JUNIPER NETWORKS

Junos® OS

CoS Features and Limitations for Specific Interface Types

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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.xsl;
       }
     }
   }
   interfaces {
     fxp0 {
       disable;
       unit 0 {
         family inet {
           address 10.0.0.1/24;
         }
       }
     }
   }
   ```

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

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

Merging a Snippet

To merge a snippet, follow these steps:

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

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

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

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 xi 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 xi 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
Italic text like this	• Introduces or emphasizes important new terms. • Identifies book names. • Identifies RFC and Internet draft titles.	• A policy *term* is a named structure that defines match conditions and actions. • *Junos OS System Basics Configuration Guide* • RFC 1997, *BGP Communities Attribute*
Italic text like this	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** *domain-name*
Text like this	Represents names of configuration statements, commands, files, and directories; configuration hierarchy levels; or labels on routing platform components.	• 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** **(*string1* | *string2* | *string3*)**
# (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*** **]**

Indention and braces ({ })	Identify a level in the configuration hierarchy.	[edit]
		routing-options {
		  static {
		  route default {
		  nexthop *address*;
		  retain;
		  }
		  }
		}

; (semicolon)	Identifies a leaf statement at a configuration hierarchy level.	
GUI Conventions		
Bold text like this	Represents graphical user interface (GUI) items you click or select.	• In the Logical Interfaces box, select **All Interfaces**. • To cancel the configuration, click **Cancel**.
> (bold right angle bracket)	Separates levels in a hierarchy of menu selections.	In the configuration editor hierarchy, select **Protocols>Ospf**.

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- Use the Case Management tool in the CSC at http://www.juniper.net/cm/.
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For international or direct-dial options in countries without toll-free numbers, see http://www.juniper.net/support/requesting-support.html.

PART 1

Overview

CHAPTER 1

Overview of CoS on Specific Transports

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 10.

- 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 you 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 Library for Routing Devices*.

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 percentlow-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;
}
```

PART 2

Configuration

CHAPTER 2

CoS Configuration on Aggregated Interfaces

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 Routers

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 ea*n*]** 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 Library for Routing Devices*.

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 Routers.

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 the 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. Shaping rate is also scaled if you configure it in bits per second (bps). Shaping rate is not scaled if you configure it as a percentage of the available interface bandwidth.

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**

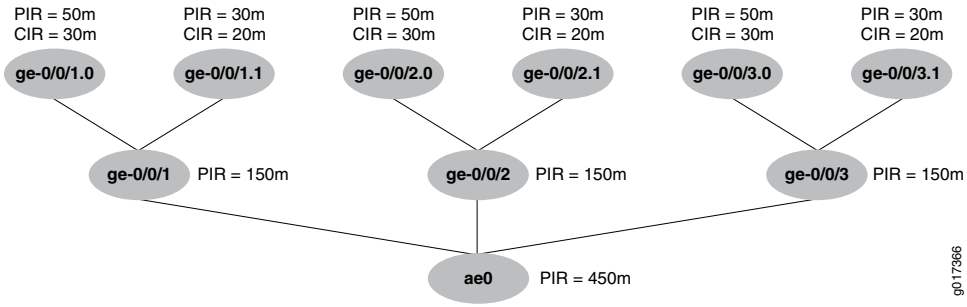
The traffic control profile parameters configured on **ae0.0** are divided across all the underlying logical interfaces (the unit 0s). In the same way, the traffic control profile parameters configured on **ae0.1** are divided across all the underlying logical interfaces (the unit 1s).

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 16.

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:

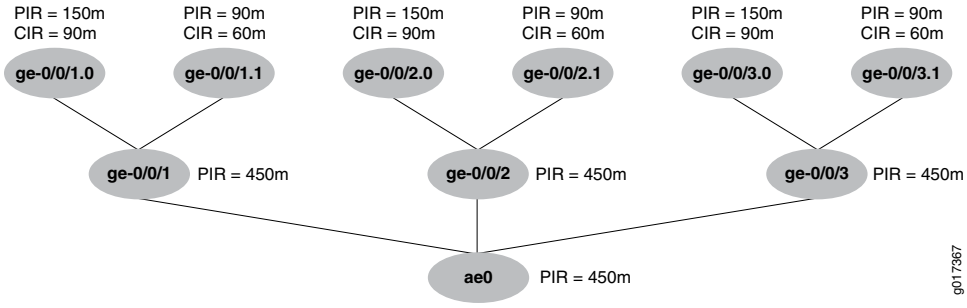
- When the parameters are configured using traffic control profiles, then the parameters replicated are the shaping rate, guaranteed rate, and delay buffer rate.
- When the parameters are configured using scheduler maps, then the parameters replicated are the transmit rate and buffer size.

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 17.

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

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 percentlow-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 22.

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:

```
default epd-threshold = number of buffers * shaping rate / 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.

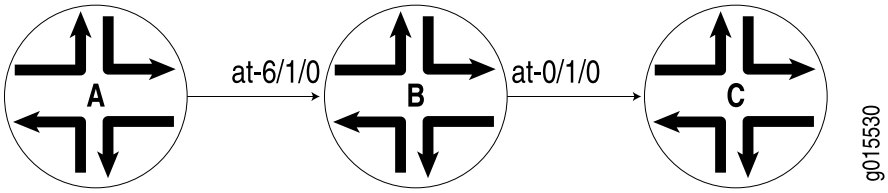
NOTE: When you are considering enabling eight queues on an ATM2 IQ interface, you should note the following:

- 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 23, 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 Library for Routing Devices*.

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 Library for Routing Devices*.

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 35

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 Documentation

- *BA Classifier Overview*

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 32

CHAPTER 4

Configuration Statements

address (CoS on ATM Interfaces)

Syntax

```
address address {
  destination address;
}
```

Hierarchy Level

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

Release Information

Statement introduced before Junos OS Release 7.4.

Description

For CoS on ATM interfaces, configure the interface address.

Options

address—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

- Example: Configuring CoS for ATM2 IQ VC Tunnels on page 33

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 67
- vci on page 72

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 *traffic-control-profile-name*]
[edit firewall atm-policer*atm-policer-name*]

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

- *show class-of-service traffic-control-profile*

buffer-size (Schedulers)

Syntax buffer-size (percent *percentage* | remainder | temporal *microseconds*);

Hierarchy Level [edit class-of-service schedulers *scheduler-name*]

Release Information Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 12.1X48 for PTX Series Packet Transport Routers.
Statement introduced in Junos OS Release 12.2 for ACX Series Routers.

Description Specify buffer size.

NOTE: On PTX Series Packet Transport Routers, buffer-size cannot be configured on rate-limited queues.

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 **percent *percentage***—Buffer size as a percentage of the total buffer.

Range: 0 through 100

remainder—Remaining buffer available.

temporal *microseconds*—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*.

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

Related Documentation

- *Configuring the Scheduler Buffer Size*
- *Example: Configuring CoS for a PBB Network on MX Series Routers*

cbr

Syntax cbr *rate*;

Hierarchy Level [edit interfaces at-*fpc/pic/port* atm-options vpi *vpi-identifier* shaping],
[edit interfaces at-*fpc/pic/port* unit *logical-unit-number* address *address* family *family* multipoint-destination *address* shaping],
[edit interfaces at-*fpc/pic/ port* unit *logical-unit-number* shaping],
[edit logical-systems *logical-system-name* interfaces at-*fpc/pic/port* unit *logical-unit-number* address *address* family *family* multipoint-destination *address* shaping],
[edit logical-systems *logical-system-name* interfaces at-*fpc/pic/port* unit *logical-unit-number* 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 ***line-rate***, or 135,600,000 bps. For ATM1 OC12 interfaces, the maximum available rate is 50 percent of ***line-rate***, 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

- *Defining the ATM Traffic-Shaping Profile*
- rtvbr on page 64
- shaping on page 67
- vbr on page 70

destination (Interfaces)

Syntax destination *address*;

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

Release Information Statement introduced before Junos OS Release 7.4.

Description For CoS on ATM interfaces, specify the remote address of the connection.

For point-to-point interfaces only, specify the address of the interface at the remote end of the connection.

For tunnel and encryption interfaces, specify the remote address of the tunnel.

Options ***address***—Address of the remote side of the connection.

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

Related Documentation

- Configuring Linear RED Profiles on ATM Interfaces on page 19
- *Multilink and Link Services Logical Interface Configuration Overview*
- *Configuring Encryption Interfaces*
- *Configuring Traffic Sampling*
- *Configuring Flow Monitoring*
- *Configuring Unicast Tunnels*

drop-profile (Schedulers)

Syntax drop-profile *profile-name*;

Hierarchy Level [edit class-of-service schedulers *scheduler-name* 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 Routers.
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 ***profile-name***—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
- *Configuring Drop Profile Maps for Schedulers*
- *RED Drop Profiles Overview*

drop-profile-map (Schedulers)

Syntax drop-profile-map loss-priority (any | low | medium-low | medium-high | high) protocol(any | non-tcp | tcp) drop-profile (Schedulers) *profile-name*;

Hierarchy Level [edit class-of-service schedulers *scheduler-name*]

Release Information Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 12.1X48 for PTX Series Packet Transport Routers.
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
- *Default Schedulers Overview*
- *Configuring Drop Profile Maps for Schedulers*

egress-shaping-overhead

Syntax egress-shaping-overhead *number*;

Hierarchy Level [edit chassis fpc *slot-number* pic *pic-number* traffic-manager],
[edit chassis lcc *number* fpc *slot-number* pic *pic-number* 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: On M Series and T Series routers with Gigabit Ethernet Intelligent Queuing 2 (IQ2) PICs and Enhanced IQ2 (IQ2E) PICs and on MX Series routers with Dense Port Concentrators (DPCs) only, to account for egress shaping overhead bytes added to output traffic on the line card, you must use the **egress-policer-overhead** statement to explicitly configure corresponding egress policing overhead for Layer 2 policers, MAC policers, or queue rate limits applied to output traffic on the line card.

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 PIC 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
- *egress-policer-overhead*
- Configuring CoS for L2TP Tunnels on ATM Interfaces on page 29
- ingress-shaping-overhead on page 51
- mode (Layer 2 Tunneling Protocol Shaping) on page 58, ingress-shaping-overhead on page 51
- traffic-manager on page 68

epd-threshold

Syntax
epd-threshold *cells* plp1 *cells*;

Hierarchy Level
[edit interfaces at-*fpc/pic/port* atm-options scheduler-maps *map-name* forwarding-class *class-name*]

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
cells—Maximum number of cells.

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.

plp1 *cells*—Early packet drop threshold value for PLP 1.

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.

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

Related Documentation
- Configuring Scheduler Maps on ATM Interfaces on page 20
- linear-red-profile on page 52

excess-priority

Syntax excess-priority [low | medium-low | medium-high | high | none];

Hierarchy Level [edit class-of-service schedulers *scheduler-name*]

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 **low**—Excess traffic for this scheduler has low priority.

medium-low—Excess traffic for this scheduler has medium-low priority.

medium-high—Excess traffic for this scheduler has medium-high priority.

high—Excess traffic for this scheduler has high priority.

none—System does not demote the priority of guaranteed traffic when the bandwidth exceeds the shaping rate or the guaranteed rate.

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

Related Documentation

- *Configuring Excess Bandwidth Sharing on IQE PICs*
- *Bandwidth Sharing on Nonqueuing Packet Forwarding Engines Overview*
- *Managing Excess Bandwidth Distribution on Static Interfaces on MICs and MPCs*

family (CoS on ATM Interfaces)

Syntax

```
family family {
  address address {
    destination address;
  }
}
```

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

For CoS on ATM interfaces, configure the protocol family.

Options

family—Protocol family:

- **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.

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

- CoS on ATM Interfaces Overview on page 5

forwarding-class (ATM2 IQ Scheduler Maps)

Syntax

```
forwarding-class class-name {
  epd-threshold cells plp1 cells;
  linear-red-profile profile-name;
  priority (high | low);
  transmit-weight (cells number | percent number);
}
```

Hierarchy Level [edit interfaces at-*fpc/pic/port* atm-options scheduler-maps *map-name*]

Release Information Statement introduced before Junos OS Release 7.4.

Description For ATM2 IQ interfaces only, define forwarding class name and option values.

Options ***class-name***—Name of forwarding class.

The statements are explained separately.

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*
- Configuring Scheduler Maps on ATM Interfaces on page 20

forwarding-class (Interfaces)

Syntax forwarding-class *class-name*;

Hierarchy Level [edit class-of-service interfaces *interface-name* unit *logical-unit-number*]

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 ***class-name***—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

- *Applying Forwarding Classes to Interfaces*

high-plp-max-threshold

Syntax high-plp-max-threshold *percent*;

Hierarchy Level [edit interfaces at-*fpc/pic/port* atm-optionslinear-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 high PLP CoS VC. When the fill level exceeds the defined percentage, all packets are dropped.

Options *percent*—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

- Configuring Linear RED Profiles on ATM Interfaces on page 19
- low-plp-max-threshold on page 55
- low-plp-threshold on page 56
- queue-depth on page 63

high-plp-threshold

Syntax high-plp-threshold *percent*;

Hierarchy Level [edit interfaces at-*fpc/pic/port* atm-optionslinear-red-profiles *profile-name*]

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 *percent*—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

- Configuring Linear RED Profiles on ATM Interfaces on page 19
- high-plp-max-threshold on page 50
- low-plp-max-threshold on page 55
- low-plp-threshold on page 56
- queue-depth on page 63

ingress-shaping-overhead

Syntax ingress-shaping-overhead *number*;

Hierarchy Level [edit chassis fpc *slot-number* pic *pic-number* traffic-manager],
[edit chassis lcc *number* fpc *slot-number* pic *pic-number* 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.

Options *number*—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.

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.

Range: –63 through 192

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 29
- egress-shaping-overhead on page 45
- mode (Layer 2 Tunneling Protocol Shaping) on page 58
- traffic-manager on page 68

linear-red-profile

Syntax linear-red-profile *profile-name*;

Hierarchy Level [edit interfaces at-*fpc/pic/port* atm-options scheduler-maps *map-name* forwarding-class *class-name*]

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-*fpc/pic/port* 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 ***profile-name***—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

- *Configuring an ATM Scheduler Map*
- linear-red-profiles on page 53
- Configuring Scheduler Maps on ATM Interfaces on page 20
- epd-threshold on page 46

linear-red-profiles

Syntax

```
linear-red-profiles profile-name {
    high-plp-threshold percent;
    low-plp-threshold percent;
    queue-depth cells;
}
```

Hierarchy Level [edit interfaces at-*fpc/pic/port* 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 ***profile-name***—Name of the 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

- *Configuring ATM2 IQ VC Tunnel CoS Components*
- Configuring Linear RED Profiles on ATM Interfaces on page 19

loss-priority (Scheduler Drop Profiles)

Syntax loss-priority (any | high | low | medium-high | medium-low);

Hierarchy Level [edit class-of-service schedulers *scheduler-name* 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 Routers.
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 Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- *Default Schedulers Overview*
- *Configuring Drop Profile Maps for Schedulers*
- *Configuring Schedulers for Priority Scheduling*
- *Configuring Tricolor Marking*
- protocol (Schedulers) on page 62

low-plp-max-threshold

Syntax low-plp-max-threshold *percent*;

Hierarchy Level [edit interfaces at-*fpc/pic/port* 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 ***percent***—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

- *Configuring ATM2 IQ VC Tunnel CoS Components*
- *high-plp-max-threshold*
- low-plp-threshold on page 56
- Configuring Linear RED Profiles on ATM Interfaces on page 19
- high-plp-max-threshold on page 50
- queue-depth on page 63

low-plp-threshold

Syntax low-plp-threshold *percent*;

Hierarchy Level [edit interfaces at-*fpc/pic/port* 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 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 ***percent***—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

- *Configuring ATM2 IQ VC Tunnel CoS Components*
- *high-plp-max-threshold*
- *high-plp-threshold*
- Configuring Linear RED Profiles on ATM Interfaces on page 19
- high-plp-max-threshold on page 50
- high-plp-threshold on page 50
- low-plp-max-threshold on page 55
- queue-depth on page 63

max-burst-size

Syntax max-burst-size *max-burst-size*;

Hierarchy Level [edit class-of-service traffic-control-profiles *traffic-control-profile-name*],
[edit firewall atm-policer *atm-policer-name*]

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 *cells*—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

- *show class-of-service traffic-control-profile*

mode (Layer 2 Tunneling Protocol Shaping)

Syntax mode *traffic-manager-mode*;

Hierarchy Level [edit chassis fpc *slot-number* pic *pic-number* traffic-manager],
[edit chassis lcc *number* fpc *slot-number* pic *pic-number* traffic-manager]

Release Information Statement introduced in Junos OS Release 8.3.

Description Enable shaping on an L2TP session.

Options *traffic-manager-mode*—Configure CoS traffic manager mode of operation on this interface. This option has the following suboptions:

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 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 29
- egress-shaping-overhead on page 45
- ingress-shaping-overhead on page 51
- traffic-manager on page 68

peak-rate

Syntax peak-rate *rate*;

Hierarchy Level [edit class-of-service traffic-control-profiles *traffic-control-profile-name*]

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 *rate*—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
- *show class-of-service traffic-control-profile*

per-session-scheduler

Syntax per-session-scheduler;

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

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
- Configuring CoS for L2TP Tunnels on ATM Interfaces on page 29
- ingress-shaping-overhead on page 51
- mode (Layer 2 Tunneling Protocol Shaping) on page 58

plp-to-clp

Syntax plp-to-clp;

Hierarchy Level [edit interfaces at-*fpc/pic/port* atm-options],
[edit interfaces at-*fpc/pic/port* unit *logical-unit-number*],
[edit logical-systems *logical-system-name* interfaces at--*fpc/pic/port* unit *logical-unit-number*]

Release Information Statement introduced 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
- *Enabling the PLP Setting to Be Copied to the CLP Bit*
- Copying the PLP Setting to the CLP Bit on ATM Interfaces on page 28

priority (ATM2 IQ Schedulers)

Syntax priority (high | low);

Hierarchy Level [edit interfaces at-*fpc/pic/port* atm-options scheduler-maps *map-name* forwarding-class *class-name*]

Release Information Statement introduced before Junos OS Release 7.4.

Description For ATM2 IQ interfaces only, assign queuing priority to a forwarding class.

Options **low**—Forwarding class has low priority.

high—Forwarding class has high priority.

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

Related Documentation
- Configuring Scheduler Maps on ATM Interfaces on page 20

priority (Schedulers)

Syntax priority *priority-level*;

Hierarchy Level [edit class-of-service schedulers *scheduler-name*]

Release Information Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 12.1X48 for PTX Series Packet Transport Routers.
Statement introduced in Junos OS Release 12.2 for ACX Series Routers.

Description Specify the packet-scheduling priority value.

Options ***priority-level*** can be one of the following:

- **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.

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.

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

Related Documentation

- *Configuring Schedulers for Priority Scheduling*

protocol (Schedulers)

Syntax protocol (any | non-tcp | tcp);

Hierarchy Level [edit class-of-service schedulers *scheduler-name* 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 Routers.
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 Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- *Configuring Schedulers*

queue-depth

Syntax queue-depth *cells*;

Hierarchy Level [edit interfaces *interface-name* atm-options linear-red-profiles *profile-name*]

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

- *Configuring ATM2 IQ VC Tunnel CoS Components*
- Configuring Linear RED Profiles on ATM Interfaces on page 19
- *high-plp-threshold*
- low-plp-threshold on page 56

rtvbr

Syntax rtvbr peak *rate* sustained *rate* burst *length*;

Hierarchy Level
[edit interfaces *interface-name* atm-options vpi *vpi-identifier* shaping],
[edit interfaces *interface-name* unit *logical-unit-number* address *address* family *family* multipoint-destination *address* shaping],
[edit interfaces *interface-name* unit *logical-unit-number* shaping],
[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* shaping],
[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* address *address* family *family* multipoint-destination *address* shaping]

Release Information Statement introduced before Junos OS Release 7.4.

Description For ATM2 IQ PICs only, define the real-time variable bandwidth utilization in the traffic-shaping profile.

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.

Default If the **rtvbr** statement is not included, bandwidth utilization is unlimited.

Options **burst *length***—Burst length, in cells. If you set the length to 1, the peak traffic rate is used.

Range: 1 through 4000 cells

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..

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.

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

Related Documentation
- *Configuring ATM CBR*
- *Configuring ATM2 IQ Real-Time VBR*
- Applying Scheduler Maps to Logical ATM Interfaces on page 28

- cbr on page 42
- vbr on page 70

scheduler-maps (For ATM2 IQ Interfaces)

Syntax

```
scheduler-maps map-name {
  forwarding-class (class-name | assured-forwarding | best-effort | expedited-forwarding
    | network-control);
  vc-cos-mode (alternate | strict);
}
```

Hierarchy Level [edit interfaces at-*fpc/pic/port* 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 *map-name*—Name of the scheduler map.

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

- Configuring Scheduler Maps on ATM Interfaces on page 20
- atm-scheduler-map on page 39

scheduler-maps (For Most Interface Types)

Syntax

```
scheduler-maps {
  map-name {
    forwarding-class class-name scheduler scheduler-name;
  }
}
```

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 *map-name*—Name of the scheduler map.

The remaining statements are explained separately.

See *Configuring Schedulers* and *Example: Configuring CoS for a PBB Network on MX Series Routers*.

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

shaping

Syntax

```
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* 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*]

Release Information

Statement introduced before Junos OS Release 7.4.

Description

For ATM encapsulation only, define the traffic-shaping profile.

For Circuit Emulation PICs, specify traffic shaping in the ingress and egress directions.

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.

VP tunnels are not supported on multipoint interfaces.

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

- *Defining Virtual Path Tunnels*
- *Defining the ATM Traffic-Shaping Profile*
- *Configuring ATM QoS or Shaping*
- Applying Scheduler Maps to Logical ATM Interfaces on page 28

sustained-rate

Syntax sustained-rate *rate*;

Hierarchy Level [edit class-of-service traffic-control-profiles *traffic-control-profile-name*]
[edit firewall atm-policer*atm-policer-name*]

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 *rate*—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
- *show class-of-service traffic-control-profile*

traffic-manager

Syntax
```
traffic-manager {
  egress-shaping-overhead number;
  ingress-shaping-overhead number;
  mode session-shaping;
}
```

Hierarchy Level [edit chassis fpc *slot-number* pic *pic-number*],
[edit chassis lcc *number* fpc *slot-number* pic *pic-number*] (Routing Matrix)

Release Information Statement introduced in Junos OS Release 8.3.

Description Enable CoS queuing, scheduling, and shaping on an L2TP session.

NOTE: Committing changes to traffic-manager automatically restarts any necessary components (PICs, DPCs, or FPCs).

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 29
- egress-shaping-overhead on page 45
- ingress-shaping-overhead on page 51
- mode (Layer 2 Tunneling Protocol Shaping) on page 58

transmit-weight

Syntax transmit-weight (cells *number* | percent *number*);

Hierarchy Level [edit interfaces at-*fpc/pic/port*atm-options scheduler-maps *map-name* 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

percent *percentage*—Transmission weight of the forwarding class as a percentage of the total bandwidth.

Range: 5 through 100

cells *number*—Transmission weight of the forwarding class as a number of cells.

Range: 0 through 32,000

Required Privilege Level

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

Related Documentation

- Configuring Scheduler Maps on ATM Interfaces on page 20

vbr

Syntax vbr peak *rate* sustained *rate* burst *length*;

Hierarchy Level
[edit interfaces *interface-name* atm-options vpi *vpi-identifier* shaping],
[edit interfaces *interface-name* unit *logical-unit-number* address *address* family *family* multipoint-destination *address* shaping],
[edit interfaces *interface-name* unit *logical-unit-number* shaping],
[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* address *address* family *family* multipoint-destination *address* shaping],
[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* shaping]

Release Information Statement introduced before Junos OS Release 7.4.

Description For ATM encapsulation only, define the variable bandwidth utilization in the traffic-shaping profile.

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.

Default If the **vbr** statement is not specified, bandwidth utilization is unlimited.

Options
burst *length*—Burst length, in cells. If you set the length to 1, the peak traffic rate is used.
Range: 1 through 4000 cells

peak *rate*—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.

sustained *rate*—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.

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

Related Documentation
- *Configuring ATM CBR*
- Applying Scheduler Maps to Logical ATM Interfaces on page 28

- cbr on page 42
- rtvbr on page 64
- shaping on page 67

vc-cos-mode

Syntax vc-cos-mode (alternate | strict);

Hierarchy Level [edit interfaces *interface-name* atm-options scheduler-maps *map-name*]

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

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.

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.

Default: alternate

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*
- Configuring Scheduler Maps on ATM Interfaces on page 20

vci

Syntax vci *vpi-identifier.vci-identifier*;

Hierarchy Level [edit interfaces at-*fpc/pic/port* unit *logical-unit-number*],
[edit interfaces at-*fpc/pic/port* unit *logical-unit-number* family *family* address *address* multipoint-destination *address*],
[edit logical-systems *logical-system-name* interfaces at-*fpc/pic/port* unit *logical-unit-number*],
[edit logical-systems *logical-system-name* interfaces at-*fpc/pic/port* unit *logical-unit-number* family *family* address *address* multipoint-destination *address*]

Release Information Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 11.1 for the QFX Series.
Statement introduced in Junos OS Release 12.2 for the ACX Series Universal Access routers.

Description For ATM point-to-point logical interfaces only, configure the virtual circuit identifier (VCI) and virtual path identifier (VPI).

To configure a VPI for a point-to-multipoint interface, specify the VPI in the *multipoint-destination* statement.

VCIs 0 through 31 are reserved for specific ATM values designated by the ATM Forum.

Options ***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.

Range: 0 through 4089 or 0 through 65,535 with promiscuous mode, with VCIs 0 through 31 reserved.

vpi-identifier—ATM virtual path identifier.

Range: 0 through 255

Default: 0

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

Related Documentation

- *Configuring a Point-to-Point ATM1 or ATM2 IQ Connection*
- Applying Scheduler Maps to Logical ATM Interfaces on page 28
- *multipoint-destination*
- *promiscuous-mode*
- *vpi (ATM CCC Cell-Relay Promiscuous Mode)*

PART 3

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