QoS Hierarchical Queueing for Ethernet DSLAMs

This feature module describes how to configure quality of service (QoS) hierarchical queueing policy maps on sessions and subinterfaces in Ethernet Digital Subscriber Line Access Multiplexer (E-DSLAM) applications on a Cisco ASR 1000 series router. The QoS Hierarchical Queueing for Ethernet DSLAMs feature supports IEEE 802.1 QinQ VLAN tag termination to configure inner VLAN identifiers on E-DSLAMs.

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest caveats and feature information, see Bug Search Tool and the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the feature information table.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Prerequisites for QoS Hierarchical Queueing for Ethernet DSLAMs

You must configure traffic classes using the class-map command.

Restrictions for QoS Hierarchical Queueing for Ethernet DSLAMs

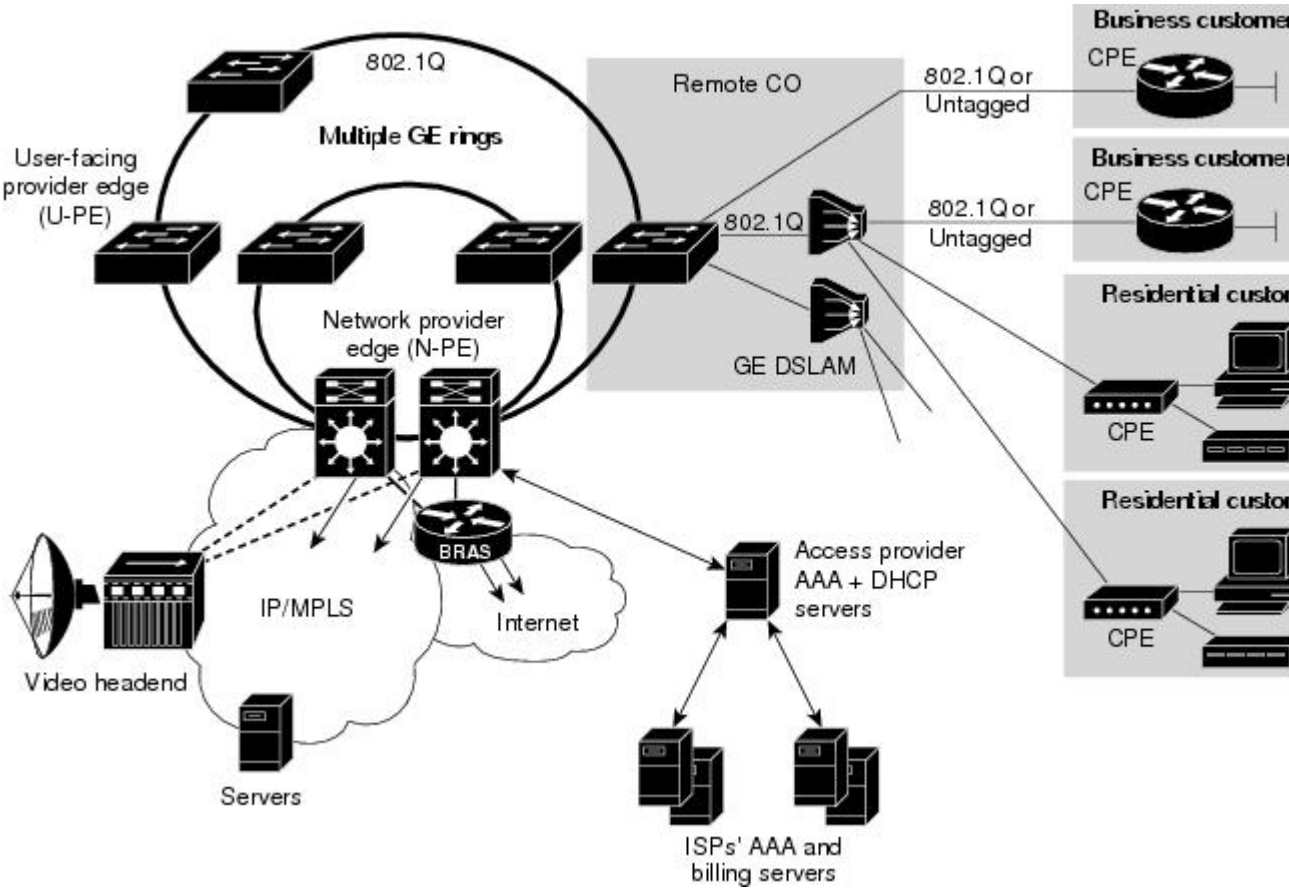
This feature is not supported in combination with load balancing when a session service policy is routed to a Layer 2 Tunnel Protocol (L2TP) tunnel. Do not configure load balancing on an L2TP tunnel if per-session queueing is enabled.

Information About QoS Hierarchical Queueing for Ethernet DSLAMs

Different Levels of QoS Provisioning

Traffic downstream from a Broadband Router Access Server (BRAS) requires different levels of QoS provisioning (for example, traffic shaping) depending on the network architecture between the BRAS and the subscriber. The figure below illustrates an Ethernet DSL access network. The sample network includes multiple entities where QoS provisioning is required for different reasons.

Figure 1: Ethernet DSL Access Network



The following entities may require different traffic shaping:

- A VLAN that is shaped to a certain aggregate traffic rate to limit the traffic to a group of subscribers (different 802.1Q interfaces in the figure above).
- Individual sessions that is shaped with certain QoS services for different classes of traffic (individual PCs in the figure above).

Integrated Queueing Hierarchy

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

The integrated queueing 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 queueing control plane sets up and enables the queueing features.

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

When a subinterface is provisioned followed by session-based policy provisioning, the integrated queueing hierarchy is formed on top of the physical interface as a result of queueing policies provisioned at two different levels. When a session is provisioned before subinterface-based policy provisioning, the queueing 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.

Configuration Guidelines for Hierarchical Queueing on Ethernet DSLAMs

When configuring the QoS Hierarchical Queueing for Ethernet DSLAMs feature, note the following guidelines:

- An individual subscriber is always identified by a PPP or IP session. A group of subscribers is identified by a particular VLAN by means of the outer tag ISP, E-DSLAM, or user-facing provider edge (U-PE).
- When a subinterface is used to aggregate a number of sessions with queueing policies, a queueing policy at a subinterface level must be a one-level policy map that is configured as class-default with only the shape and bandwidth remaining ratio feature enabled.
- Both subinterfaces and sessions can be oversubscribed and controlled by shaper and bandwidth remaining ratio.

How to Configure QoS Hierarchical Queueing for Ethernet DSLAMs

Configuring and Applying QoS Hierarchical Queueing Policy Maps to Sessions

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **policy-map** *policy-map-name*
4. **class** class-map-name
5. bandwidth {*bandwidth-kbps* | **percent***percentage*| **remainingpercent***percentage*}
6. **precedence** *precedence min-threshold max-threshold mark-probability-denominator*
7. **set cos** *cos-value*
8. **exit**
9. **exit**
10. **policy-map** *policy-map-name*
11. **class class-default**
12. **shape** average *cir*
13. **bandwidth remaining ratio** *ratio*
14. **service-polic** y*policy-map-name*
15. **exit**
16. **exit**
17. **interface virtual-template** *number*
18. **service-policy output** *policy-map-name*
19. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**policy-map** *policy-map-name* **Example:**	Creates a child policy and enters policy-map configuration mode. • Enter the policy-map name.

	Command or Action	Purpose
	`Router(config)# policy-map session_a_child`	
Step 4	**class** class-map-name **Example:** `Router(config-pmap)# class voip`	Configures the traffic class that you specify and enters policy-map class configuration mode. • Enter the name of a previously configured class map .
Step 5	bandwidth {*bandwidth-kbps* | **percent***percentage*| **remainingpercent***percentage*} **Example:** `Router(config-pmap-c)# bandwidth 10000` **Example:**	(Optional) Enables class-based weighted fair queueing based on the keywords and arguments specified, as described below. • 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. • 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. • 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.
Step 6	**precedence** *precedence min-threshold max-threshold mark-probability-denominator* **Example:** `Router(config-pmap-c)# precedence 0 32 256 100`	(Optional) Configures a precedence level for the traffic class based on the arguments specified, as described below. • precedence--Specifies the IP precedence number. Valid values are from 0 to 7. • min-threshold--Specifies the minimum threshold in number of packets. Valid values are from 1 to 4096. • max-threshold--Specifies the maximum threshold in number of packets. Valid values are from the minimum threshold to 4096. • mark-probability-denominator--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 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).

	Command or Action	Purpose
Step 7	**set cos** *cos-value* **Example:** `Router(config-pmap-c)# set cos 1`	(Optional) Sets the Layer 2 class of service (CoS) value of an outgoing packet. • Enter the IEEE 802.1Q CoS value from 0 to 7. **Note** Use the set cos command only in service policies that are attached in the output direction of an interface; packets that enter an interface cannot be set with a CoS value. You can configure a CoS value on an Ethernet interface that is configured for 802.1Q or on a virtual access interface that is using an 802.1Q interface.
Step 8	**exit** **Example:** `Router(config-pmap-c)# exit`	Exits policy-map class configuration mode.
Step 9	**exit** **Example:** `Router(config-pmap)# exit`	Exits policy-map configuration mode.
Step 10	**policy-map** *policy-map-name* **Example:** `Router(config)# policy-map session_a_parent`	Creates a parent policy and enters policy-map configuration mode. • Enter the policy-map name.
Step 11	**class class-default** **Example:** `Router(config-pmap)# class class-default`	Configures the traffic class as class-default and enters policy-map class configuration mode. **Note** Do not configure any other traffic class.
Step 12	**shape** average *cir* **Example:** `Router(config-pmap-c)# shape average 10000000`	Specifies average-rate traffic shaping for all traffic that does not match any other traffic class. • Enter the **average** keyword followed by the committed information rate (CIR), in bits per second (bps).
Step 13	**bandwidth remaining ratio** *ratio* **Example:** `Router(config-pmap-c)# bandwidth remaining ratio 10`	Specifies the weight (ratio) for the subinterface. • Enter the relative weight of this subinterface (or class queue). This number (ratio) indicates the proportional relationship between the other subinterfaces or class queues.

	Command or Action	Purpose
Step 14	**service-polic** *ypolicy-map-name* **Example:** `Router(config-pmap-c)# service-policy session_a_child`	Applies the child policy map to the parent class-default class. • Enter the name of a previously configured child policy map.
Step 15	**exit** **Example:** `Router(config-pmap-c)# exit`	Exits policy-map class configuration mode.
Step 16	**exit** **Example:** `Router(config-pmap)# exit`	Exits policy-map configuration mode.
Step 17	**interface virtual-template** *number* **Example:** `Router(config)# interface virtual-template 1`	Creates a virtual template and enters interface configuration mode. • Enter the virtual template number. Valid range is from 1 to 4095.
Step 18	**service-policy output** *policy-map-name* **Example:** `Router(config-if)# service-policy output session_a_parent`	Applies the service policy to the virtual interface. • Enter the name of the previously configured parent policy map. **Note** You must specify the output keyword to apply the service policy to outbound traffic on the interface.
Step 19	**end** **Example:** `Router(config-if)# end`	(Optional) Returns to privileged EXEC mode.

Examples

The following is an example of how to configure and apply a QoS hierarchical queueing policy map to PPP/IP sessions by using a virtual template:

```
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)# exit
Router(config-pmap)# class video
```

```
Router(config-pmap-c)# police 100000
Router(config-pmap-c)# priority level 2
Router(config-pmap-c)# exit
Router(config-pmap)# class precedence_0
Router(config-pmap-c)# bandwidth remaining ratio 10
Router(config-pmap-c)# exit
Router(config-pmap)# class precedence_1
Router(config-pmap-c)# bandwidth remaining ratio 20
Router(config-pmap-c)# exit
Router(config-pmap)# exit
Router(config)# policy-map session_a_parent
Router(config-pmap-c)# exit
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)# 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 Queueing Policy Maps to Subinterfaces

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **policy-map** *policy-map-name*
4. **class class-default**
5. **shape average** *cir*
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*
11. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.

	Command or Action	Purpose
Step 3	**policy-map** *policy-map-name* **Example:** `Router(config)# policy-map subint_1`	Creates a policy map and enters policy-map configuration mode. • policy-map-name--The name of the policy map.
Step 4	**class class-default** **Example:** `Router(config-pmap)# class class-default`	Configures the traffic class as class-default and enters policy-map class configuration mode. Do not configure any other traffic class. **Note** When a subinterface aggregates a number of sessions with queueing policies, a queueing policy at a subinterface level must be a one-level policy map configured as class-default.
Step 5	**shape average** *cir* **Example:** `Router(config-pmap-c)# shape average 10000000`	Specifies average-rate traffic shaping for all traffic that does not match any other traffic class. • Enter the **average** keyword followed by the CIR, in bps. **Note** When a subinterface aggregates a number of sessions with queueing policies, a queueing policy at a subinterface level must be a one-level policy map with only the shape feature enabled.
Step 6	**exit** **Example:** `Router(config-pmap-c)# exit`	Exits policy-map class configuration mode.
Step 7	**exit** **Example:** `Router(config-pmap)# exit`	Exits policy-map configuration mode.
Step 8	interface type slot/subslot/port**.**subinterface **Example:** `Router(config)# interface GigabitEthernet3/1/1.1`	Specifies the subinterface on which you are attaching the policy map and enters subinterface configuration mode. • Enter the interface type and slot number, subslot number, port number, and subinterface number.
Step 9	**encapsulation dot1q** *outer-vlan-id* [**second-dot1q***inner-vlan-id*] **Example:** `Router(config-subif)# encapsulation dot1q 100`	Enables IEEE 802.1Q encapsulation of traffic on the subinterface. The **second-dot1q**keywordsupports the IEEE 802.1 QinQ VLAN Tag Termination feature to configure an inner VLAN ID.

	Command or Action	Purpose
		• 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	**service-policy output** *policy-map-name* **Example:** `Router(config-subif)# service-policy output subint_1`	Attaches the service policy to the subinterface. • policy-map-name--The name of the previously configured policy map. **Note** You must specify the output keyword to apply the service policy to outbound traffic on the subinterface.
Step 11	**end** **Example:** `Router(config-subif)# end`	(Optional) Returns to privileged EXEC mode.

Examples

The following is an example of how to configure and apply a QoS hierarchical queueing policy map to a subinterface (and provide aggregate shaping for a large number of subscribers):

```
Router> enable
Router# configure terminal
Router(config)# policy-map subint_1
Router(config-pmap)# class class-default
Router(config-pmap-c)# shape average 10000000
Router(config-pmap-c)# exit
Router(config-pmap)# exit
Router(config)# interface GigabitEthernet3/1/1.1
Router(config-subif)# encapsulation dot1q 100
Router(config-subif)# service-policy output subint_1
Router(config-subif)# end
```

Displaying Policy-Map Information for Hierarchical Queueing

SUMMARY STEPS

1. **enable**
2. **show policy-map**
3. **show policy-map interface** *type number*
4. **show policy-map session**
5. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**show policy-map** **Example:** `Router# show policy-map`	(Optional) Displays all information for all class maps.

Step 3	**show policy-map interface** *type number*
	Example:
	`Router#`
	`show policy-map interface GigabitEthernet4/0/0.1`
		(Optional) Displays the packet statistics of all classes that are configured for all service policies either on the specified interface or subinterface or on a specific PVC on the interface.
		• Enter the interface type and number.

Step 4	**show policy-map session**
	Example:
	`Router#`
	`show policy-map session`
		(Optional) Displays the QoS policy map in effect for the SSS session.

Step 5	**exit** **Example:** `Router# exit`	(Optional) Exits privileged EXEC mode.

Configuration Examples for QoS Hierarchical Queueing for Ethernet DSLAMs

Example Policy Maps on VLANs or QinQ Subinterfaces

The following example shows how to configure and apply QoS hierarchical queueing policy maps on VLANs or QinQ subinterfaces. A child queueing 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 cir percent 20 bc 300 ms pir precent 40
Router(config-pmap-c)# set cos 1
```

```
Router(config-pmap-c)# exit
Router(config-pmap)# class video
Router(config-pmap-c)# police cir percent 20 bc 300 ms pir prectent 40
Router(config-pmap-c)# set cos 2
Router(config-pmap-c)# exit
Router(config-pmap)# class gaming
Router(config-pmap-c)# bandwidth remaining percent 80
Router(config-pmap-c)# set cos 3
Router(config-pmap-c)# exit
Router(config-pmap)# class class-default
Router(config-pmap-c)# bandwidth remaining percent 20
Router(config-pmap-c)# set cos 4
Router(config-pmap-c)# exit
Router(config-pmap)# exit
!
Router(config)# policy-map service_z_out
Router(config-pmap)# exit
!
Router(config)# policy-map rate_1_service_a_in
Router(config-pmap)# class voip
Router(config-pmap-c)# police cir percent 25 4 ms 1 ms
Router(config-pmap-c)# exit
Router(config-pmap)# class gaming
Router(config-pmap-c)# police cir percent 50 2 ms 1 ms
Router(config-pmap-c)# exit
Router(config-pmap)# class class-default
Router(config-pmap-c)# police percent 20 bc 300 ms pir 40
Router(config-pmap-c)# exit
Router(config-pmap)# exit
!
Router(config)# policy-map rate_x_service_z_in
Router(config-pmap)# exit
!
Router(config)# 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)# exit
Router(config-pmap)# exit
!
Router(config)# 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
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-subif)# 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-subif)# end
```

Example Policy Maps on VLANs with Arbitrary QinQ

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

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

```
Router(config-pmap)# exit
!
Router(config)# policy-map service_z_in
Router(config-pmap)# exit
!
Router(config)# policy-map isp_A_out
Router(config-pmap)# class user_1
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)# exit
Router(config-pmap)# class user_n
Router(config-pmap-c)# bandwidth remaining ratio 20
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
!
Router(config)# policy-map isp_Z_out
Router(config-pmap)# exit
!
Router(config)# policy-map isp_A_in
Router(config-pmap)# class user_1
Router(config-pmap-c)# service policy service_a_in
Router(config-pmap-c)# class user_n
Router(config-pmap-c)# service policy service_z_in
Router(config-pmap-c)# exit
Router(config-pmap)# exit
!
Router(config)# policy-map isp_Z_in
Router(config-pmap)# exit
!
Router(config)# policy-map interface_policy_out
Router(config-pmap)# class isp_A
Router(config-pmap-c)# shape average 100000
Router(config-pmap-c)# service policy isp_A_out
Router(config-pmap-c)# exit
Router(config-pmap)# class isp_Z
Router(config-pmap-c)# shape average 100000
Router(config-pmap-c)# service policy isp_Z_out
Router(config-pmap-c)# exit
Router(config-pmap)# exit
!
Router(config)# policy-map interface_policy_in
Router(config-pmap)# class isp_A
Router(config-pmap-c)# service policy isp_A_in
Router(config-pmap-c)# exit
Router(config-pmap)# class isp_Z
Router(config-pmap-c)# service policy isp_Z_in
Router(config-pmap-c)# exit
Router(config-pmap)# exit
!
Router(config)# interface GigabitEthernet1/0/0.1
Router(config-subif)# encapsulation dot1q 5 second dot1q any
Router(config-subif)# service-policy output interface_policy_out
Router(config-subif)# service-policy input interface_policy_in
Router(config-subif)# end
```

Example CPolicy Maps on Sessions

The following example shows how to configure and apply QoS hierarchical queueing policy maps on sessions. A child queueing 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)# exit
Router(config-pmap)# class video
Router(config-pmap-c)# set cos 2
Router(config-pmap-c)# exit
Router(config-pmap)# class gaming
Router(config-pmap-c)# bandwidth remaining percent 80
Router(config-pmap-c)# set cos 3
Router(config-pmap-c)# exit
Router(config-pmap)# class class-default
Router(config-pmap-c)# bandwidth remaining percent 20
Router(config-pmap-c)# set cos 4
Router(config-pmap-c)# exit
Router(config-pmap)# exit
!
Router(config)# policy-map service_z_out
Router(config-pmap)# exit
!
Router(config)# 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)# exit
Router(config-pmap)# exit
!
Router(config)# 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
!
Router(config)# policy-map rate_1_service_a_in
Router(config-pmap)# class voip
Router(config-pmap-c)# police cir percent 25 4 ms 1 ms
Router(config-pmap-c)# exit
Router(config-pmap)# class gaming
Router(config-pmap-c)# police cir percent 50 2 ms 1 ms
Router(config-pmap-c)# exit
Router(config-pmap)# class class-default
Router(config-pmap-c)# police cir percent 20 bc 300 ms pir precent 40
Router(config-pmap-c)# exit
Router(config-pmap)# exit
!
Router(config)# policy-map rate_x_service_z_in
Router(config-pmap)# exit
!
Router(config)# policy-map isp_A_out
Router(config-pmap)# class class-default
Router(config-pmap-c)# shape average 100000
Router(config-pmap-c)# bandwidth remaining ratio 10
Router(config-pmap-c)# exit
Router(config-pmap)# exit
Router(config)# exit
Router(config)# policy-map isp_Z_out
Router(config-pmap-c)# exit
```

```
Router(config-pmap)# class class-default
Router(config-pmap-c)# shape average 200000
Router(config-pmap-c)# bandwidth remaining ratio 30
Router(config-pmap-c)# exit
Router(config-pmap)# exit
Router(config)# interface GigabitEthernet1/0/0.1
Router(config-subif)# encapsulation dot1q 1
Router(config-subif)# service-policy output isp_A_out
Router(config-subif)# exit
Router(config)# interface GigabitEthernet2/0/0.2
Router(config-subif)# encapsulation dot1q 2
Router(config-subif)# service-policy output isp_Z_out
Router(config-subif)# end
```

Example Policy Maps on Sessions with Aggregate Shaping

The following example shows how to configure and apply QoS hierarchical queueing 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)# police cir percent 25 4 ms 1 ms
Router(config-pmap-c)# set cos 1
Router(config-pmap-c)# exit
Router(config-pmap)# class video
Router(config-pmap-c)# police cir percent 30 5 ms 1 ms
Router(config-pmap-c)# set cos 2
Router(config-pmap-c)# exit
Router(config-pmap)# class class-default
Router(config-pmap-c)# bandwidth remaining percent 20
Router(config-pmap-c)# set cos 3
Router(config-pmap-c)# exit
Router(config-pmap)# exit
!
Router(config)# policy-map service_z_out
Router(config-pmap)# exit
!
Router(config)# policy-map rate_1_service_a_in
Router(config-pmap)# class voip
Router(config-pmap-c)# police cir percent 25 4 ms 1 ms
Router(config-pmap-c)# exit
Router(config-pmap)# class video
Router(config-pmap-c)# police cir percent 30 2 ms 1 ms
Router(config-pmap-c)# exit
Router(config-pmap)# class class-default
Router(config-pmap-c)# police cir percent 40 2 ms 1 ms
Router(config-pmap-c)# exit
Router(config-pmap)# exit
!
Router(config)# policy-map rate_x_service_z_in
Router(config-pmap)# exit
!
Router(config)# 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)# exit
Router(config-pmap)# exit
!
Router(config)# 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
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

Related Documents

Related Topic	Document Title
QoS commands: complete command syntax, command modes, command history, defaults, usage guidelines, and examples	*Cisco IOS Quality of Service Solutions Command Reference*
Traffic shaping	"Regulating Traffic Flow Using Traffic Shaping" module
MQC	"Applying QoS Features Using the MQC" module

Standards

Standard	Title
No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature.	--

MIBs

MIB	MIBs Link
No new or modified MIBs are supported by this feature, and support for existing MIBs has not been modified by this feature.	To locate and download MIBs for selected platforms, Cisco IOS XE Software releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

RFCs

RFC	Title
No new or modified RFCs are supported by this feature, and support for existing RFCs has not been modified by this feature.	--

Technical Assistance

Description	Link
The Cisco Support and Documentation website provides online resources to download documentation, software, and tools. Use these resources to install and configure the software and to troubleshoot and resolve technical issues with Cisco products and technologies. Access to most tools on the Cisco Support and Documentation website requires a Cisco.com user ID and password.	http://www.cisco.com/cisco/web/support/index.html

Feature Information for QoS Hierarchical Queueing for Ethernet DSLAMs

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Table 1: Feature Information for QoS Hierarchical Queueing for Ethernet DSLAMs

Feature Name	Releases	Feature Information
QoS Hierarchical Queueing for Ethernet DSLAMs	Cisco IOS XE Release 2.4	This feature module describes how to configure QoS hierarchical queueing policy maps on sessions and subinterfaces in Ethernet Digital Subscriber Line Access Multiplexer (E-DSLAM) applications. This feature was implemented on Cisco ASR 1000 Series Routers.