Chapter 7

Configuring Rates and Weights in the Scheduler Hierarchy

This chapter provides information for configuring shaping rates, assured rates, and weights in the QoS scheduler hierarchy using scheduler profiles.

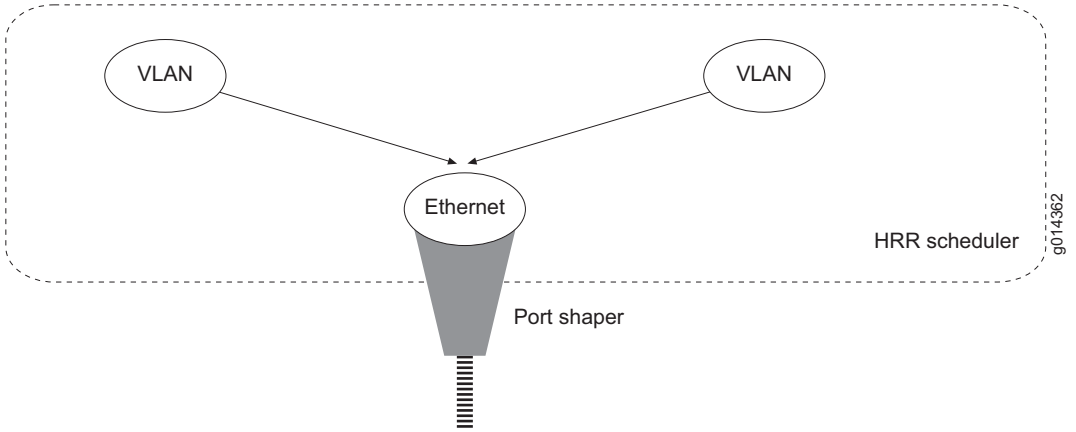
QoS topics are discussed in the following sections:

Rate Shaping and Port Shaping Overview

Rate shaping throttles the rate at which queues transmit packets. Rate shaping is TCP friendly; that is, it buffers packets that are above the rate, rather than dropping them.

Port shaping enables you to shape the aggregate traffic through a port or channel to a rate that is less than the line or port rate. With port shaping, you can configure scheduler nodes at the port level, as shown in Figure 9.

Figure 9: Port Shaping on an Ethernet Module



The per-port shaping feature provides the ability to shape the output of a port.

Related Topics

- Configuring Rate Shaping for a Scheduler Node or Queue on page 54
- Configuring Port Shaping on page 55

Configuring Rate Shaping for a Scheduler Node or Queue

The router supports 64,000 rate shapers per line module. Shaping rates are multiples of 1 Kbps.

To configure a shaping rate for a scheduler node or queue:

1. Create a scheduler profile.

   ```
   host1(config)#scheduler-profile video
   host1(config-scheduler-profile)#
   ```

2. Specify a shaping rate in the scheduler profile.

   ```
   host1(config-scheduler-profile)#shaping-rate 128000 burst 32767 milliseconds
   host1(config-scheduler-profile)#shaping-rate 5000 x 90
   ```

   The range for the shared-shaping rate is 1000–1000000000 bps (1 Kbps–1000 Kbps); the default is the minimum shaping rate (1 Kbps). The router rounds the rate to the next higher 8 Kbps.

   Use the *operator* and *operandValue* variables to configure a shaping rate with an expression.

   You can use the **bps** or **kbps** keywords to specify the unit of the shaping rate. By default, the shaping rate is configured in bps.

Use the **burst** keyword to specify the catch-up number associated with the shaper; the range is 0–522240. Specifying 0 enables the router to select an applicable default value.

Use the **milliseconds** or **bytes** keywords to specify the unit of the burst size.

Related Topics

- Rate Shaping and Port Shaping Overview on page 53
- Configuring a Scheduler Profile for a Scheduler Node or Queue on page 50
- **scheduler-profile** command
- **shaping-rate** command

Configuring Port Shaping

To configure port-shaping:

1. Configure the scheduler profile and the shaping rate.

   host1(config)#**scheduler-profile 80mbps**
   host1(config-scheduler-profile)#**shaping-rate 80000000**
   host1(config-scheduler-profile)#**exit**

2. Configure a QoS profile, specify the **node** command, and reference the scheduler-profile.

   host1(config)#**qos-profile 80mbps**
   host1(config-qos-profile)#**ethernet node scheduler-profile 80mbps**
   host1(config-qos-profile)#**exit**

3. Attach the QoS profile to the port.

   host1(config)#**interface fastethernet 2/0**
   host1(config-if)#**qos-profile 80mbps**

The sample configuration shapes Fast Ethernet port 2/0 to a rate no higher than 80 Mbps.

Using the following configuration, you can shape the corresponding HDLC channel down to 20 Mbps:

host1(config)#**scheduler-profile 20mbps**
host1(config-scheduler-profile)#**shaping-rate 20000000**
host1(config-scheduler-profile)#**exit**
host1(config)#**qos-profile 20mbps**
host1(config-qos-profile)#**serial node scheduler-profile 20mbps**
host1(config-qos-profile)#**exit**
host1(config)#**interface serial 2/0:1/1**
host1(config-if)#**qos-profile 20mbps**

Related Topics

- Rate Shaping and Port Shaping Overview on page 53
- Configuring a Scheduler Profile for a Scheduler Node or Queue on page 50
- For more information about specifying an expression that you can reference within a scheduler profile, see *Using Expressions for Bandwidth and Burst Values in a Scheduler Profile* on page 51
- **node** command
- **qos-profile** command
- **scheduler-profile** command
- **shaping-rate** command

Static and Hierarchical Assured Rate Overview

You can configure the effective weight of the scheduler node or queue by configuring a static assured rate or a hierarchical assured rate (HAR). The JUNOSe hierarchical assured rate (HAR) feature provides a more powerful and efficient method of configuring assured rates than static assured rates.

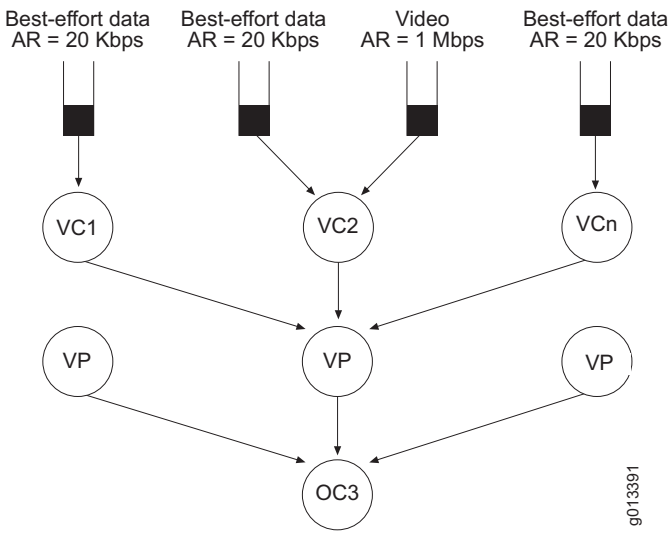
When you use static assured rates, a queue is guaranteed to receive its assured rate only when its parent node is configured with an assured rate that equals the sum of all its child assured rates. Therefore, to ensure that a queue receives its specified assured rate, you must frequently recalculate the assured rates on all parent nodes in the queue's hierarchy. This recalculation is necessary because of the number of scheduler nodes and queues that may be dynamically created or deleted through applications such as bandwidth-on-demand. Eventually, this complicated manual recalculation process becomes unreasonable and virtually impossible.

HAR replaces the manual recalculation process by directing the router to dynamically calculate the assured rate for a scheduler node based on the sum of the assured rates of all its child nodes and queues. For example, you might use HAR to increase the effective weight of an ATM-VC scheduler node when a video queue is created, and to later restore the effective rate of the node when the video queue is deleted.

HAR is applicable only to level 1 and level 2 scheduler nodes, and is not applicable to queues or ports. When you configure HAR, the changes take place immediately. When you disable HAR, the scheduler node's previous weight is restored.

Figure 10 shows an application of HAR for VC nodes. In the example, VCs, which are configured for HAR, are stacked over virtual path (VP) nodes. The VP nodes are in turn stacked over an OC-3 ATM port. Each VC has a best-effort data queue, which currently has an assured rate of 20 Kbps. The VCs share equal portions of their parent VP's bandwidth. However, when the video queue is added to VC2, HAR enables VC2's share of the VP bandwidth to increase in proportion to the 1-Mbps video queue that was created. The bandwidth of sibling VC nodes, which have only a data queue, is decreased in equal proportions.

Figure 10: Hierarchical Assured Rate



Related Topics

- Configuring an Assured Rate for a Scheduler Node or Queue on page 57
- Configuring the HRR Weight for a Scheduler Node or Queue on page 59

Configuring an Assured Rate for a Scheduler Node or Queue

You can configure the effective weight of the scheduler node or queue by configuring a static assured rate or a hierarchical assured rate (HAR). HAR dynamically adjusts the available bandwidth for a scheduler node based on the creation and deletion of other scheduler nodes.

By default, the HRR weight is configured for the scheduler profile. If the assured rate setting is other than none (the default), then the assured rate is used instead of the HRR weight setting for the scheduler node or queue.

Tasks to configure an assured rate are:

- Configuring a Static Assured Rate on page 58
- Configuring a Hierarchical Assured Rate on page 58
- Changing the Assured Rate to an HRR Weight on page 58

Configuring a Static Assured Rate

To configure a static assured rate:

1. Create a scheduler profile.

   host1(config)#**scheduler-profile static**
   host1(config-scheduler-profile)#

2. Specify a numeric rate with the **assured-rate** command in the scheduler profile.

   host1(config-scheduler-profile)#**assured-rate 56000**
   host1(config-scheduler-profile)#**assured-rate 50000 - 31000**

   For a static assured rate, specify the bits per second value in the range 25000–1000000000 bps (25 Kbps to 1 Gbps); the default is none (no assured rate).

   Use the *operator* and *operandValue* variables to configure an assured rate with an expression.

Configuring a Hierarchical Assured Rate

To specify that the HAR is used for scheduler nodes (HAR is not used for queues or ports):

1. Create a scheduler profile.

   host1(config)#**scheduler-profile har**
   host1(config-scheduler-profile)#

2. Specify the **hierarchical** keyword with the **assured-rate** command in the scheduler profile.

   host1(config-scheduler-profile)#**assured-rate hierarchical**

Changing the Assured Rate to an HRR Weight

To change an assured rate to an HRR weight:

1. Create a scheduler profile.

   host1(config)#**scheduler-profile static**
   host1(config-scheduler-profile)#

2. Delete the configured assured rate.

   host1(config-scheduler-profile)#**no assured-rate**

   The assured rate in the scheduler profile reverts to using the HRR weight specification.

Related Topics

- Static and Hierarchical Assured Rate Overview on page 56
- Configuring a Scheduler Profile for a Scheduler Node or Queue on page 50
- Configuring the HRR Weight for a Scheduler Node or Queue on page 59
- For more information about specifying an expression that you can reference within a scheduler profile, see *Using Expressions for Bandwidth and Burst Values in a Scheduler Profile* on page 51
- **assured-rate** command
- **scheduler-profile** command

Configuring the HRR Weight for a Scheduler Node or Queue

By default, the HRR weight is configured for the scheduler profile. You can set a specific HRR weight of the scheduler node or queue. The weight value is used when no assured rate is set.

To configure a static weight:

1. Create a scheduler profile.

   host1(config)#**scheduler-profile relative**
   host1(config-scheduler-profile)#

2. Specify the weight value.

   host1(config-scheduler-profile)#**weight 10**
   host1(config-scheduler-profile)#**weight 800 - 200**

   The weight value is in the range 0–4080. The default weight is 8. Weight 0 (zero) is a special weight that is used for relative strict-priority scheduling.

   Use the *operator* and *operandValue* variables to configure a weight with an expression.

Related Topics

- Static and Hierarchical Assured Rate Overview on page 56
- For more information about specifying an expression that you can reference within a scheduler profile, see *Using Expressions for Bandwidth and Burst Values in a Scheduler Profile* on page 51
- Relative Strict-Priority Scheduling Overview on page 62
- **scheduler-profile** command
- **weight** command