

Syntax	<code>vbr peak <i>rate</i> sustained <i>rate</i> burst <i>length</i>;</code>
Hierarchy Level	<p>[edit interfaces <i>interface-name</i> atm-options vpi <i>vpi-identifier</i> shaping],</p> <p>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> address <i>address</i> family <i>family</i> multipoint-destination <i>address</i> shaping],</p> <p>[edit interfaces <i>interface-name</i> unit <i>logical-unit-number</i> shaping],</p> <p>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> address <i>address</i> family <i>family</i> multipoint-destination <i>address</i> shaping],</p> <p>[edit logical-systems <i>logical-system-name</i> interfaces <i>interface-name</i> unit <i>logical-unit-number</i> shaping]</p>
Release Information	Statement introduced before Junos OS Release 7.4.
Description	<p>For ATM encapsulation only, define the variable bandwidth utilization in the traffic-shaping profile.</p> <p>When you configure the variable bandwidth utilization, you must specify all three options (burst, peak, and sustained). You can specify the rate in bits per second either as a complete decimal number or as a decimal number followed by the abbreviation k (1000), m (1,000,000), or g (1,000,000,000). You can also specify the rate in cells per second by entering a decimal number followed by the abbreviation c; values expressed in cells per second are converted to bits per second by means of the formula 1 cps = 384 bps.</p>
Default	If the vbr statement is not specified, bandwidth utilization is unlimited.
Options	<p>burst <i>length</i>—Burst length, in cells. If you set the length to 1, the peak traffic rate is used. Range: 1 through 4000 cells</p> <p>peak <i>rate</i>—Peak rate, in bits per second or cells per second. Range: For ATM1 interfaces, 33 Kbps through 135.6 Mbps (ATM OC3); 33 Kbps through 276 Mbps (ATM OC12). For ATM2 IQ OC3 and OC12 interfaces, 33 Kbps through 542,526,792 bps. For ATM2 IQ OC48 interfaces, 33 Kbps through 2,170,107,168 bps. For ATM2 IQ DS3 and E3 interfaces, from 33 Kbps through the maximum rate, which depends on the ATM encapsulation and framing you configure.</p> <p>sustained <i>rate</i>—Sustained rate, in bits per second or cells per second. Range: For ATM1 interfaces, 33 Kbps through 135.6 Mbps (ATM OC3); 33 Kbps through 276 Mbps (ATM OC12). For ATM2 IQ OC3 and OC12 interfaces, 33 Kbps through 542,526,792 bps. For ATM2 IQ OC48 interfaces, 33 Kbps through 2,170,107,168 bps. For ATM2 IQ DS3 and E3 interfaces, from 33 Kbps through the maximum rate, which depends on the ATM encapsulation and framing you configure.</p>
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 Documentation	<ul style="list-style-type: none"> Configuring ATM CBR Applying Scheduler Maps to Logical ATM Interfaces on page 30

- [cbr on page 52](#)
- [rtvbr on page 77](#)
- [shaping on page 81](#)

vc-cos-mode

Syntax	vc-cos-mode (alternate strict);
Hierarchy Level	[edit interfaces <i>interface-name</i> atm-options scheduler-maps <i>map-name</i>]
Release Information	Statement introduced before Junos OS Release 7.4.
Description	For ATM2 IQ interfaces only, specify packet-scheduling priority value for ATM2 IQ VC tunnels.
Options	<p>alternate—VC CoS queue has high priority. The scheduling of the queues alternates between the high-priority queue and the remaining queues, so every other scheduled packet is from the high-priority queue.</p> <p>strict—VC CoS queue has strictly high priority. A queue with strict high priority is always scheduled before the remaining queues. The remaining queues are scheduled in round-robin fashion.</p> <p>Default: alternate</p>
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring ATM2 IQ VC Tunnel CoS Components• Configuring Scheduler Maps on ATM Interfaces on page 22

vci

Syntax	<code>vci vpi-identifier.vci-identifier;</code>
Hierarchy Level	<p>[edit interfaces at-<i>fpc/pic/port</i> unit <i>logical-unit-number</i>],</p> <p>[edit interfaces at-<i>fpc/pic/port</i> unit <i>logical-unit-number</i> family <i>family</i> address <i>address</i> multipoint-destination <i>address</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> interfaces at-<i>fpc/pic/port</i> unit <i>logical-unit-number</i>],</p> <p>[edit logical-systems <i>logical-system-name</i> interfaces at-<i>fpc/pic/port</i> unit <i>logical-unit-number</i> family <i>family</i> address <i>address</i> multipoint-destination <i>address</i>]</p>
Release Information	<p>Statement introduced before Junos OS Release 7.4.</p> <p>Statement introduced in Junos OS Release 11.1 for the QFX Series.</p> <p>Statement introduced in Junos OS Release 12.2 for the ACX Series Universal Access routers.</p>
Description	<p>For ATM point-to-point logical interfaces only, configure the virtual circuit identifier (VCI) and virtual path identifier (VPI).</p> <p>To configure a VPI for a point-to-multipoint interface, specify the VPI in the multipoint-destination statement.</p> <p>VCIs 0 through 31 are reserved for specific ATM values designated by the ATM Forum.</p>
Options	<p>vci-identifier—ATM virtual circuit identifier. Unless you configure the interface to use promiscuous mode, this value cannot exceed the highest-numbered VC configured for the interface with the maximum-vcs option of the vpi statement.</p> <p>Range: 0 through 4089 or 0 through 65,535 with promiscuous mode, with VCIs 0 through 31 reserved.</p> <p>vpi-identifier—ATM virtual path identifier.</p> <p>Range: 0 through 255</p> <p>Default: 0</p>
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 Documentation	<ul style="list-style-type: none"> Configuring a Point-to-Point ATM1 or ATM2 IQ Connection Applying Scheduler Maps to Logical ATM Interfaces on page 30 multipoint-destination promiscuous-mode vpi (ATM CCC Cell-Relay Promiscuous Mode)

CHAPTER 7

Operational Mode Commands

show class-of-service l2tp-session

Syntax	<code>show class-of-service l2tp-session <i>session-id</i></code>
Release Information	Command introduced in Junos OS Release 8.2.
Description	Display CoS objects associated with an L2TP session on M7i, M10i, and M120 routers.
Options	<i>session-id</i> —L2TP session number for which you want to display a summary of CoS attributes.
Required Privilege Level	view
List of Sample Output	show class-of-service l2tp-session on page 93
Output Fields	Table 4 on page 92 lists the output fields for the show class-of-service l2tp-session command. Output fields are listed in the approximate order in which they appear.

Table 4: show class-of-service l2tp-session Output Fields

Field Name	Field Description
L2TP Session Username	Username associated with the L2TP session.
Index	Session index identification number.
Physical interface	Physical interface on which the tunnel session is established.
Index	Index ID associated with the physical interface on which the tunnel session is established.
Queues supported	Number of scheduler queues supported for the L2TP session.
Queues in use	Number of scheduler queues active on the L2TP session.
Scheduler map	Scheduler map name associated with the session.
Index	Scheduler map index number associated with the session.
Shaping rate	Maximum bandwidth configured for the session. Each active queue on the session receives a maximum of the configured amount of absolute bandwidth or the configured percentage of bandwidth, even if more bandwidth is available.

Sample Output

```
show class-of-service l2tp-session user@host> show class-of-service l2tp-session 123
l2tp-session                        L2TP Session Username: user1@bng.com, Index: 12553
                                   Physical interface: ge-2/0/0, Index: 130
                                   Queues supported: 8, Queues in use: 4
                                   Scheduler map: GEN-SCHED-MAP-EF-65%, Index: 5212
                                   Shaping rate: 200000 bps
```


PART 3

Index

- [Index on page 97](#)

Index

Symbols

#, comments in configuration statements.....	xiv
(), in syntax descriptions.....	xiv
< >, in syntax descriptions.....	xiv
[], in configuration statements.....	xiv
{ }, in configuration statements.....	xiv
(pipe), in syntax descriptions.....	xiv

A

address statement.....	47
usage guidelines.....	22
aggregated Ethernet interfaces	
CoS and.....	3
CoS example.....	12
aggregated interfaces	
scheduler modes.....	14
aggregated SONET/SDH interfaces	
CoS and.....	3
CoS example.....	12
ATM	
classifiers example.....	36
scheduler for VPLS.....	34, 37
ATM interfaces	
CoS and	
egress queues.....	24
eight forwarding classes.....	24
atm-options statement.....	48
atm-scheduler-map statement.....	49
usage guidelines.....	30
atm-service statement.....	50
ATM2 IQ interfaces	
CoS and.....	5
copying the PLP to the CLP bit.....	30
example configuration.....	25
linear RED profiles.....	21
scheduler maps.....	22
scheduling on the logical interface.....	30
scheduling priority.....	29
CoS example.....	35
eight forwarding classes	
example configuration.....	25

B

BA classification	
VPLS over ATM.....	33
braces, in configuration statements.....	xiv
brackets	
angle, in syntax descriptions.....	xiv
square, in configuration statements.....	xiv
buffer-size statement.....	51

C

cbr statement.....	52
usage guidelines.....	30
classifiers	
for ATM interfaces example.....	36
comments, in configuration statements.....	xiv
conventions	
text and syntax.....	xiii
CoS	
aggregated Ethernet interfaces.....	3
aggregated Ethernet interfaces example.....	12
aggregated SONET/SDH interfaces.....	3
aggregated SONET/SDH interfaces	
example.....	12
ATM and VPLS.....	33
ATM interfaces	
egress queues.....	24
ATM2 IQ interfaces.....	5
linear RED profiles.....	21
scheduler maps.....	22
scheduling on the logical interface.....	30
scheduling priority.....	29
ATM2 IQ interfaces example.....	35
eight forwarding classes.....	24
example configuration.....	25
for aggregated interfaces.....	11
for aggregated interfaces example.....	12
for MPLS.....	7
limitations for aggregated interfaces.....	3
curly braces, in configuration statements.....	xiv
customer support.....	xv
contacting JTAC.....	xv

D

destination statement.....	53
documentation	
comments on.....	xv
drop-profile statement.....	54
RED.....	54
See also RED	

drop-profile-map statement.....	54	linear-red-profiles statement.....	66
E		usage guidelines.....	21
egress-shaping-overhead statement.....	55	low-plp-max-threshold statement.....	68
epd-threshold statement.....	56	usage guidelines.....	21
usage guidelines.....	22	low-plp-threshold statement.....	69
Ethernet		usage guidelines.....	21
ATM scheduler for VPLS.....	34, 37	LSPs	
example		CoS values.....	7
classifiers for ATM.....	36	M	
CoS on aggregated interfaces.....	12	manuals	
excess-priority statement.....	57	comments on.....	xv
excess-rate statement.....	58	max-burst-size statement.....	70
EXP bits.....	7	max-queues-per-interface statement.....	70
F		member-link-scheduler	
family statement		usage guidelines.....	14
ATM interfaces.....	59	mode statement.....	71
font conventions.....	xiii	usage guidelines.....	31
forwarding-class statement.....	60	MPLS	
usage guidelines.....	22	CoS values.....	7
H		EXP bits.....	7
high-plp-max-threshold statement.....	61	with CoS.....	7
usage guidelines.....	21	P	
high-plp-threshold statement.....	61	parentheses, in syntax descriptions.....	xiv
usage guidelines.....	21	peak-rate statement.....	72
I		per-session-scheduler statement.....	72
ingress-shaping-overhead statement.....	62	plp-to-clp statement.....	73
usage guidelines.....	31	usage guidelines.....	30
interfaces		plp1 statement	
aggregated Ethernet and SONET/SDH.....	11	usage guidelines.....	22
aggregated Ethernet and SONET/SDH		priority statement	
example.....	12	usage guidelines	
ATM, VC tunnel CoS.....	5	ATM scheduler map.....	22
egress queues.....	24	Q	
linear RED profiles.....	21	queue-depth statement.....	76
scheduler maps.....	22	usage guidelines.....	21
scheduling on the logical interface.....	30	R	
scheduling priority.....	29	rtvbr statement.....	77
CoS limitations.....	3	usage guidelines.....	30
interfaces statement		S	
CoS.....	63	scheduler modes	
L		on aggregated interfaces.....	14
linear-red-profile statement.....	65	replicate or scale.....	14
usage guidelines.....	22		

scheduler-maps statement	
for ATM2 IQ interfaces.....	79
usage guidelines.....	22
for most non-ATM2 IQ interfaces.....	79
schedulers	
for ATM and VPLS.....	34, 37
shaping statement.....	81
usage guidelines.....	30
show class-of-service l2tp-session.....	92
signaled LSPs	
CoS values.....	7
support, technical See technical support	
sustained-rate statement.....	82
syntax conventions.....	xiii

T

technical support	
contacting JTAC.....	xv
traffic-manager statement.....	82
transmit-rate statement.....	83
transmit-weight statement.....	85
usage guidelines.....	22

U

unit statement	
CoS.....	86

V

vbr statement.....	87
usage guidelines.....	30
VC tunnel CoS	
ATM2 IQ interfaces.....	5
vc-cos-mode statement.....	88
usage guidelines.....	29
vci statement.....	89
usage guidelines.....	31
VPLS	
ATM scheduler.....	34, 37

