

## Chapter 25

# Configuring Hierarchical QoS Parameters

This chapter provides information for configuring hierarchical quality of service (QoS) parameters on E-series routers.

QoS parameters are discussed in the following sections:

- Hierarchical QoS Parameters Overview on page 255
- Guidelines for Configuring Hierarchical Parameters on page 256
- Configuring a Parameter Definition to Calculate Hierarchical Instances on page 257
- Example: QoS Parameter Configuration for Hierarchical Parameters on page 257

### Hierarchical QoS Parameters Overview

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You use hierarchical parameters in applications where you want the system to add instances associated with child interfaces and associate the sum with a parent interface. For example, to shape an S-VLAN to 50 percent of the sum of the shaping rates of the VLANs stacked above the S-VLAN, you specify *explicit* instances of the parameter associated with the VLANs, and the system creates an *implicit* instance of the parameter associated with the S-VLAN. The parameter maintains the value of the sum of the explicit instances.

The most common use of hierarchical parameters is in combination with the IP multicast bandwidth adjustment application.

For example, you create a hierarchical parameter that controls a VLAN. The hierarchical parameter has two explicit parameter instances on two IP interfaces, with values of 1 Mbps and 3 Mbps. Therefore, an implicit parameter instance is created at the VLAN interface with a value of 4 Mbps.

## Related Topics

- Configuring a Parameter Definition to Calculate Hierarchical Instances on page 257
- For information about the IP multicast bandwidth adjustment application, see *IP Multicast Bandwidth Adjustment for QoS Overview* on page 263

## Guidelines for Configuring Hierarchical Parameters

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Use the following guidelines when specifying a hierarchical parameter:

- You can specify only a subset of the instance-interface types that are supported for non-hierarchical parameters. The following output lists the instance-interface types that are supported:

```
host1(config)#qos-parameter-define hierarchical-parameter hierarchical
host1(config-qos-parameter-define)#instance-interface-type ?
  atm-vc      ATM Virtual Circuit (VC)
  ip          IP interface
  ipv6        IP version 6 interface
  l2tp-session L2tp session interface
  vlan        VLAN subinterface
```

- You can specify only one instance-interface type per hierarchical parameter. For example:

```
host1(config)#qos-parameter-define hierarchical-parameter hierarchical
host1(config-qos-parameter-define)#instance-interface-type ip
host1(config-qos-parameter-define)#instance-interface-type vlan
% only one instance-interface-type can be specified for a hierarchical parameter
```

- Hierarchical instance-interface types cannot stack above the *highest* controlled-interface type. For example:

```
host1(config)#qos-parameter-define hierarchical-parameter hierarchical
host1(config-qos-parameter-define)#controlled-interface-type ip
host1(config-qos-parameter-define)#instance-interface-type vlan
% hierarchical instance-interface-type vlan cannot stack above
controlled-interface-type ip
```

In contrast, a non-hierarchical instance-interface type cannot stack above the *lowest* controlled-interface type (vlan). For example:

```
host1(config)#qos-parameter-define non-hierarchical-parameter
host1(config-qos-parameter-define)#controlled-interface-type vlan
host1(config-qos-parameter-define)#instance-interface-type ip
% instance-interface-type ip cannot stack above the lowest controlled-interface-type
```

- You must specify a subscriber-interface type that is identical to the instance-interface type that you specified.

## Related Topics

- [Configuring a Parameter Definition to Calculate Hierarchical Instances on page 257](#)

## Configuring a Parameter Definition to Calculate Hierarchical Instances

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You can configure hierarchical parameters for applications where you want the system to add instances associated with child interfaces and associate the sum with a parent interface.

Hierarchical parameters have explicit instances that are associated with the logical interfaces of instance-interface types, as well as implicit instances that are associated with the logical interfaces of controlled-interface types. The system computes the values of an implicit instance as the sum of the values of the explicit instances stacked above the implicit instance.

To configure a hierarchical QoS parameter definition:

- Include the **hierarchical** keyword with the **qos-parameter-define** command.

```
host1(config)#qos-parameter-define max-subscriber-bandwidth
host1(config-qos-parameter-define)#
```

## Related Topics

- [Hierarchical QoS Parameters Overview on page 255](#)
- [Configuring a Basic Parameter Definition for QoS Administrators on page 232](#)
- [Configuring a Parameter Definition for IP Multicast Bandwidth Adjustment on page 265](#)
- [Example: QoS Parameter Configuration for Hierarchical Parameters on page 257](#)
- **qos-parameter-define** command

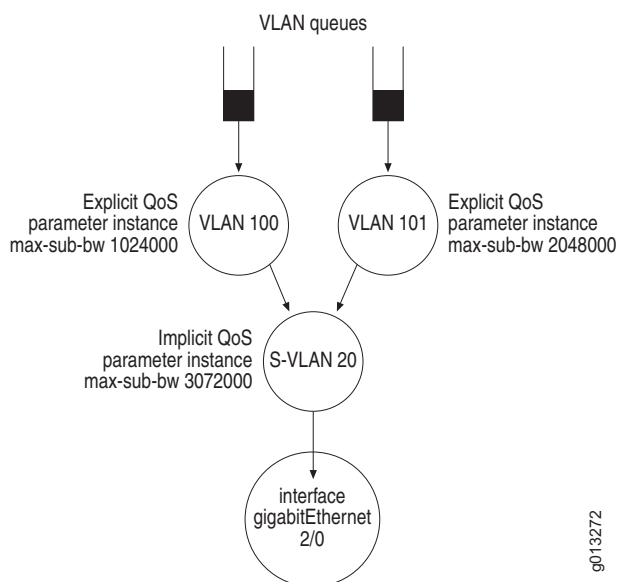
## Example: QoS Parameter Configuration for Hierarchical Parameters

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The example in this section illustrates how to configure hierarchical parameters for VLANs and S-VLANs.

Figure 60 on page 258 shows the QoS scheduler hierarchy that the QoS client creates for the VLANs and S-VLANs in the interface stack. The QoS client creates explicit parameter instances using the parameter definition max-sub-bw to shape rates at the VLAN subinterfaces 100 and 101.

An S-VLAN node is located below the two VLAN nodes in the interface stack. The QoS client creates an implicit parameter instance by applying a shaper to the S-VLAN subinterface 10 that equals the total rate at the VLANs (3072000).

**Figure 60: Hierarchical Parameters Scheduler Hierarchy**

### Procedure for QoS Administrators

This section describes the procedures to configure the scheduler hierarchy shown in Figure 60 by using QoS parameters.

#### Configuring the Parameter Definition

The QoS administrator configures the parameter definition for the maximum subscriber bandwidth.

To configure a parameter definition for the maximum subscriber bandwidth:

1. Configure the parameter definition named max-sub-bw.
2. Enable the parameter to control S-VLANs.
3. Enable the parameter to control VLANs.
4. Enable the parameter to have instances created on VLAN subinterfaces.
5. Specify that the QoS client can create the parameter instance for VLANs, which represent subscribers.

```
host1(config)#qos-parameter-define max-sub-bw hierarchical
host1(config-qos-parameter-define)#controlled-interface-type svlan
host1(config-qos-parameter-define)#controlled-interface-type vlan
host1(config-qos-parameter-define)#instance-interface-type vlan
host1(config-qos-parameter-define)#subscriber-interface-type vlan
host1(config-qos-parameter-define)#exit
```

**Configuring the Scheduler Profiles**

The QoS administrator can then reference the parameter definition within a scheduler profile, which defines the shaping rates for the parameter.

1. Configure a scheduler profile to shape the throughput the explicit QoS parameters for VLANs.
  - a. Configure the scheduler profile named sp-shape-cvlan.
  - b. Configure the shaping rate by referencing the parameter max-sub-bw.

```
host1(config)#scheduler-profile sp-shape-cvlan
host1(config-scheduler-profile)#shaping-rate max-sub-bw
host1(config-scheduler-profile)#exit
```

2. Configure a scheduler profile to shape the S-VLAN throughput.
  - a. Configure the scheduler profile named sp-shape-svlan.
  - b. Configure the shaping rate by referencing the parameter max-sub-bw.

```
host1(config)#scheduler-profile sp-shape-svlan
host1(config-scheduler-profile)#shaping-rate max-sub-bw
host1(config-scheduler-profile)#exit
```

**Configuring the QoS Profiles**

By referencing the scheduler profiles within QoS profiles, the QoS administrator creates the scheduler hierarchy. In this portion of the example, the QoS administrator configures QoS profiles for the VLAN and the S-VLAN.

1. Configure the QoS profile for the VLAN interfaces.
  - a. Configure the QoS profile named qp-shape-cvlan.
  - b. Configure the VLAN queue and reference the best-effort traffic class.
  - c. Configure the VLAN node and reference the scheduler profile for shaping VLANs.

```
host1(config)#qos-profile qp-shape-cvlan
host1(config-qos-profile)#vlan queue traffic-class best-effort
host1(config-qos-profile)#vlan node scheduler-profile sp-shape-cvlan
host1(config-qos-profile)#exit
```

2. Configure the QoS profile for the S-VLAN interface.
  - a. Configure the QoS profile named qp-shape-svlan.
  - b. Configure the S-VLAN node and reference the scheduler profile sp-shape-svlan.

```
host1(config)#qos-profile qp-shape-svlan
host1(config-qos-profile)#svlan node scheduler-profile sp-shape-svlan
host1(config-qos-profile)#exit
```

## Procedure for QoS Clients

This section describes procedures to create parameter instances at VLAN subinterface 100 and VLAN subinterface 101.

1. Create an explicit parameter instance at VLAN subinterface 100.
  - a. Specify the Gigabit Ethernet interface in slot 2, port 0.
  - b. Configure the VLAN major interface.
  - c. Configure the VLAN subinterface at slot 2, port 0, subinterface 100.
  - d. Assign an S-VLAN ID of 10 and a VLAN ID of 100 to the VLAN subinterface.
  - e. Attach the max-sub-bw QoS parameter to the subinterface with a value of 1024000.
  - f. Attach the qp-shape-cvlan QoS profile to the subinterface.

```
host1(config)#interface gigabitEthernet 2/0
host1(config-if)#encapsulation vlan
host1(config)#interface gigabitEthernet 2/0.100
host1(config-if)#svlan id 10 100
host1(config-if)#qos-parameter max-sub-bw 1024000
host1(config-if)#qos-profile qp-shape-cvlan
host1(config-if)#exit
```

2. Create an explicit parameter instance at VLAN subinterface 101.
  - a. Specify the VLAN subinterface 101 in slot 2, port 0.
  - b. Assign an S-VLAN ID of 10 and a VLAN ID of 101 to the VLAN subinterface.
  - c. Attach the max-sub-bw QoS parameter to the subinterface with a value of 2048000.
  - d. Attach the qp-shape-cvlan QoS profile to the subinterface.

```
host1(config-if)#interface gigabitEthernet 2/0.101
host1(config-if)#svlan id 10 101
host1(config-if)#qos-parameter max-sub-bw 2048000
host1(config-if)#qos-profile qp-shape-cvlan
host1(config-if)#exit
```

3. Create an implicit parameter instance at S-VLAN subinterface 10.
  - a. Specify the Gigabit Ethernet interface at slot 2, port 0.
  - b. Attach the qp-shape-svlan QoS profile to the node at S-VLAN subinterface 10.

```
host1(config)#interface gigabitEthernet 2/0
host1(config-if)#svlan 10 qos-profile qp-shape-svlan
```

### Monitoring Hierarchical QoS Parameters

After completing the configuration, both the QoS administrator and the QoS client can monitor it by issuing the **show qos-parameter references** command. To display the information about hierarchical parameter instances, you must specify the Gigabit Ethernet interface.

```
host1#show qos-parameter max-sub-bw references interface gigabitEthernet 2/0
```

interface	parameter name	value	instance Type
GigabitEthernet2/0	svlan	10	max-sub-bw
GigabitEthernet2/0.100	max-sub-bw	3072000	hierarchical
GigabitEthernet2/0.101	max-sub-bw	1024000	explicit
GigabitEthernet2/0.101	max-sub-bw	2048000	explicit

```
Explicit parameter instances:      2
Hierarchical parameter instances: 1
IP multicast parameter instances: 0
Parameter instances reported:     3
```

### Complete Configuration Example

You can use the complete configuration examples provided for each of the configurations in your own network. To customize the configuration example for your needs, copy the text into a text editor, and modify it.

To use the example for immediate use, copy it to the local console or Telnet session from which you access the router.

You can also save the example as a script (.scr) file that executes the commands as though they were entered at the terminal. For information about executing .scr files, see *JUNOS System Basics Configuration Guide, Chapter 2, Command-Line Interface*.

#### QoS Administrator Configuration

From Global Configuration mode:

```
! Configure the max-sub-bw QoS parameter definition.
qos-parameter-define max-sub-bw hierarchical
controlled-interface-type svlan
controlled-interface-type vlan
instance-interface-type vlan
subscriber-interface-type vlan
exit
! Configure the sp-shape-cvlan and sp-shape-svlan scheduler profiles.
scheduler-profile sp-shape-cvlan
shaping-rate max-sub-bw
exit
scheduler-profile sp-shape-svlan
shaping-rate max-sub-bw
exit
```

! Configure the qp-shape-cvlan and qp-shape-svlan QoS profiles.

```
qos-profile qp-shape-cvlan
vlan queue traffic-class best-effort
vlan node scheduler-profile sp-shape-cvlan
exit
qos-profile qp-shape-svlan
svlan node scheduler-profile sp-shape-svlan
exit
```

### **QoS Client Configuration**

From Global Configuration mode:

! Configure the QoS parameter max-sub-bw for VLAN subinterface 100.

```
interface gigabitEthernet 2/0
encapsulation vlan
interface gigabitEthernet 2/0.100
svlan id 10 100
qos-parameter max-sub-bw 1024000
qos-profile qp-shape-cvlan
exit
```

! Configure the QoS parameter max-sub-bw for VLAN subinterface 101.

```
interface gigabitEthernet 2/0.101
svlan id 10 101
qos-parameter max-sub-bw 2048000
qos-profile qp-shape-cvlan
```

! Attach the QoS profile to the S-VLAN subinterface 10.

```
interface gigabitEthernet 2/0
svlan 10 qos-profile qp-shape-svlan
```

### **Related Topics**

- Hierarchical QoS Parameters Overview on page 255