Hierarchical QoS

This chapter includes details of hierarchical QoS.

Information About Hierarchical QoS

Hierarchical QoS allows you to specify QoS behavior at multiple policy levels, which provides a high degree of granularity in traffic management.

HQoS is not supported on Link Aggregation Group (LAG).

Two-Level Hierarchical Policies

Two-level hierarchical policies, also called *nested polices*, can be illustrated with a parent-level policy for the top level of the hierarchy and a child-level for the bottom level of the hierarchy. A two-level hierarchical policy can have queueing or marking or policing at child level and policing or shaping or bandwidth at parent level.

Four levels of priority are supported —priority level 1, 2, 3 and 4. These priority levels can be used along with the normal-priority queues. The normal-priority queues are scheduled by a different scheduler that does not give any priority treatment to the packets. Priority levels are supported only in the egress direction.

Note Whenever a policy with unsupported combination is applied, a failure message is displayed.

Configuring Hierarchical Policing

Hierarchical policing provides support at two levels:

- Parent level
- Child level

In the hierarchical ingress policy, **policer** command is supported at the parent level. In the hierarchical egress policy, **policer** command is not supported.

Procedure

Step 1 **configure**

Step 2 **policy-map** *policy-name*

Example:

```
RP/0/(config)# policy-map policy1
```

Enters policy map configuration mode.

- Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy.

Step 3 **class default**

Example:

```
RP/0/(config-pmap)# class default
```

Enters policy map class configuration mode.

Step 4 **service-policy** *policy-map-name*

Example:

```
RP/0/(config-pmap-c)# service-policy child
```

Attaches a policy map to an input or output interface to be used as the service policy for that interface.

Step 5 **police rate percent** *percentage*

Example:

```
RP/0/(config-pmap-c)# police rate percent 50
```

Configures traffic policing and enters policy map police configuration mode.

Step 6 **end** or **commit**

Example:

```
RP/0/(config-if)# end
```

or

```
RP/0/(config-if)# commit
```

Saves configuration changes.

- When you issue the **end** command, the system prompts you to commit changes:

  Uncommitted changes found, commit them before exiting(yes/no/cancel)? [cancel]:

  Entering **yes** saves configuration changes to the running configuration file, exits the configuration session, and returns the router to EXEC mode.

Entering **no** exits the configuration session and returns the router to EXEC mode without committing the configuration changes.

Entering cancel leaves the router in the current configuration session without exiting or committing the configuration changes.

- Use the **commit** command to save the configuration changes to the running configuration file and remain within the configuration session.

Configuration example for HQoS

Configuration example for Egress HQoS on L3 sub-interface

```
class-map match-any CLASS_1_IPV4PREC
 match precedence 6
 end-class-map

policy-map child_POLICY_
 class CLASS_1_IPV4PREC
  set qos-group 6
  police rate percent 17 peak-rate percent 25
end-policy-map

policy-map parent_POLICY
 class class-default
  service-policy child_POLICY
 end-policy-map

interface TenGigE0/3/0/2
 service-policy input parent_POLICY
 ipv4 address 90.0.0.1 255.255.255.0
class-map match-any match_exp_4
match mpls experimental topmost 4
 end-class-map
!
class-map match-any match_exp_5
match mpls experimental topmost 5
 end-class-map
!

class-map match-any match_exp_1
match mpls experimental topmost 1
 end-class-map
!
class-map match-any match_exp_2
match mpls experimental topmost 2
 end-class-map
!
class-map match-any match_exp_3
match mpls experimental topmost 3
 end-class-map
!
class-map match-any control_class_6
match dscp cs6
 match precedence 6
 match mpls experimental topmost 6
 end-class-map
```

```
!
class-map match-any control_class_7
match dscp cs7
 match precedence 7
 match mpls experimental topmost 7
 end-class-map
!


class-map match-any match_qos_group1
match qos-group 1
 end-class-map
!


class-map match-any match_qos_group2
match qos-group 2
 end-class-map
!


class-map match-any match_qos_group3
match qos-group 3
 end-class-map
!


class-map match-any match_qos_group4
match qos-group 4
 end-class-map
!


class-map match-any match_qos_group5
match qos-group 5
 end-class-map
!


class-map match-any match_qos_group6
match qos-group 6
 end-class-map
!

class-map match-any match_qos_group7
match qos-group 7
 end-class-map
!



policy-map policy_classify_exp_new
class match_exp_1
  set qos-group 1
!
 class match_exp_2
  set qos-group 2
!
 class match_exp_3
  set qos-group 3
!
 class match_exp_4
  set qos-group 4
!
```

```
 class match_exp_5
  set qos-group 5
!
 class control_class_6
  set qos-group 6
!
 class control_class_7
  set qos-group 7
!
 class class-default
!
 end-policy-map
!



policy-map hqos_child_policy_42xx
class match_qos_group1
  bandwidth 1 gbps
 !
 class match_qos_group2
  bandwidth 1 gbps
 !
 class match_qos_group3
  bandwidth 1 gbps
 !
 class match_qos_group4
  bandwidth 1 gbps
 !
 class match_qos_group5
  bandwidth 1 gbps
 !
 class match_qos_group6
  priority level 1
  police rate 1 gbps
  !
 !
 class match_qos_group7
  priority level 2
  police rate 1 gbps
  !
 !
 class class-default
!
 end-policy-map
!


policy-map hqos_parent_policy_42xx
class class-default
  service-policy hqos_child_policy_42xx
  shape average 5 gbps
 !
 end-policy-map
!
```