

## Per-Packet Queuing on the SAR Scheduler Overview

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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.

## ERX7xx Models, ERX14xx Models, and the ERX310 Router

The ERX7xx models, ERX14xx models, and the ERX310 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 1 lists the possible combinations of the two commands and the resultant operational shaping mode.

**Table 1: Operational Shaping Modes for ERX7xx Models, ERX14xx Models, and the ERX310 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 2 lists the possible combinations of the two commands and the resultant operational shaping mode.

**Table 2: 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
  - Configuring Default Integrated Mode for ATM Interface
  - Configuring Low-Latency Mode for Per-Port Queuing on ATM Interfaces
  - Configuring Low-CDV Mode for Per-Port Queuing on ATM Interfaces
  - Configuring the QoS Shaping Mode for ATM Interfaces

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