QoS - Hierarchical Queuing for Ethernet DSLAMs

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This feature module describes how to configure QoS hierarchical queuing policy maps on sessions and subinterfaces in Ethernet Digital Subscriber Line Access Multiplexer (E-DSLAM) applications on a Cisco 10000 series router. The QoS - Hierarchical Queuing for E-DSLAM feature supports IEEE 802.1 QinQ VLAN Tag Termination to configure inner Virtual LAN (VLAN) identifiers on E-DSLAMs.

Finding Feature Information in This Module
Your Cisco IOS software release may not support all of the features documented in this module. To reach links to specific feature documentation in this module and to see a list of the releases in which each feature is supported, use the “Feature Information for QoS - Hierarchical Queuing for Ethernet DSLAMs” section on page 16.

Finding Support Information for Platforms and Cisco IOS Software Images
Use Cisco Feature Navigator to find information about platform support and Cisco IOS software image support. Access Cisco Feature Navigator at http://www.cisco.com/go/fn. You must have an account on Cisco.com. If you do not have an account or have forgotten your username or password, click Cancel at the login dialog box and follow the instructions.

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Prerequisites for QoS - Hierarchical Queuing for Ethernet DSLAMs

- You must configure traffic classes using the `class-map` command.
- This feature requires a Performance Routing Engine 3 (PRE3).

Restrictions for QoS - Hierarchical Queuing for Ethernet DSLAMs

- Cisco IOS Release 12.2(31)SB2 does not include Modular QoS CLI (MQC) support for these session-based queuing policies:
  - IP sessions
  - Inner VLAN sessions
- This feature is not supported in combination with load balancing when a session service policy is routed to an L2TP tunnel. Do not configure load balancing on an L2TP tunnel if per-session queuing is enabled.

Information about QoS - Hierarchical Queuing for Ethernet DSLAMs

Traffic downstream from a Broadband Router Access Server (BRAS) requires different levels of Quality of Service (QoS) provisioning depending on the network architecture between the BRAS and subscriber. Figure 1 on page 3 shows multiple entities where QoS provisioning is required for different reasons.

The following examples are entities that may require different traffic shaping:
- A VLAN shaped to a certain aggregate traffic rate to limit the traffic to a group of subscribers (different 802.1Q interfaces in Figure 1).
- Individual sessions shaped with certain QoS services for different classes of traffic (individual PCs in Figure 1).

Different traffic shaping requirements result in QoS provisioning at multiple levels at the same time. The QoS - Hierarchical Queuing for E-DSLAM feature provides the ability to form one integrated queuing hierarchy that provides QoS provisioning at multiple levels with support for features such as bandwidth distribution at any of these levels.

The integrated queuing hierarchy is formed on the physical interface. When a service policy is instantiated on a session, the Subscriber Service Switch (SSS) infrastructure invokes the MQC and a common queuing control plane sets up and enables the queuing features.

Session-to-interface associations are resolved to determine the physical interface on which to form the integrated queuing hierarchy for all levels of QoS provisioning. As subinterface session-based policies are added, the respective queues are created and integrated into the queuing hierarchy.

When a subinterface is provisioned followed by session-based policy provisioning, the integrated queuing hierarchy is formed on top of the physical interface as a result of queuing policies provisioned at two different levels. When a session is provisioned before subinterface-based policy provisioning, the
The queuing hierarchy has a placeholder logical level between the physical queue and the session queue. The placeholder queue becomes the default queue at that level, and all other sessions are parented to that queue.

A PRE3 supports three hierarchical levels of scheduling: physical port, session, and class queues. When sessions are established within a subinterface configured with a shaping policy, the subinterface level is lowered to the physical layer.

**Figure 1 Ethernet DSL Access Network**

**Configuration Guidelines and Restrictions**

- An individual subscriber is always identified by a PPP or IP session. A group of subscribers is identified by a particular VLAN via outer tag ISP, E-DSLAM, or user-facing provider edge (U-PE).
- When a subinterface is used to aggregate a number of sessions with queuing policies, a queuing policy at a subinterface level must be a one-level policy map configured as class-default with only the shape feature.
- Do not oversubscribe sessions to ensure distributed bandwidth for sessions with configured shape rates.
Configuring QoS - Hierarchical Queuing for Ethernet DSLAMs

This section includes the following procedures:

- Configuring and Applying QoS - Hierarchical Queuing Policy Maps to Sessions, page 4
- Configuring and Applying QoS - Hierarchical Queuing Policy Maps to Subinterfaces, page 8
- Displaying Policy Map Information, page 10

Configuring and Applying QoS - Hierarchical Queuing Policy Maps to Sessions

Perform this task to configure and apply a QoS hierarchical queuing policy map to PPP/IP sessions through a virtual template.

SUMMARY STEPS

1. enable
2. configure terminal
3. policy-map policy-map-name
4. class class-map-name
5. (Optional) bandwidth {bandwidth-kbps|percent percentage | remaining percent percentage}
6. (Optional) precedence precedence min-threshold max-threshold mark-probability-denominator
7. (Optional) set cos cos-value
8. policy-map policy-map-name
9. class class-default
10. shape average cir [bc] [be]
11. bandwidth remaining ratio weight
12. service-policy policy-map-name
13. exit
14. exit
15. interface virtual-template number
16. service-policy output policy-map-name
### DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong> enable</td>
<td>Enables privileged EXEC mode.</td>
</tr>
<tr>
<td><strong>Example:</strong> Router&gt; enable</td>
<td>• Enter your password if prompted.</td>
</tr>
<tr>
<td><strong>Step 2</strong> configure terminal</td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong> Router# configure terminal</td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong> policy-map policy-map-name</td>
<td>Creates a child policy. Enters policy-map configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong> Router(config)# policy-map session_a_child</td>
<td>• policy-map-name—A maximum of 40 alphanumeric characters.</td>
</tr>
<tr>
<td><strong>Step 4</strong> class class-map-name</td>
<td>Configures the traffic class you specify. Enters policy-map class configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong> Router(config-pmap)# class voip</td>
<td>• class-map-name—Name of a previously configured class map.</td>
</tr>
<tr>
<td><strong>Step 5</strong> bandwidth {bandwidth-kbps</td>
<td>percent percentage</td>
</tr>
<tr>
<td><strong>Example:</strong> Router(config-pmap-c)# bandwidth 10000</td>
<td>• bandwidth-kbps—Specifies the minimum bandwidth allocated for a class belonging to a policy map. Valid values are from 8 to 2,488,320, which represents from 1 to 99 percent of the link bandwidth.</td>
</tr>
<tr>
<td></td>
<td>• percent percentage—Specifies the minimum percentage of the link bandwidth allocated for a class belonging to a policy map. Valid values are from 1 to 99.</td>
</tr>
<tr>
<td></td>
<td>• remaining percent percentage—Specifies the minimum percentage of unused link bandwidth allocated for a class belonging to a policy map. Valid values are from 1 to 99.</td>
</tr>
<tr>
<td>Command or Action</td>
<td>Purpose</td>
</tr>
<tr>
<td>--------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Step 6</strong></td>
<td>(Optional) Configures a precedence level for the traffic class.</td>
</tr>
<tr>
<td><code>precedence precedence min-threshold max-threshold mark-probability-denominator</code></td>
<td>• <code>precedence</code>—Specifies the IP precedence number. Valid values are from 0 to 7.</td>
</tr>
<tr>
<td></td>
<td>• <code>min-threshold</code>— Specifies the minimum threshold in number of packets. Valid values are from 1 to 4096.</td>
</tr>
<tr>
<td></td>
<td>• <code>max-threshold</code>— Specifies the maximum threshold in number of packets. Valid values are from the minimum threshold to 4096.</td>
</tr>
<tr>
<td></td>
<td>• <code>mark-probability-denominator</code>— Specifies the denominator for the fraction of packets dropped when the average queue depth is equal to the maximum threshold. For example, if the denominator is 512, 1 out of every 512 packets is dropped when the average queue depth is at the maximum threshold. Valid values are from 1 to 65536. The default value is 10 (1 out of every 10 packets is dropped at the maximum threshold).</td>
</tr>
<tr>
<td><strong>Step 7</strong></td>
<td>(Optional) Sets the Layer 2 class of service (CoS) value of an outgoing packet.</td>
</tr>
<tr>
<td><code>set cos cos-value</code></td>
<td>• <code>cos-value</code>— Specifies an IEEE 802.1Q CoS value from 0 to 7.</td>
</tr>
<tr>
<td><strong>Step 8</strong></td>
<td>Creates a parent policy. Enters policy-map configuration mode.</td>
</tr>
<tr>
<td><code>policy-map policy-map-name</code></td>
<td>• <code>policy-map-name</code>— A maximum of 40 alphanumeric characters.</td>
</tr>
<tr>
<td><strong>Step 9</strong></td>
<td>Configures the traffic class as class-default. Do not configure any other traffic class.</td>
</tr>
<tr>
<td><code>class class-default</code></td>
<td></td>
</tr>
<tr>
<td><strong>Step 10</strong></td>
<td>Specifies average or peak rate traffic shaping for all traffic that does not match any other traffic class.</td>
</tr>
<tr>
<td><code>shape average cir [bc] [be]</code></td>
<td>• <code>average</code>— Average rate shaping.</td>
</tr>
<tr>
<td></td>
<td>• <code>cir</code>— Committed information rate (CIR), in bits per second (bps).</td>
</tr>
<tr>
<td></td>
<td>• <code>bc</code>— (Optional) Committed Burst size, in bits.</td>
</tr>
<tr>
<td></td>
<td>• <code>be</code>— (Optional) Excess Burst size, in bits.</td>
</tr>
</tbody>
</table>

**Example:**
- **Step 6**
  ```
  Router(config-pmap-c)# precedence 0 32 256 100
  ```
- **Step 7**
  ```
  Router(config-pmap)# set cos 1
  ```
- **Step 8**
  ```
  Router(config-pmap)# policy-map session_a_parent
  ```
- **Step 9**
  ```
  Router(config-pmap)# class class-default
  ```
- **Step 10**
  ```
  Router(config-pmap-c)# shape average 10000000
  ```
### Configuring QoS - Hierarchical Queuing for Ethernet DSLAMs

**Step 11**

**Command or Action:**
```
bandwidth remaining ratio weight
```

**Example:**
```
Router(config-pmap-c)# bandwidth remaining ratio 10
```

**Purpose:**
- Specifies the weight for the subinterface.
  - **weight**—Specifies the relative weight of the subinterface with respect to other subinterfaces, during periods of congestion.

**Step 12**

**Command or Action:**
```
service-policy policy-map-name
```

**Example:**
```
Router(config-pmap-c)# service-policy session_a_child
```

**Purpose:**
- Applies the child policy to the parent class-default class.
  - **policy-map-name**—Specifies the name of a previously configured child policy.

**Step 13**

**Command or Action:**
```
exit
```

**Example:**
```
Router(config-pmap-c)# exit
```

**Purpose:**
- Exits policy-map class configuration mode.

**Step 14**

**Command or Action:**
```
exit
```

**Example:**
```
Router(config-pmap)# exit
```

**Purpose:**
- Exits policy-map configuration mode.

**Step 15**

**Command or Action:**
```
interface virtual-template number
```

**Example:**
```
Router(config)# interface virtual-template 1
```

**Purpose:**
- Creates a virtual template. Enters interface configuration mode.
  - **number**—Identifies the virtual template. Valid range is from 1 to 200.

**Step 16**

**Command or Action:**
```
service-policy output policy-map-name
```

**Example:**
```
Router(config-if)# service-policy output session_a_parent
```

**Purpose:**
- Applies the service policy to the virtual interface.
  - **policy-map-name**—Specifies the name of the previously configured parent policy.

**Note**
- You must specify the **output** keyword to apply the service policy to outbound traffic on the interface.

### Example

```
Router> enable
Router# configure terminal
Router(config)# policy-map session_a_child
Router(config-pmap)# class voip
Router(config-pmap-c)# police 1000000
Router(config-pmap-c)# priority level 1
Router(config-pmap-c)# class video
Router(config-pmap-c)# police 1000000
Router(config-pmap-c)# priority level 2
Router(config-pmap-c)# class precedence_0
Router(config-pmap-c)# bandwidth remaining ratio 10
Router(config-pmap-c)# class precedence_1
Router(config-pmap-c)# bandwidth remaining ratio 20
Router(config-pmap-c)# policy-map session_a_parent
Router(config-pmap)# class class-default
Router(config-pmap-c)# shape average 10000000
Router(config-pmap-c)# bandwidth remaining ratio 10
Router(config-pmap-c)# service-policy session_a_child
Router(config-pmap-c)# exit
Router(config-pmap-c)# exit
```
Router(config)# interface virtual-template 20
Router(config-if)# service-policy output session_a_parent
Router(config-if)# end

Configuring and Applying QoS - Hierarchical Queuing Policy Maps to Subinterfaces

Perform this task to configure and apply a QoS hierarchical queuing policy map to a subinterface. This provides aggregate shaping for a large number of subscribers.

Note

When a subinterface is used to aggregate a number of sessions with queuing policies, a queuing policy at a subinterface level must be a one-level policy map configured as class-default with only the shape feature.

SUMMARY STEPS

1. enable
2. configure terminal
3. policy-map policy-map-name
4. class class-default
5. shape average cir [bc] [be]
6. exit
7. exit
8. interface type slot/subslot/port.subinterface
9. encapsulation dot1q outer-vlan-id second-dot1q inner-vlan-id
10. service-policy output policy-map-name
## Detailed Steps

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
</table>
| **Step 1** enable | Enables privileged EXEC mode.  
  • Enter your password if prompted. |
| **Example:** Router> enable | |
| **Step 2** configure terminal | Enters global configuration mode. |
| **Example:** Router# configure terminal | |
| **Step 3** policy-map policy-map-name | Creates the policy map. Enters policy-map configuration mode.  
  • `policy-map-name`—A maximum of 40 alphanumeric characters. |
| **Example:** Router(config)# policy-map subint_1 | |
| **Step 4** class class-default | Configures the traffic class as `class-default`. Do not configure any other traffic class. |
| **Example:** Router(config-pmap)# class class-default | |
| **Step 5** shape average cir [bc] [be] | Specifies average or peak rate traffic shaping for all of the traffic that does not match any other traffic class.  
  • `average`—Average rate shaping.  
  • `cir`—Committed information rate (CIR), in bits per second (bps).  
  • `bc`—(Optional) Committed Burst size, in bits.  
  • `be`—(Optional) Excess Burst size, in bits. |
| **Example:** Router(config-pmap-c)# shape average 10000000 | |
| **Step 6** exit | Exits policy-map class configuration mode. |
| **Example:** Router(config-pmap-c)# exit | |
| **Step 7** exit | Exits policy-map configuration mode. |
| **Example:** Router(config-pmap)# exit | |
| **Step 8** interface type slot/subslot/port.subinterface | Specifies the subinterface on which you are attaching the policy map. Enters subinterface configuration mode. |
| **Example:** Router(config)# interface g3/1/1.1 | |
Configuring QoS - Hierarchical Queuing for Ethernet DSLAMs

**Step 9**

```
Router> enable
Router# configure terminal
Router(config-pmap-c)# policy-map subint_1
Router(config-pmap-c)# class class-default
Router(config-pmap-c)# shape average 1000000
Router(config-pmap-c)# exit
Router(config-pmap)# exit
```

**Command or Action**
encapsulation dot1q outer-vlan-id
[second-dot1q inner-vlan-id]

**Purpose**
Enables IEEE 802.1Q encapsulation of traffic on the subinterface.

The *second-dot1q* keyword supports the IEEE 802.1 QinQ VLAN Tag Termination feature to configure an inner VLAN ID.

- *outer-vlan-id*—The outer VLAN identifier. The range is from 1 to 4095.
- *inner-vlan-id*—The inner VLAN identifier. The range is from 1 to 4095.

**Step 10**

```
Router(config-subif)# encapsulation dot1q 100
```

**Command or Action**
Service-policy output policy-map-name

**Purpose**
Attaches the service policy to the subinterface.

- *policy-map-name*—Specifies the name of the previously configured policy map.

**Example**
```
Router> enable
Router# configure terminal
Router(config-pmap-c)# policy-map subint_1
Router(config-pmap-c)# class class-default
Router(config-pmap-c)# shape average 1000000
Router(config-pmap-c)# exit
Router(config-pmap)# exit
Router(config)# interface g3/1/1
Router(config-subif)# encapsulation dot1q 100 second-dot1q 10
Router(config-subif)# service-policy output subint_1
Router(config-subif)# end
```

**Displaying Policy Map Information**

**Table 1** lists the *show* commands to display policy map information.

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>show policy-map</td>
<td>Configuration of all classes for a specified service policy or all classes for all existing policy maps.</td>
</tr>
<tr>
<td>show policy-map session</td>
<td>Policy maps in effect for subscriber sessions.</td>
</tr>
<tr>
<td>show policy-map subinterface</td>
<td>Statistics for policy maps enabled on a subinterface.</td>
</tr>
</tbody>
</table>

**Example**

```
Router> enable
Router# configure terminal
Router(config-pmap-c)# policy-map subint_1
Router(config-pmap-c)# class class-default
Router(config-pmap-c)# shape average 1000000
Router(config-pmap-c)# exit
Router(config-pmap)# exit
Router(config)# interface g3/1/1
Router(config-subif)# encapsulation dot1q 100 second-dot1q 10
Router(config-subif)# service-policy output subint_1
Router(config-subif)# end
```
Configuration Examples for QoS - Hierarchical Queuing for E-DSLAMs

This section provides the following configuration examples:

- Configuring QoS - Hierarchical Queuing Policy Maps on VLANs or QinQ Subinterfaces: Example
- Configuring QoS - Hierarchical Queuing Policy Maps on VLANs with Arbitrary QinQ: Example
- Configuring QoS - Hierarchical Queuing Policy Maps on Sessions: Example
- Configuring QoS - Hierarchical Queuing Policy Maps on Sessions with Aggregate Shaping: Example

Configuring QoS - Hierarchical Queuing Policy Maps on VLANs or QinQ Subinterfaces: Example

The following example shows how to configure and apply QoS hierarchical queuing policy maps on VLANs or QinQ subinterfaces. A child queuing policy is applied to each parent subscriber line level policy. In this example, the policy maps are applied to create subscriber groups on subinterfaces.

Router> enable
Router# configure terminal
Router(config)# policy-map service_a_out
Router(config-pmap)# class voip
Router(config-pmap-c)# priority
Router(config-pmap-c)# police percent 20 bc 300 ms pir 40
Router(config-pmap-c)# set cos 1
Router(config-pmap-c)# class video
Router(config-pmap-c)# police percent 20 bc 300 ms pir 40
Router(config-pmap-c)# set cos 2
Router(config-pmap-c)# class gaming
Router(config-pmap-c)# bandwidth remaining percent 80
Router(config-pmap-c)# set cos 3
Router(config-pmap-c)# class class-default
Router(config-pmap-c)# bandwidth remaining percent 20
Router(config-pmap-c)# set cos 4
!
Router(config-pmap-c)# policy-map service_z_out
Router(config-pmap)# policy-map rate_1_service_a_in
Router(config-pmap)# class voip
Router(config-pmap-c)# police percent 25 4 ms 1 ms
Router(config-pmap-c)# class gaming
Router(config-pmap-c)# police percent 50 2 ms 1 ms
Router(config-pmap-c)# class class-default
Router(config-pmap-c)# police percent 20 bc 300 ms pir 40
Router(config-pmap-c)# policy-map rate_x_service_z_in
Router(config-pmap)# policy-map rate_1_service_a_out
Router(config-pmap)# class class-default
Router(config-pmap-c)# bandwidth remaining ratio 10
Router(config-pmap-c)# shape average 100000
Router(config-pmap-c)# service policy service_a_out
Router(config-pmap-c)# policy-map rate_x_service_z_out
Router(config-pmap)# class class-default
Router(config-pmap-c)# bandwidth remaining ratio 10
Router(config-pmap-c)# shape average 100000
Router(config-pmap-c)# service policy service_z_out
Router(config-pmap-c)# exit
Router(config-pmap)# exit
Configuration Examples for QoS - Hierarchical Queuing for E-DSLAMs

QoS - Hierarchical Queuing for Ethernet DSLAMs

! Router(config)# interface GigabitEthernet1/0/0.1
Router(config-subif)# encapsulation dot1q 5 second dot1q 20
Router(config-subif)# service-policy output rate_1_service_a_out
Router(config-subif)# service-policy input rate_1_service_a_in
Router(config-if)# exit
Router(config)# interface GigabitEthernet1/0/0.2
Router(config-subif)# encapsulation dot1q 5 second dot1q 25
Router(config-subif)# service-policy output rate_x_service_z_out
Router(config-subif)# service-policy input rate_x_service_z_in
Router(config-if)# end

Configuring QoS - Hierarchical Queuing Policy Maps on VLANs with Arbitrary QinQ: Example

The following example shows how to configure and apply QoS hierarchical queuing policy maps on VLANs with subscriber lines grouped by arbitrary QinQ. A child queuing policy is applied to each parent subscriber line level policy. This example includes configuration of four class maps.

Router# enable
Router# configure terminal
Router(config)# class-map match-all user_1
Router(config-cmap)# match vlan 10
Router(config-cmap)# class-map match-all user_2
Router(config-cmap)# match vlan 11
Router(config-cmap)# class-map match-all user_3
Router(config-cmap)# match vlan 10
Router(config-cmap)# class-map match-any user_4
Router(config-cmap)# match vlan 11
Router(config-cmap)# class-map match-all user_n
Router(config-cmap)# class-map match-any isp_A
Router(config-cmap)# match class user_1
Router(config-cmap)# match class user_2
Router(config-cmap)# class-map match-any isp_Z
Router(config-cmap)# match class user_3
Router(config-cmap)# match class user_4
Router(config-cmap)# exit
!
Router(config)# policy-map service_a_out
Router(config-pmap)# class voip
Router(config-pmap-c)# priority
Router(config-pmap-c)# police cir percent 20 bc 300 ms pir 40
Router(config-pmap-c)# set cos 1
Router(config-pmap-c)# class video
Router(config-pmap-c)# police cir percent 20 bc 300 ms pir 40
Router(config-pmap-c)# set cos 2
Router(config-pmap-c)# class gaming
Router(config-pmap-c)# bandwidth remaining percent 80
Router(config-pmap-c)# set cos 3
Router(config-pmap-c)# class class-default
Router(config-pmap-c)# bandwidth remaining percent 20
Router(config-pmap-c)# set cos 4
!
Router(config-pmap-c)# policy-map service_z_out
Router(config-pmap)# policy-map service_a_in
Router(config-pmap)# class voip
Router(config-pmap-c)# police percent 25 4 ms 1 ms
Router(config-pmap-c)# class gaming
Router(config-pmap-c)# police percent 50 2 ms 1 ms
Router(config-pmap-c)# class class-default
Router(config-pmap-c)# police cir percent 20 bc 300 ms pir 40

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The following example shows how to configure and apply QoS hierarchical queuing policy maps on sessions. A child queuing policy is applied to each parent subscriber line level policy.

```
Router> enable
Router# configure terminal
Router(config)# policy-map service_a_out
Router(config-pmap)# class voip
Router(config-pmap-c)# priority
Router(config-pmap-c)# set cos 1
Router(config-pmap-c)# class video
Router(config-pmap-c)# set cos 2
Router(config-pmap-c)# class gaming
Router(config-pmap-c)# bandwidth remaining percent 80
Router(config-pmap-c)# set cos 3
Router(config-pmap-c)# class class-default
Router(config-pmap-c)# bandwidth remaining percent 20
Router(config-pmap-c)# set cos 4
!
Router(config-pmap-c)# policy-map service_z_out
Router(config-pmap)# policy-map rate_1_service_a_out
Router(config-pmap)# class class-default
Router(config-pmap-c)# bandwidth remaining ratio 10
```
Configuring QoS - Hierarchical Queuing Policy Maps on Sessions with Aggregate Shaping: Example

The following example shows how to configure and apply QoS hierarchical queuing policy maps on sessions with multiple PPP/IP sessions per subscriber line. In this example, the same policies are applied to all sessions using the same virtual interface.

Router> enable
Router# configure terminal
Router(config)# policy-map service_a_out
Router(config-pmap)# class voip
Router(config-pmap-c)# priority
Router(config-pmap-c)# policy percent 25 4 ms 1 ms
Router(config-pmap-c)# set cos 1
Router(config-pmap-c)# class video
Router(config-pmap-c)# policy percent 30 5 ms 1 ms
Router(config-pmap-c)# set cos 2
Router(config-pmap-c)# class class-default
Router(config-pmap-c)# bandwidth remaining percent 20
Router(config-pmap-c)# set cos 3

Router(config-pmap-c)# policy-map service_z_out
Router(config-pmap-c)# policy-map rate_1_service_a_in
Router(config-pmap-c)# class voip
Router(config-pmap-c)# policy percent 25 4 ms 1 ms
QoS - Hierarchical Queuing for Ethernet DSLAMs

Router(config-pmap-c)# class video
Router(config-pmap-c)# police percent 30 2 ms 1 ms
Router(config-pmap-c)# class class-default
Router(config-pmap-c)# police percent 40 2 ms 1 ms
Router(config-pmap-c)# policy-map rate_x_service_z_in
Router(config-pmap-c)# policy-map rate_l_service_a_out
Router(config-pmap-c)# class class-default
Router(config-pmap-c)# bandwidth remaining ratio 10
Router(config-pmap-c)# shape average 100000
Router(config-pmap-c)# service policy service_a_out
Router(config-pmap-c)# policy-map rate_x_service_z_out
Router(config-pmap-c)# class class-default
Router(config-pmap-c)# bandwidth remaining ratio 10
Router(config-pmap-c)# shape average 100000
Router(config-pmap-c)# service policy service_z_out
Router(config-pmap-c)# exit
Router(config-pmap-c)# exit
Router(config)# interface GigabitEthernet1/0/0
Router(config-if)# encapsulation dot1q 1
Router(config-if)# service-policy output isp_A_out
Router(config-if)# exit
Router(config)# interface GigabitEthernet2/0/0
Router(config-if)# encapsulation dot1q 2
Router(config-if)# service-policy output isp_Z_out
Router(config-if)# end

Additional References

The following sections provide references related to the QoS - Hierarchical Queuing for E-DSLAM feature.

Related Documents

<table>
<thead>
<tr>
<th>Related Topic</th>
<th>Document Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>QoS provisioning and traffic shaping</td>
<td>Cisco 10000 Series Router Quality of Service Configuration Guide</td>
</tr>
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Standards

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<tr>
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<th>Title</th>
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<tr>
<td>No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature.</td>
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MIBs

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<tr>
<th>MIB</th>
<th>MIBs Link</th>
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</thead>
<tbody>
<tr>
<td>No new or modified MIBs are supported by this feature, and support for existing MIBs has not been modified by this feature.</td>
<td>To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: <a href="http://www.cisco.com/go/mibs">http://www.cisco.com/go/mibs</a></td>
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RFCs

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<th>Title</th>
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Technical Assistance

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<tr>
<th>Description</th>
<th>Link</th>
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<tr>
<td>The Cisco Technical Support &amp; Documentation website contains thousands of pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content.</td>
<td><a href="http://www.cisco.com/techsupport">http://www.cisco.com/techsupport</a></td>
</tr>
</tbody>
</table>

Command Reference

This feature uses no new or modified commands.

Feature Information for QoS - Hierarchical Queuing for Ethernet DSLAMs

Table 2 lists the release history for this feature.

Not all commands may be available in your Cisco IOS software release. For release information about a specific command, see the command reference documentation.

Cisco IOS software images are specific to a Cisco IOS software release, a feature set, and a platform. Use Cisco Feature Navigator to find information about platform support and Cisco IOS software image support. Access Cisco Feature Navigator at http://www.cisco.com/go/fn. You must have an account on Cisco.com. If you do not have an account or have forgotten your username or password, click Cancel at the login dialog box and follow the instructions that appear.
Table 2 lists only the Cisco IOS software release that introduced support for a given feature in a given Cisco IOS software release train. Unless noted otherwise, subsequent releases of that Cisco IOS software release train also support that feature.

<table>
<thead>
<tr>
<th>Feature Name</th>
<th>Releases</th>
<th>Feature Information</th>
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<tr>
<td>QoS - Hierarchical Queuing for Ethernet DSLAMs</td>
<td>12.2(31)SB2</td>
<td>This feature was introduced and implemented on the Cisco 10000 series router for the PRE3.</td>
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