Chapter 19

Configuring an Integrated Scheduler to Provide QoS for ATM

This chapter provides information for configuring an integrated scheduler to provide QoS for ATM.

QoS topics are discussed in the following sections:

ATM Integrated Scheduler Overview

The E-series router provides extended ATM QoS functionality through its integrated scheduler. The integrated scheduler consists of two schedulers in series—the hierarchical round robin (HRR) scheduler and the segmentation and reassembly (SAR) scheduler.

The integrated scheduler enables you to configure QoS on your ATM networks using the HRR scheduler that is used on all E-series ASIC-enabled line modules. In addition, you can use the commercial SAR scheduler to configure traditional ATM cell-based QoS.

NOTE: The term *HRR scheduler* is used in this chapter to describe the scheduling performed by the ASIC on the ATM line module. Although the ASIC might differ depending on the ATM line module, the configuration and performance of the HRR scheduler are the same. For example, the ERX-7xx models, ERX-14xx models, and ERX-310 router use the egress forwarding ASIC (EFA); and the E120 router and the E320 router use the frame forwarding ASIC (FFA) on the ES2 4G LM.

The HRR scheduler and the SAR scheduler work together as an integrated scheduler for ATM traffic. The HRR scheduler is configured by default with per-VC and per-IP interface scheduler nodes, and one best-effort class queue for each IP interface. The SAR scheduler implements weighted round-robin scheduling with one queue per VC. The VC queues are grouped into round robins based on the ATM service classes and the VP tunnels you have configured.

In the default integrated mode, controlled by the ATM application, the SAR scheduler controls the scheduling via the VC backpressure messages it sends to the HRR scheduler. When the HRR scheduler receives a backpressure message from the SAR scheduler, the HRR scheduler disables the node regardless of the node weight or shaping rate. When the HRR scheduler receives a backpressure release, the scheduler node is reenabled.

Backpressure and the Integrated Scheduler

ATM packets are initially scheduled through the HRR scheduler and then sent to the SAR scheduler, from where the cells are scheduled onto the circuit. If a SAR VC queue begins to fill up, the SAR scheduler issues *VC backpressure* messages to the HRR scheduler. The backpressure messages control the amount of traffic the HRR scheduler sends to the SAR scheduler. The SAR scheduler can also exert *port backpressure* on the HRR scheduler.

In default integrated mode, the SAR sends VC backpressure messages as well as port backpressure messages. Port backpressure messages are sent to the port node in the hierarchical scheduler.

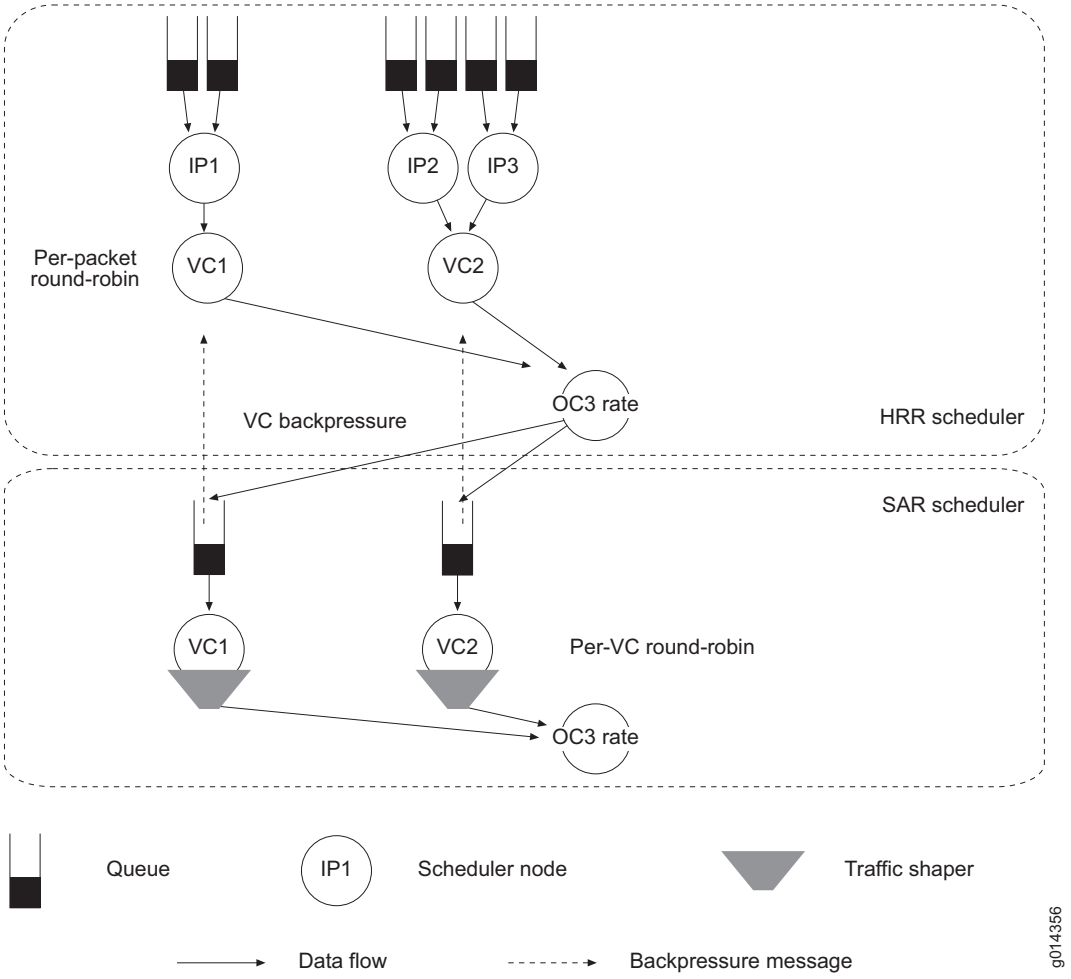
Backpressure is a critical mechanism that enables the two schedulers in series to operate as a single integrated scheduler. Backpressure ensures that packets do not drain over internal data paths at an unmanageable rate from the HRR scheduler to the SAR scheduler. Without backpressure from the SAR scheduler, the HRR scheduler does not detect congestion even if the SAR scheduler is completely saturated.

NOTE: The default QoS profile for ATM (atm-default) contains the **atm-vc node** command, which creates the scheduler node that is required by the SAR VC backpressure mechanism. If the SAR scheduler is operating in default integrated mode, this command must be in QoS profiles that are attached to ATM ports.

Figure 43 on page 169 shows the HRR and SAR schedulers working together to form the integrated scheduler. When the SAR VC queues start to back up, the SAR exerts VC backpressure to the corresponding VC node in the HRR scheduler.

VC backpressure affects only VC nodes that are in the default traffic-class group. As a consequence, VC nodes that are in named traffic-class groups within the scheduler hierarchy are not affected by VC backpressure.

Figure 43: Integrated ATM Scheduler



VP Shaping

VP shaping can be performed either in the SAR or by using the QoS shaping application using QoS profiles. Configuring VP shaping in the SAR enables traffic to be sent out of the port at a rate that closely matches strict ATM contract rates. SAR VP shaping is configured for the physical port using the **atm vp-tunnel** command.

Related Topics

- Integrating the HRR Scheduler and SAR Scheduler on page 170
- Per-Packet Queuing on the SAR Scheduler Overview on page 171

Integrating the HRR Scheduler and SAR Scheduler

The proper integration of the two schedulers is an important element of the router's ATM QoS support. Three QoS port modes control integration of the two schedulers:

- Default integrated QoS port mode—ATM application controls the scheduling facilities of the SAR scheduler.
- Low-latency QoS port mode—HRR scheduler controls the traffic rate.
- Low-CDV QoS port mode—HRR scheduler and the SAR scheduler work together to schedule traffic.

Improper configuration of the two schedulers might create an inefficient scenario in which extra latency is introduced, or might cause the scheduler to underuse the link.

To configure integration of the schedulers, use the **qos-mode-port** commands listed in Table 17.

Table 17: qos-mode-port Commands

Command	Backpressure	SAR Buffering	Scheduling
no qos-mode-port (default integrated mode)	VC and port	significant	SAR
qos-mode-port low-cdv	port	normal	SAR and HRR
qos-mode-port low-latency	port	minimal	HRR
qos-mode-port	port	minimal	HRR

NOTE: For ERX-7xx models, ERX-14xx models, and the ERX-310 router, the **qos-mode-port** commands are valid only for the major interface on port 0.

To properly integrate the schedulers, make sure that the HRR and the SAR schedulers shape packets at the same rate. If the HRR scheduler sends packets at a higher rate than the SAR scheduler shapes them, the SAR scheduler can become congested and block the entire port.

To manage the integration of the HRR and the SAR schedulers:

1. Specify the cell-based shaping mode.

   See *Configuring the QoS Shaping Mode for ATM Interfaces* on page 184.

2. Configure low-CDV QoS port mode to ensure that the HRR and SAR schedulers are configured at the same rate.

   See *Configuring Low-CDV Mode for Per-Port Queuing on ATM Interfaces* on page 180.

3. Configure the QoS application to control the SAR scheduler's operation. In this mode you configure both schedulers using scheduler profiles and QoS profiles. The E-series router then ensures that VPs and VCs are shaped to the same rates in both schedulers.

NOTE: You can also use the QoS cell mode application with QoS parameters to manage the integration of HRR and SAR schedulers.

Specifying the QoS cell mode application with the **qos-parameter-define** command enables you to configure a port with either frame or cell shaping mode and then configure the port for low-CDV port mode.

Related Topics

- For more information about scheduler profiles, see *Scheduler Hierarchy Overview* on page 47
- For more information about configuring QoS profiles, see *QoS Profile Overview* on page 133
- For more information about configuring QoS parameters, see *QoS Parameter Overview* on page 221

Per-Packet Queuing on the SAR Scheduler Overview

You can configure port queuing on the SAR scheduler, enabling per-packet rather than per-circuit scheduling. Port queuing mode allows you to use more of the facilities of the HRR scheduler, which are effectively disabled in default integrated mode, while at the same time making the SAR scheduler more transparent. In port queuing mode, you use the QoS application to configure the three levels of the HRR scheduler, including weighted round robin, traffic shaping, and strict priority scheduling.

You can configure the following modes:

- Default integrated mode—The ATM SAR scheduler does the scheduling. Both VC and port backpressure are enabled, and the HRR scheduler does minimal scheduling. The SAR scheduler performs significant buffering.

- Low-latency mode—The HRR scheduler does the scheduling. All QoS configurations are supported. VC backpressure is disabled, port backpressure is set as aggressive, and the SAR scheduler does minimal buffering. This mode enables the lowest latency for packets scheduled in the HRR scheduler with strict priority. Because the SAR scheduler is running with minimal buffering, there is no head-of-line blocking.

- Low-CDV mode—The HRR and SAR schedulers both perform scheduling; QoS synchronizes the rates of the two schedulers. All QoS configurations are supported. VC backpressure is disabled, and port backpressure is set to the default thresholds of 6 MB per OC3 port and 24 MB per OC12 port. In this mode, you can configure shaping in both the SAR scheduler and the HRR scheduler; low-cdv mode works with cell shaping mode only and enables relative weighted VCs and hierarchical shaping in the HRR scheduler. The SAR scheduler performs normal buffering and can shape either the VC or VP, but not both.

Operational QoS Shaping Mode for ATM Interfaces Overview

The E-series router enables you to shape ATM traffic based on either frames or cells. The default frame shaping mode provides compatibility with previous versions of the E-series software. When you use cell shaping mode to configure the shaping or policing rate, the resulting traffic stream conforms exactly to the policing rates configured in downstream ATM switches. Using cell shaping also reduces the number of packet drops in the ATM network.

ATM policing is sensitive to cell delay variation tolerance (CDVT). If the cells on a particular VC or VP arrive too closely spaced, an ATM switch might drop cells. However, the cell scheduler reduces CDVT by ensuring cell spacing. The router enables you to use techniques such as WRR on the HRR scheduler to achieve the proper packet scheduling. You use the SAR scheduler in series with the HRR scheduler to even out cell bursts into smoother per-VC and per-VP traffic profiles that bound CDVT. You accomplish this by using the **qos-shaping-mode cell** command to configure the QoS shaping mode, and the **qos-mode-port low-cdv** command to configure the port queuing mode.

The QoS shaping mode also determines how QoS statistics are reported. Frame shaping reports QoS statistics such as transmitted bytes and dropped bytes based on bytes within frames. Cell shaping reports the statistics in bytes within cells and also accounts for cell encapsulation and padding overhead.

ERX-7xx Models, ERX-14xx Models, and the ERX-310 Router

The ERX-7xx models, ERX-14xx models, and the ERX-310 router use an operational shaping mode that is based on the following two commands:

- The QoS shaping mode you set with the **qos-shaping-mode** command on port 0 and on the specific port
- The port queuing mode you set with the **qos-mode-port** command on port 0

The router uses the following rules to determine the operational shaping mode used for a port:

1. If the specific port has a QoS shaping mode configured, the operational shaping mode for that port is the same as the QoS shaping mode.
2. If the specific port has no QoS shaping mode configured, the operational shaping mode is the same as the QoS shaping mode for port 0, if one is configured.
3. If both the specific port and port 0 have no QoS shaping mode configured, the operational shaping mode is based on the port 0 queuing mode. If the port 0 queuing mode (set by the **qos-mode-port** command) is low-cdv, the operational shaping mode is cell; otherwise the operational shaping mode is frame.

Table 18 lists the possible combinations of the two commands and the resultant operational shaping mode.

Table 18: Operational Shaping Modes for ERX-7xx Models, ERX-14xx Models, and the ERX-310 Router

Rule	qos-shaping-mode for the Specific Port	qos-shaping-mode for Port 0	qos-mode-port for Port 0	Operational Shaping Mode for the Specific Port
Rule 1	Cell	Cell	low-cdv	Cell
	Frame	Frame	low-latency or none	Frame
Rule 2	No shaping mode	Cell	low-cdv	Cell
	No shaping mode	Frame	low-latency or none	Frame
Rule 3	No shaping mode	No shaping mode	low-cdv	Cell
	No shaping mode	No shaping mode	low-latency or none	Frame

E120 Router and E320 Router

The E120 router and the E320 router use an operational shaping mode that is based on the following two commands:

- The QoS shaping mode you set with the **qos-shaping-mode** command on port 0 and on the specific port
- The port queuing mode you set with the **qos-mode-port** command on port 0 and on the specific port

The E120 and E320 routers use the following rules to determine the operational shaping mode used for a port:

1. If the specific port has a QoS shaping mode configured, the operational shaping mode for that port is the same as the QoS shaping mode.

2. If the specific port has no QoS shaping mode and a port queuing mode of low-cdv configured, the operational shaping mode is cell.

3. If the specific port has no QoS shaping mode and no queuing mode configured, the operational shaping mode for that port is the same as the port 0 QoS shaping mode.

4. If both the specific port and port 0 have no QoS shaping mode configured, the operational shaping mode is based on the port 0 queuing mode. If the port 0 queuing mode (set by the **qos-mode-port** command) is low-cdv, the operational shaping mode is cell; otherwise the operational shaping mode is frame.

Table 19 lists the possible combinations of the two commands and the resultant operational shaping mode.

Table 19: Operational Shaping Modes for the E120 Router and E320 Router

Rule	qos-shaping-mode for specific port	qos-mode-port for Specific Port	qos-shaping-mode for Port 0	qos-mode-port for Port 0	Operational Shaping Mode for Specific Port
Rule 1	Cell	low-cdv	Any	Any	Cell
	Frame	low-latency or none	Any	Any	Frame
Rule 2	No shaping mode	low-cdv	Any	Any	Cell
Rule 3	No shaping mode	low-latency or none	Frame	Any	Frame
	No shaping mode	low-latency or none	Cell	Any	Cell
Rule 4	No shaping mode	low-latency or none	No shaping mode	low-cdv	Cell
	No shaping mode	low-latency or none	No shaping mode	low-latency or none	Frame

Related Topics

- Guidelines for Configuring QoS over ATM on page 174
- Configuring Default Integrated Mode for ATM Interfaces on page 176
- Configuring Low-Latency Mode for Per-Port Queuing on ATM Interfaces on page 178
- Configuring Low-CDV Mode for Per-Port Queuing on ATM Interfaces on page 180
- Configuring the QoS Shaping Mode for ATM Interfaces on page 184

Guidelines for Configuring QoS over ATM

This section provides general QoS configuration guidelines for ATM line modules. These guidelines are applicable to all JUNOSe releases.

The SAR scheduler generates VC backpressure as a way to control the flow of packets from the HRR scheduler to the SAR scheduler. The QoS port modes control integration of the two schedulers.

In default integrated mode, each VC queue in the SAR generates backpressure for the ATM VC node in the default traffic class group in the HRR. The backpressure throttles the dequeue rate of the ATM VC node and the nodes and queues stacked above it in the scheduler hierarchy. VC backpressure is disabled in low-latency QoS port mode and low-cdv QoS port mode.

You can configure queues in default integrated mode in the HRR that are immune to VC backpressure so that you can run voice and video applications. Queues and nodes in any named traffic class group are not subject to VC backpressure.

In addition, ATM VP and ATM (port level) queues are not stacked above ATM VC nodes, so queues are not subject to backpressure, regardless of the traffic class group.

Take care not to saturate SAR queues with too much traffic from the HRR, especially when shaping VP tunnels or VCs in the SAR. You can accomplish this in several ways:

NOTE: These rules apply only to the default integrated mode. VC backpressure is disabled in low-latency or low-cdv modes. You must account for cell tax; to do this, use the **qos-shaping-mode cell** command for the line module.

- Use external admission control to guarantee that the sum of non-backpressured traffic into the VC is less than the SAR shaping rate for the VC.
- Shape the non-backpressured queues or nodes in the HRR, making the aggregate of the non-backpressured traffic for a VC less than the VC rate.
- In JUNOSe Release 6.0 and later, you can configure a shared shaper on the ATM VC node in the default traffic class group. Configure the shared-shaping rate to be less than or equal to the VC shaping rate in the SAR.
- Special rules apply for VP tunnels shaped in the SAR. When shaping in the SAR, configure ATM VP nodes in the HRR, and arrange that the aggregate traffic dequeued from the HRR for that vp-tunnel is less than or equal to the VP tunnel shaping rate in the SAR.

  Use one of the following two techniques for VP tunnels shaped in the SAR:

  - Partition the SAR VP tunnel bandwidth across the ATM VP nodes in the different traffic class groups in the HRR. For example, using a 4 Mbps VP tunnel, allocate 1 Mbps for the ATM VP node in the default traffic class group, 2 Mbps for the ATM VP node in the video traffic class group, and 1 Mbps for the ATM VP node in the voice traffic class group.

    When using this technique, keep in mind that the different traffic classes cannot share bandwidth.

- In JUNOSe Release 6.1 and later, using the EFA2 ASIC, you can configure shared shaping on the ATM VP nodes in the HRR to perform bandwidth sharing.

Related Topics

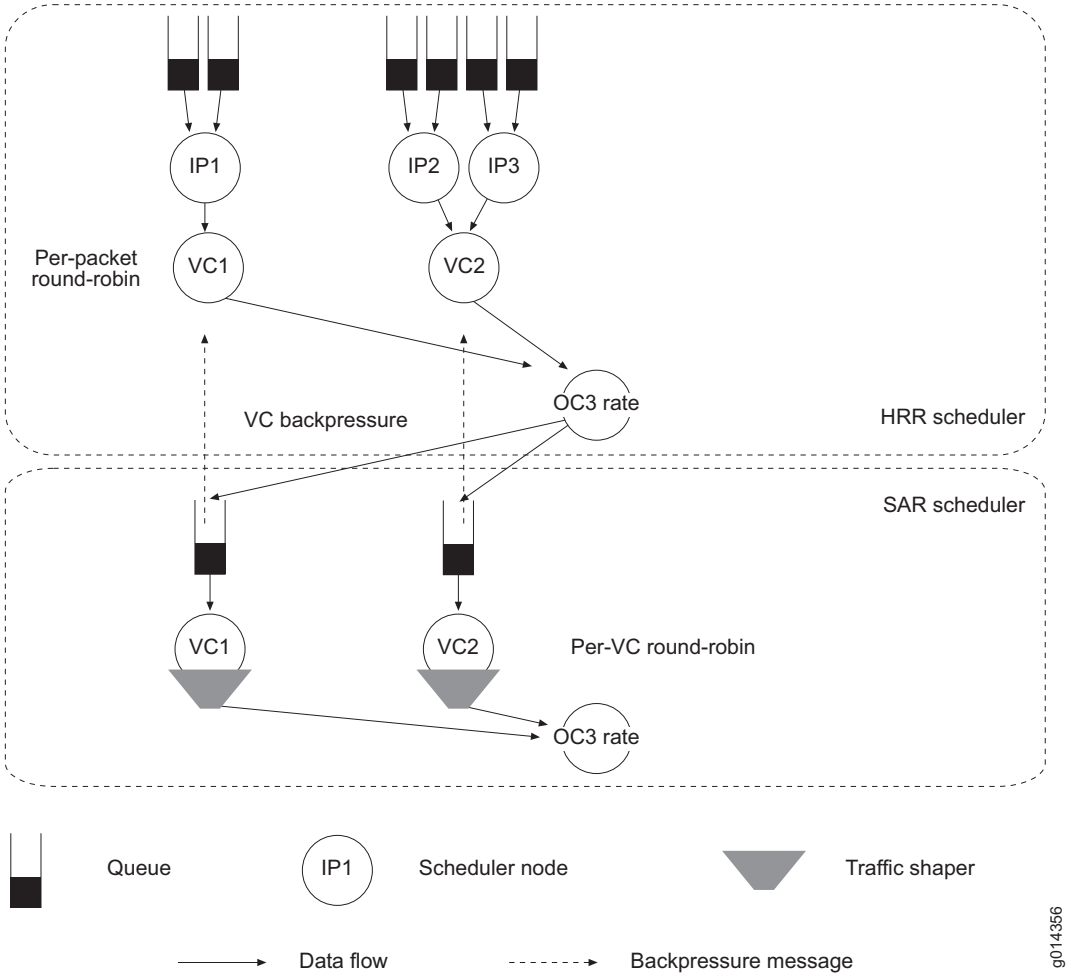
- Integrating the HRR Scheduler and SAR Scheduler on page 170
- Shared Shaping and Low-CDV Mode on page 77
- Configuring Default Integrated Mode for ATM Interfaces on page 176
- Configuring Low-Latency Mode for Per-Port Queuing on ATM Interfaces on page 178
- Configuring Low-CDV Mode for Per-Port Queuing on ATM Interfaces on page 180
- Configuring the QoS Shaping Mode for ATM Interfaces on page 184

Configuring Default Integrated Mode for ATM Interfaces

In the default integrated mode, the SAR scheduler is the dominant scheduler, and it backpressures the first-stage (HRR) scheduler per VC. Each VC buffers only a few hundred bytes.

Figure 44 shows the default integrated mode.

Figure 44: Default Integrated Mode



To configure default integrated mode:

1. From the desired port, set the QoS port mode to default integrated mode.

```
host1(config)#interface atm 2/0
host1(config-if)#no qos-mode-port
```

TIP: For ATM interfaces on ERX-7xx models, ERX-14xx models, and the ERX-310 router, you must specify port 0.

2. Specify the VP shaping rate.

   host1(config-if)#**atm vp-tunnel 0 2000**

TIP: Configuring an ATM VP tunnel sets a shaping rate in the SAR scheduler. Before configuring an ATM VP tunnel, there must be no PVCs with the same VPI that you are about to configure. Before using the **atm vp-tunnel** command, remove any PVCs from the configuration. You can reconfigure the PVCs after configuring the shapeless VP tunnel.

3. Specify the shaping rate for the ATM subinterface.

   host1(config-if)#**interface atm 2/0.5**
   host1(config-subif)#**atm-pvc 5 0 5 aal5snap 768**

Related Topics

- Per-Packet Queuing on the SAR Scheduler Overview on page 171
- Guidelines for Configuring QoS over ATM on page 174
- **atm vp-tunnel** command
- **interface atm** command
- **qos-mode-port** command

Configuring Low-Latency Mode for Per-Port Queuing on ATM Interfaces

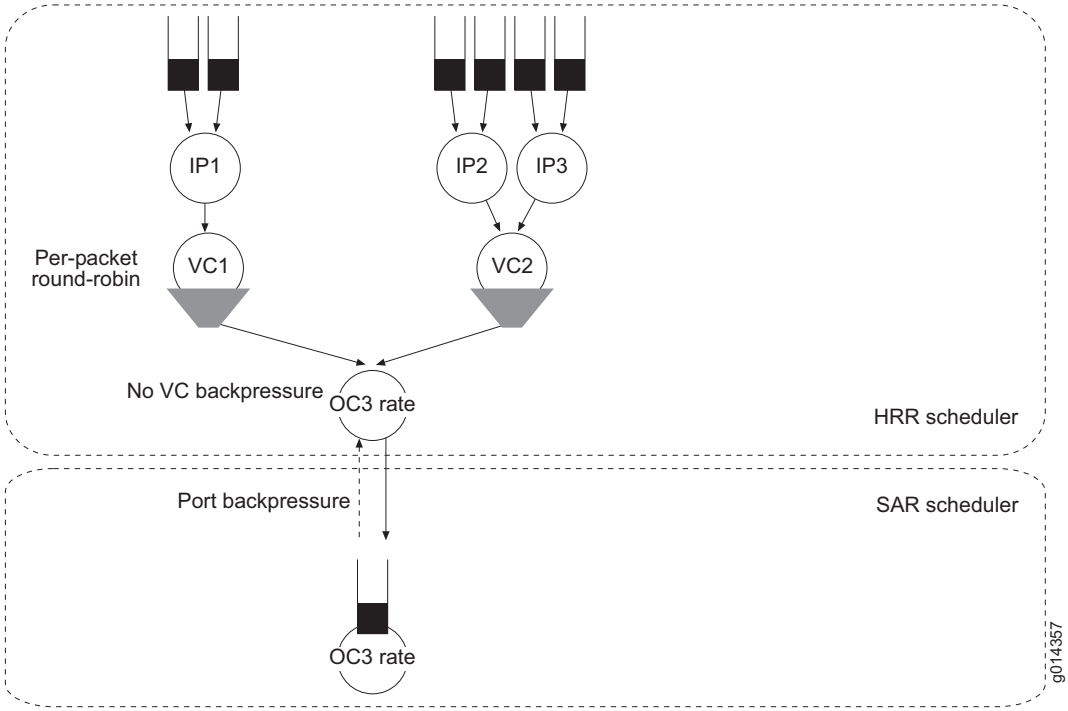
In low-latency mode, the SAR scheduler backpressures the HRR scheduler per physical port; each physical port buffers only a few kilobytes.

When you configure low-latency mode:

- VC backpressure is disabled.
- Port backpressure is enabled as aggressive.
- SAR scheduler performs minimal buffering.
- HRR scheduler is dominant.

This procedure creates the low-latency mode configuration shown in Figure 45 on page 179.

Figure 45: Low-Latency Mode



To configure low-latency mode with a strict-priority queue and a best-effort queue:

1. Configure the traffic class.

   host1(config)#**traffic-class strict**
   host1(config-traffic-class)#**exit**

2. Set the traffic class in the traffic-class group.

   host1(config)#**traffic-class-group strict**
   host1(config-traffic-class-group)#**traffic-class strict**
   host1(config-traffic-class-group)#**exit**

3. Define the scheduler profile for the traffic-class group.

   host1(config)#**scheduler-profile strict**
   host1(config-scheduler-profile)#**strict-priority**
   host1(config-scheduler-profile)#**exit**

4. Configure the QoS profile with two ATM VC queues.

```
host1(config)#qos-profile low-latency-q-p
host1(config-qos-profile)#atm-vc node
host1(config-qos-profile)#atm-vc queue traffic-class best-effort
host1(config-qos-profile)#atm group strict scheduler-profile strict
host1(config-qos-profile)#atm-vc queue traffic-class strict
host1(config-qos-profile)#exit
```

5. From the desired port, set the QoS port mode to low latency.

```
host1(config)#interface atm 2/0
host1(config-if)#qos-mode-port low-latency
host1(config-if)#qos-profile low-latency-q-p
```

TIP: For ATM interfaces on ERX-7xx models, ERX-14xx models, and the ERX-310 router, you must specify port 0.

The **qos-mode-port** command:

- Excludes non-UBR ATM QoS services on any VC on the ATM module; for example, PCR, nrtVBR, and CBR
- Cannot be used if shaping is currently configured on the SAR scheduler
- Cannot be used with ATM VP tunnels with nonzero rates; however, can be used with tunnels with rates of zero (shapeless tunnels).

Related Topics

- Per-Packet Queuing on the SAR Scheduler Overview on page 171
- Guidelines for Configuring QoS over ATM on page 174
- **interface atm** command
- **qos-mode-port** command
- **qos-profile** command

Configuring Low-CDV Mode for Per-Port Queuing on ATM Interfaces

In low-CDV mode, the HRR scheduler and the SAR scheduler operate in concert. In low-CDV QoS port mode, QoS automatically configures the shaping rate of the VPs, VCs, or both based on the QoS profile and the scheduler profile. Therefore, the QoS shaping mode must be set to the cell mode. In low-CDV mode, the SAR scheduler converts frame-atomic bursts of cells to CDVT-conformant streams of interleaved cells. There is no VC backpressure, and the port backpressure is loose, so several megabytes of cells can reside in the SAR buffer pool.

When you configure low-CDV mode:

- QoS synchronizes the shaping rates for VPs and VCs in the HRR and SAR schedulers.
- VC backpressure is disabled.
- Port backpressure is set to default thresholds of 6 MB per OC3 port and 24 MB per OC12 port.
- SAR scheduler performs more buffering than in low-latency mode.
- Use cell QoS shaping mode.

This procedure creates the low-CDV mode with per-VP CDVT configuration shown in Figure 46. Figure 47 shows low-CDV mode with per-VC CDVT.

Figure 46: Low-CDV Mode (per-VP CDVT)

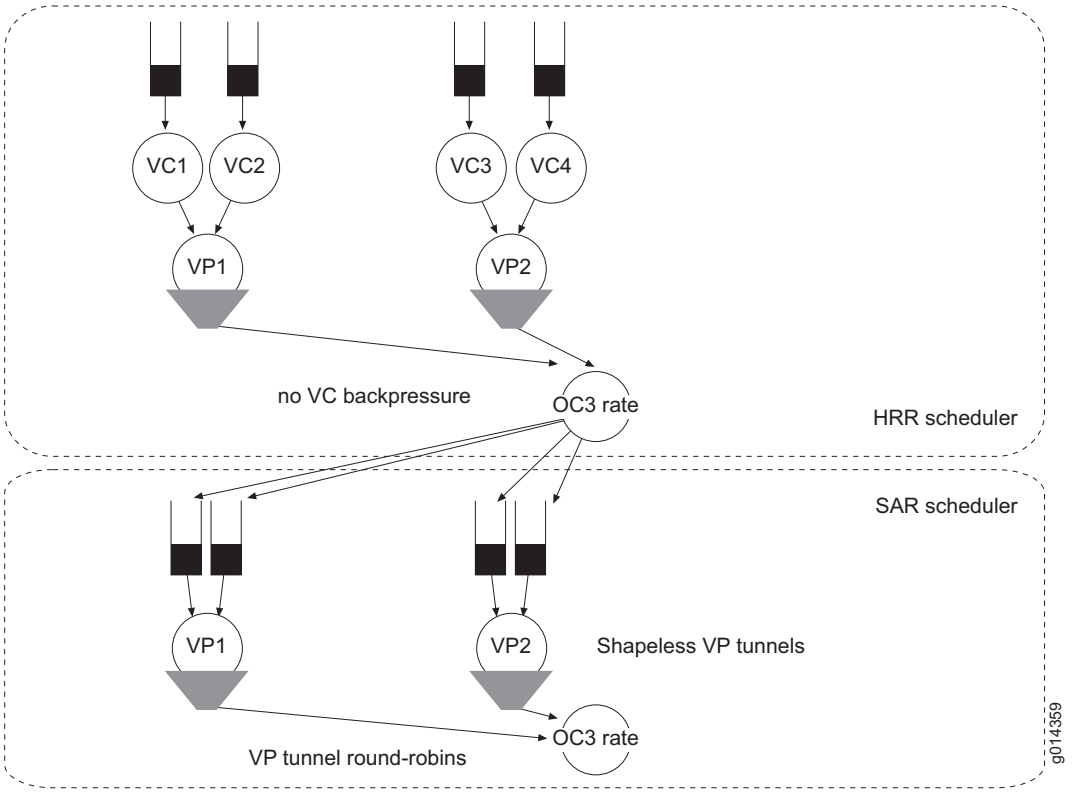
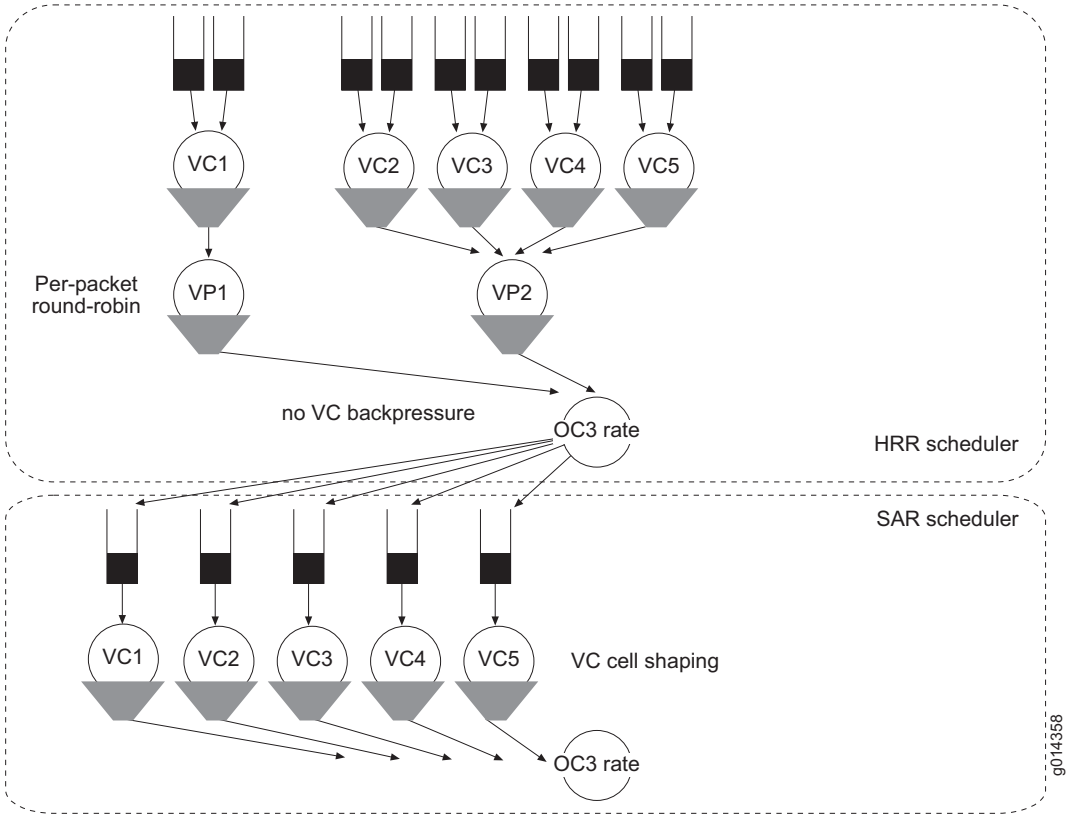


Figure 47: Low-CDV Mode (per-VC CDVT)



To configure low-CDV mode with a strict-priority queue and a best-effort queue:

1. Configure the traffic class.

   host1(config)#**traffic-class strict**
   host1(config-traffic-class)#**exit**

2. Set the traffic class in the traffic-class group.

   host1(config)#**traffic-class-group strict**
   host1(config-traffic-class-group)#**traffic-class strict**
   host1(config-traffic-class-group)#**exit**

3. Define the scheduler profiles for the traffic-class group.

   host1(config)#**scheduler-profile strict**
   host1(config-scheduler-profile)#**strict-priority**
   host1(config-scheduler-profile)#**exit**

   host1(config)#**scheduler-profile 500k**
   host1(config-scheduler-profile)#**shaping-rate 500000**
   host1(config-scheduler-profile)#**exit**

```
host1(config)#scheduler-profile 1m
host1(config-scheduler-profile)#shaping-rate 1000000
host1(config-scheduler-profile)#exit

host1(config)#scheduler-profile 2m
host1(config-scheduler-profile)#shaping-rate 2000000
host1(config-scheduler-profile)#exit
```

4. Configure per-VC CDVT by configuring QoS profile with ATM VC queues.

```
host1(config)#qos-profile low-cdv-q-p
host1(config-qos-profile)#atm-vc node scheduler-profile 1m
host1(config-qos-profile)#atm-vp node scheduler-profile 2m
host1(config-qos-profile)#atm-vc queue traffic-class best-effort
host1(config-qos-profile)#atm group strict scheduler-profile strict
host1(config-qos-profile)#atm-vc queue traffic-class strict scheduler-profile
500k
host1(config-qos-profile)#exit
```

5. Configure per-VP CDVT using shapeless VP tunnels that are used when the QoS application controls SAR scheduler shaping and set the QoS port mode to low CDV.

```
host1(config)#interface atm 2/0
host1(config-if)#atm vp-tunnel 0 0
host1(config-if)#atm vp-tunnel 1 0
host1(config-if)#qos-mode-port low-cdv
host1(config-if)#qos-profile low-cdv-q-p
host1(config-subif)#interface atm 2/0.5
host1(config-subif)#atm pvc 5 0 5 aal5snap
host1(config-subif)#interface atm 2/0.6
host1(config-subif)#atm pvc 6 0 6 aal5snap
host1(config-subif)#interface atm 2/0.7
host1(config-subif)#atm pvc 7 1 7 aal5snap
host1(config-subif)#interface atm 2/0.8
host1(config-subif)#atm pvc 8 1 8 aal5snap
```

TIP: For ATM interfaces on ERX-7xx models, ERX-14xx models, and the ERX-310 router, you must specify port 0.

Configuring an ATM VP tunnel sets a shaping rate in the SAR scheduler. Before configuring an ATM VP tunnel, there must be no PVCs with the same VPI that you are about to configure. Before using the **atm vp-tunnel** command, remove any PVCs from the configuration. You can reconfigure the PVCs after configuring the shapeless VP tunnel.

The **qos-mode-port** command:

- Excludes non-UBR ATM QoS services on any VC on the ATM module; for example, PCR, nrtVBR, and CBR
- Cannot be used if shaping is currently configured on the SAR scheduler
- Cannot be used with ATM VP tunnels with nonzero rates; however, can be used with tunnels with rates of zero (shapeless tunnels)

Related Topics

- Per-Packet Queuing on the SAR Scheduler Overview on page 171
- Guidelines for Configuring QoS over ATM on page 174
- **atm vp-tunnel** command
- **interface atm** command
- **qos-mode-port** command

Configuring the QoS Shaping Mode for ATM Interfaces

In frame mode, SAR shaping is controlled by the ATM application. Shaping is based on the number of bytes in the frame, without regard to cell encapsulation or padding overhead; this is the default mode.

In cell mode, SAR shaping is controlled by the QoS application. Shaping is based on the number of bytes in cells, and accounts for the ATM cell encapsulation and padding overhead.

To configure the operational shaping mode for ATM interfaces:

1. Configure the ATM interface.

   host1(config)#**interface atm 5/1**

   For ATM interfaces on ERX-7xx models, ERX-14xx models, and the ERX-310 router, you must use port 0.

2. Configure the shaping mode and specify either frame or cell.

   host1(config-if)#**qos-shaping-mode cell**

BEST PRACTICE: We recommend that you clear the statistics counters whenever you change the QoS shaping mode. Otherwise, the statistics contain a mixture of frame-based and cell-based values.

Related Topics

- Per-Packet Queuing on the SAR Scheduler Overview on page 171
- **interface atm** command
- **qos-mode-port** command
- **qos-shaping-mode** command

Disabling Per-Port Queuing on ATM Interfaces

You can remove per-port queuing on ATM interfaces and restore the default integrated mode setting.

When per-port queuing is disabled, both the VC and port backpressure are enabled. The SAR scheduler performs significant buffering, and the HRR scheduler does minimal scheduling. The **atm-vc node** command must appear in the QoS profile attached to the ATM port.

To disable per-port queuing:

1. Specify the ATM interface for which you want to disable per-port queuing.

   host1(config)#**interface atm 2/0**

2. Disable per-port queuing on that interface.

   host1(config-if)#**no qos-mode-port**

Related Topics

- Configuring Default Integrated Mode for ATM Interfaces on page 176
- **interface atm** command
- **qos-mode-port** command

Monitoring QoS Configurations for ATM

To monitor QoS configurations for ATM:

- Monitoring the QoS Configuration of ATM Interfaces on page 339
- Monitoring the QoS Configuration of IP Interfaces on page 341
- Monitoring the QoS Profiles Attached to an Interface on page 335
- Monitoring the Configuration of QoS Port-Type Profiles on page 337

- Monitoring the Configuration of QoS Profiles on page 337
- Monitoring the QoS Scheduler Hierarchy on page 322
- Monitoring Shared Shapers on page 327