



Configuring Fabric Quality of Service Policies and Classes on Cisco IOS XR Software

This module provides the conceptual and configuration information for fabric QoS on Cisco IOS XR software. This module details information relevant to the Cisco CRS-1 and Cisco XR 12000 Series Router.



Note

For additional conceptual information about QoS in general and complete descriptions of the QoS commands listed in this module, see the [“Related Documents”](#) section of this module. To locate documentation for other commands that might appear in the course of executing a configuration task, search online in the Cisco IOS XR software master command index.

Feature History for Configuring Fabric Quality of Service Policies and Classes on Cisco IOS XR Software

| Release | Modification |
|---------------|--|
| Release 3.6.0 | This feature was introduced on the Cisco CRS-1 and Cisco XR 12000 Series Router. |
| Release 3.7.0 | No modification. |
| Release 3.8.0 | No modification. |

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Prerequisites for Configuring Fabric Quality of Service Policies and Classes on Cisco IOS XR Software

The following prerequisites are required for configuring modular fabric QoS on your network:

- To perform these configuration tasks, your Cisco IOS XR software system administrator must assign you to a user group associated with a task group that includes the corresponding command task IDs.

If you need assistance with your task group assignment, contact your system administrator.

- All command task IDs are listed in individual command references and in the *Cisco IOS XR Task ID Reference Guide*.
- For detailed information about user groups and task IDs, see the *Configuring AAA Services on Cisco IOS XR Software* module of *Cisco IOS XR Software System Security Configuration Guide*.

Information About Configuring Fabric Quality of Service Policies and Classes on Cisco IOS XR Software

To implement fabric QoS features in this document, you must understand the following concepts:

- [Overview, page QC-128](#)
- [Ingress Policy and Fabric QoS Policy Interaction, page QC-129](#)

Overview

The fabricq queue selection mechanism is known as fabric QoS. Three ports are defined: a high-priority port for internal control traffic and classified high-priority traffic, a low-priority port for assured-forwarding (AF) traffic, and a best effort port (BE) for low-priority traffic. Each port is assigned 1023 queues. The queues map to a physical egress interface and are assigned when the interface is created. The associated quanta for each of the queues are derived from the bandwidth of the physical or logical interfaces in relative terms to the other interfaces present on that line card or PLIM.

By default, internal control traffic is placed in the high-priority queue. All other traffic is placed in the best-effort queue.

If an ingress QoS policy is configured classifying certain traffic as being priority, then the priority traffic is placed into the high-priority queue together with the internal control traffic. All other traffic is placed in the best-effort queue.

The user can configure a fabric QoS policy that defines the relative MDRR bandwidths associated with the AF and BE ports. This is applied to the secure domain router (SDR) (this may be the whole router if no individual service domain routers are configured) and affects all fabricq ASICs in the logical router.

A maximum of three classes can be specified within the policy. A class known as *class-default* is automatically created and equates to the BE port or queues. The name of this class cannot be altered. Any name may be applied to the classes that equate to the priority and AF ports or queues.

Within the fabric QoS policy, the only applicable actions are to assign **priority** to the priority class and **bandwidth remaining percent** to the AF and BE classes. The bandwidth remaining percent for the BE class does not need to be specified. It receives all remaining capacity after the appropriate weight has been allocated to the AF class. The user may wish to specifically enter configuration values for the default class just for clarity.

Fabric QoS policy class maps are restricted to matching a subset of the following classification options:

- **precedence**
- **dscp**
- **qos-group**
- **discard-class**
- **mpls experimental topmost**

**Note**

To match on **qos-group** or **discard-class**, an ingress QoS policy must be applied, setting the required values for **qos-group** or **discard-class**. Both of these variables have local significance only and are not recognized outside of the router.

Ingress Policy and Fabric QoS Policy Interaction

Be careful when applying ingress QoS policies when they must interact with a fabric QoS policy. The fabric QoS policy overrides any traffic classification conducted by the ingress policy when determining which traffic should be placed in the priority, AF, or BE queues within the fabricq ASIC. In addition, the fabric QoS policy is used to determine which traffic is placed in the priority queue within the ingressq ASIC fabric queues and the switch fabric ASICs (S2 and S3 stages) rather than any **priority** marking set by the ingress QoS policy. The **priority** marking performed by the ingress QoS policy is still used when determining packet scheduling in the shape queues within the ingressq ASIC.

For example, if an ingress QoS policy were to classify and mark particular traffic types as being **priority** and a fabric QoS policy were to be applied either marking alternative traffic as being **priority** or not setting **priority** at all, then the ingress policy **priority** statement is effectively ignored in the fabricq, the S2 ASICs, and the S3 ASICs. Use caution to ensure that there is no conflict between the ingress QoS policy and the fabric QoS policy.

A very simplistic illustration would be if an ingress QoS policy uses a class-map to exclude MPLS experimental 3 from the **priority** class, but the fabric QoS policy places MPLS experimental 3 traffic in the **priority** class. In this case, the MPLS experimental 3 traffic is placed in the high-priority S2 and S3 queues and the fabricq high-priority port or queues.

If the ingress QoS policy remarks certain traffic with values that the fabric QoS policy class-maps are to match on, then the remarked traffic is matched and placed in the appropriate port or queues. This provides the ability for the ingress QoS policy and the fabric QoS policy to complement each other, rather than potentially conflicting.

As noted above, fabric QoS is constrained to a subset of the possible **match** criteria that can be used in its class maps. If the ingress QoS policy were to set a **qos-group** marking for all traffic that should be placed in the priority queue and another **qos-group** marking for all traffic to be placed in the AF class, then if the fabric QoS policy class maps matches on the **qos-group** values, the policy is honored end to end. This approach enables multiple ingress QoS policies to interact in the expected manner with a fabric QoS policy.

It is important to remember that if an ingress QoS policy is applied to an interface and the fabric QoS policy has been applied to the router, then the ingress MSC RX PSE is required to perform two classification cycles. This has an impact on the forwarding capacity of the line card or PLIM, reducing the performance to about 62.5 Mpps.

You can choose not to apply a specific fabric QoS policy, giving the ingress QoS policy the decision on which traffic is placed in the high-priority queues but removing the ability to differentiate between AF and BE classes in the fabricq ASIC.

How to Configure Fabric Quality of Service Policies and Classes on Cisco IOS XR Software

This section contains instructions for the following tasks:

- [Creating a Traffic Class, page QC-130](#) (required)
- [Creating a Fabric QoS Service Policy, page QC-130](#) (required)

Creating a Traffic Class

See “Creating a Traffic Class” section on page 24 in [Configuring Modular Quality of Service Packet Classification on Cisco IOS XR Software](#). For fabric QoS, the supported class-map match types are:

- precedence
- dscp
- qos-group
- discard-class
- mpls exp topmost
- cos

Creating a Fabric QoS Service Policy

This configuration task explains how to configure a fabric QoS policy.

Restrictions

A maximum of three classes can be specified within the service policy. A class known as default is automatically created and equates to the BE port or queues. The name of this class cannot be modified. You can rename the classes that equate to the priority and AF ports or queues.

Within the fabric QoS policy, the only applicable actions are to assign:


- Priority to the priority class
- Percent of bandwidth remaining to the AF and BE classes.

The percent of bandwidth remaining for the BE class does not need to be specified.

SUMMARY STEPS

1. **configure**
2. **class-map** *class-map-name*
3. **match precedence** *precedence-value*
4. **policy-map** *policy-name*
5. **class-map** *class-map-name*
6. **priority**
7. **switch-fabric service-policy**
8. **end**
or
commit

DETAILED STEPS

| | Command or Action | Purpose |
|--------|--|--|
| Step 1 | configure Example: RP/0/RP0/CPU0:router# configure | Enters global configuration mode. |
| Step 2 | class-map <i>class-map-name</i> Example: RP/0/RP0/CPU0:router(config)# class-map class201 | Enters class map configuration mode. <ul style="list-style-type: none"> • Creates a class map to be used for matching packets to the class whose name you specify. • If you specific match-any, one of the match criteria must be met for traffic entering the traffic class to be classified as part of the traffic class. This is the default. |
| Step 3 | match precedence <i>precedence value</i> Example: RP/0/RP0/CPU0:router(config-cmap)# match precedence ipv4 5 | Specifies a precedence value that is used as the match criteria against which packets are checked to determine if they belong to the class specified by the class map.  Note Fabric QoS is supported for IPv4 only. |
| Step 4 | policy-map <i>policy-name</i> Example: RP/0/RP0/CPU0:router(config-cmap)# policy-map policy1 | Enters policy map configuration mode. <ul style="list-style-type: none"> • Creates or modifies a policy map that can be attached to one or more interfaces to specify a service policy. |
| Step 5 | class <i>class-name</i> Example: RP/0/RP0/CPU0:router(config-pmap)# class class1 | Specifies the name of the class whose policy you want to create or change. |

| | Command or Action | Purpose |
|--------|---|--|
| Step 6 | <p>priority</p> <p>Example: RP/0/RP0/CPU0:router(config-pmap-c)# priority</p> | Specifies priority to a class of traffic belonging to a policy map. |
| Step 7 | <p>switch-fabric service-policy</p> <p>Example: RP/0/RP0/CPU0:router(config)# switch-fabric service-policy map1</p> | Configures a service policy for the switch fabric. |
| Step 8 | <p>end OR commit</p> <p>Example: RP/0/RP0/CPU0:router(config)# end OR RP/0/RP0/CPU0:router(config)# commit</p> | <p>Saves configuration changes.</p> <ul style="list-style-type: none"> When you issue the end command, the system prompts you to commit changes: <pre>Uncommitted changes found, commit them before exiting (yes/no/cancel)? [cancel]:</pre> <ul style="list-style-type: none"> 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 Examples for Configuring Fabric Quality of Service Policies and Classes on Cisco IOS XR Software

This section contains the following examples:

- [Configuring Fabric Quality of Service Policies and Classes: Example, page QC-132](#)

Configuring Fabric Quality of Service Policies and Classes: Example

The following configuration is an example of a possible fabric QoS policy:

```
class-map match-any llq
 match mpls experimental topmost 5
 match precedence critical
!
class-map match-any business
 match mpls experimental topmost 3
 match precedence flash
```

```
!  
policy-map fabric_qos  
  class llq  
    priority  
  !  
  class business  
    bandwidth remaining percent 65  
  !  
  class class-default  
    bandwidth remaining percent 35  
  !  
!
```

To apply the policy, use the **switch-fabric service-policy** command with the *policy-name* argument.

The following example shows an ingress QoS policy working in conjunction with a fabric QoS policy. The fabric QoS policy is shown first, followed by the ingress QoS policy:

```
class-map match-any llq  
  match qos-group 5  
!  
class-map match-any business&games  
  match qos-group 3  
!  
policy-map fabric_qos  
  class llq  
    priority  
  !  
  class business&games  
    bandwidth remaining percent 65  
  !  
  class class-default  
    bandwidth remaining percent 35  
  !  
!  
  
class-map match-any voip  
  match mpls experimental topmost 5  
  match precedence critical  
  match dscp cs5  
!  
class-map match-any business  
  match mpls experimental topmost 4  
  match dscp cs4  
  match precedence flash-override  
!  
class-map match-any broadband-games  
  match mpls experimental topmost 3  
  match dscp cs3  
  match precedence flash  
!  
  
policy-map input-qos  
  class voip  
    priority  
    set qos-group 5  
  class business  
    set qos-group 3  
  class broadband-games  
    set qos-group 3
```

**Note**

In the policy-map input-qos command, the **priority** keyword under class voip is for reference rather than for configuration.

Additional References

The following sections provide references related to implementing fabric QoS policies and classes on Cisco IOS XR software.

Related Documents

| Related Topic | Document Title |
|--|--|
| Cisco IOS XR QoS commands: complete command syntax, command modes, command history, defaults, usage guidelines, and examples | <i>Cisco IOS XR Modular Quality of Service Command Reference</i> |
| Traffic shaping, traffic policing, low-latency queuing, and MDDR | <i>Configuring QoS Congestion Management on Cisco IOS XR Software</i> |
| WRED, RED, and tail drop | <i>Configuring QoS Congestion Avoidance on Cisco IOS XR Software</i> |
| Cisco IOS XR getting started material | <i>Cisco IOS XR Getting Started Guide</i> |
| Information about user groups and task IDs | <i>Configuring AAA Services on Cisco IOS XR Software</i> module of <i>Cisco IOS XR System Security Configuration Guide</i> |
| Cisco IOS XR QoS overview information | <i>Modular Quality of Service Overview on Cisco IOS XR Software</i> |

Standards

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

MIBs

| MIBs | MIBs Link |
|------|--|
| — | To locate and download MIBs using Cisco IOS XR software, use the Cisco MIB Locator found at the following URL and choose a platform under the Cisco Access Products menu: http://cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml |

RFCs

| RFCs | 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 Technical Support 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. | http://www.cisco.com/techsupport |