

EVC Quality of Service

This document contains information about how to enable quality of service (QoS) features (such as traffic classification and traffic policing) for use on an Ethernet virtual circuit (EVC).

An EVC as defined by the Metro Ethernet Forum is a port-level point-to-point or multipoint-to-multipoint circuit. It is an end-to-end representation of a single instance of a service being offered by a provider to a customer. It embodies the different parameters on which the service is being offered.

- Information About Quality of Service on an EVC, on page 1
- How to Configure a Quality of Service Feature on an EVC, on page 5
- Configuration Examples for EVC Quality of Service, on page 10
- Additional References, on page 12
- Feature Information for Configuring EVC Quality of Service, on page 13

Information About Quality of Service on an EVC

EVC Quality of Service and the MQC

QoS functionality is typically applied using traffic classes, class maps, and policy-maps. For example, you can specify that traffic belonging to a particular class be grouped into specific categories, and receive a specific QoS treatment (such as classification or policing). The QoS treatment the traffic is to receive is specified in a policy-map and the policy-map is attached to an interface. The mechanism used for applying QoS in this manner is the modular QoS CLI (MQC.)

The policy-map can be attached to an interface in either the incoming (ingress) or outgoing (egress) direction with the **service-policy** command.

The MQC structure allows you to define a traffic class, create a traffic policy, and attach the traffic policy to an interface (in this case, an EVC).

The MQC structure consists of the following three high-level steps.

1. Define a traffic class by using the **class-map**command. A traffic class is used to classify traffic.
2. Create a traffic policy by using the **policy-map** command. (The terms *traffic policy* and *policy-map* are often synonymous.) A traffic policy (policy-map) contains a traffic class and one or more QoS features that will be applied to the traffic class. The QoS features in the traffic policy determine how to treat the classified traffic.

3. Attach the traffic policy (policy-map) to the interface by using the **service-policy** command.

Note For more information about the MQC, including information about hierarchical policy-maps and class maps, see the "Applying QoS Features Using the MQC" module.

QoS-Aware Ethernet Flow Point (EFP)

As described in the EVC Quality of Service and the MQC, on page 1 , the MQC is used to apply one or more QoS features to network traffic. The last step in using the MQC is to attach the traffic policy (policy-map) to an interface (in this case, an EVC) by using the **service-policy** command.

With the EVC Quality of Service feature, the **service-policy** command can be used to attach the policy-map to an Ethernet Flow Point (EFP) in either the incoming (ingress) *or* outgoing (egress) direction of an EVC. This way, the EFP is considered to be "QoS-aware."

QoS Functionality and EVCs

The specific QoS functionality includes the following:

- Packet classification (for example, based on differentiated services code point (DSCP) value and QoS group identifier)
- Packet marking (for example, based on Class of Service (CoS) value)
- Traffic policing (two- and three-color and multiple actions)
- Bandwidth sharing
- Priority queueing (in the outbound direction on the EVC only)
- Weighted Random Early Detection (WRED)

The QoS functionality is enabled by using the appropriate commands listed in the following sections.

match Commands Supported by EVC QoS for Classifying Traffic

The table below lists *some* of the available **match** commands that can be used when classifying traffic on an EVC. The available **match** commands vary by Cisco IOS XE release. For more information about the commands and command syntax, see the Cisco IOS Quality of Service Solutions Command Reference.

Table 1: match Commands That Can Be Used with the MQC

Command	Purpose
match access-group	Configures the match criteria for a class map on the basis of the specified access control list (ACL).
match any	Configures the match criteria for all packets.
match cos	Matches a packet based on a Layer 2 CoS marking.

Command	Purpose
match cos inner	Matches the inner CoS of QinQ packets on a Layer 2 CoS marking.
match [**ip**] **dscp**	Identifies a specific IP DSCP value as a match criterion. Up to eight DSCP values can be included in one match statement.
match not	Specifies the single match criterion value to use as an unsuccessful match criterion. **Note** The **match not** command, rather than identifying the specific match parameter to use as a match criterion, is used to specify a match criterion that prevents a packet from being classified as a member of the class. For instance, if the **match not qos-group 6**command is issued while you configure the traffic class, QoS group 6 becomes the only QoS group value that is not considered a successful match criterion. All other QoS group values would be successful match criteria.
match [**ip**] **precedence**	Identifies IP precedence values as match criteria.
match qos-group	Identifies a specific QoS group value as a match criterion.
match source-address mac	Uses the source MAC address as a match criterion. **Note** Classifying traffic using the **match source-address mac**command is supported in the input direction only.
match vlan (QoS)	Matches and classifies traffic on the basis of the VLAN identification number.
match vlan inner	Configures a class map to match the innermost VLAN ID in an 802.1q tagged frame.

Multiple match Commands in One Traffic Class

If the traffic class contains more than one **match** command, you need to specify how to evaluate the **match** commands. You specify this by using either the **match-any** or **match-all**keyword of the **class-map** command. Note the following points about the **match-any** and **match-all** keywords:

- If you specify the **match-any**keyword, the traffic being evaluated by the traffic class must match *one* of the specified criteria.
- If you specify the **match-all** keyword, the traffic being evaluated by the traffic class must match *all* of the specified criteria.
- If you do not specify either keyword, the traffic being evaluated by the traffic class must match *all* of the specified criteria (that is, the behavior of the **match-all** keyword is used).

Commands Used to Enable QoS Features on the EVC

The commands used to enable QoS features vary by Cisco IOS XE release. The table below lists *some* of the available commands and the QoS features that they enable. For complete command syntax, see the Cisco IOS Quality of Service Solutions Command Reference.

For more information about a specific QoS feature that you want to enable, see the appropriate module of the Cisco IOS Quality of Service Solutions Configuration Guide.

Table 2: Commands Used to Enable QoS Features

Command	Purpose
bandwidth	Configures a minimum bandwidth guarantee for a class.
bandwidth remaining	Configures an excess weight for a class.
drop	Discards the packets in the specified traffic class.
fair-queue	Enables the flow-based queueing feature within a traffic class.
police	Configures traffic policing. Allows specifying of multiple policing actions.
police (percent)	Configures traffic policing on the basis of a percentage of bandwidth available on an interface.
police (two rates)	Configures traffic policing using two rates, the committed information rate (CIR) and the peak information rate (PIR).
priority	Gives priority to a class of traffic belonging to a policy-map.
queue-limit	Specifies or modifies the maximum number of packets the queue can hold for a class configured in a policy-map.
random-detect	Enables Weighted Random Early Detection (WRED).
random-detect cos-based	Enables Weighted random early detection (WRED) on the basis of the class of service (CoS) value of a packet.
random-detect dscp-based	Specifies that Weighted random early detection (WRED) is to use the differentiated services code point (DSCP) value when it calculates the drop probability for a packet.
random-detect discard-class	Configures the WRED parameters for a discard-class value for a class in a policy-map.
random-detect discard-class-based	Configures WRED on the basis of the discard class value of a packet.
random-detect exponential-weighting-constant	Configures the exponential weight factor for the average queue size calculation for the queue reserved for a class.
random-detect precedence	Configure the WRED parameters for a particular IP Precedence for a class policy in a policy-map.
service-policy	Specifies the name of a traffic policy used as a matching criterion (for nesting traffic policies [hierarchical traffic policies] within one another).
set cos	Sets the Layer 2 CoS value of an outgoing packet.

Command	Purpose
set cos-inner	Marks the inner class of service field in a bridged frame.
set discard-class	Marks a packet with a discard-class value.
set [**ip**] **dscp**	Marks a packet by setting the DSCP value in the type of service (ToS) byte.
set mpls experimental	Designates the value to which the Multiprotocol Label Switching (MPLS) bits are set if the packets match the specified policy-map.
set precedence	Sets the precedence value in the packet header.
set qos-group	Sets a QoS group identifier (ID) that can be used later to classify packets.
shape	Shapes traffic to the indicated bit rate according to the algorithm specified.

input and output Keywords of the service-policy Command

As a general rule, the QoS features configured in the traffic policy can be applied to packets entering the interface or to packets leaving the interface. Therefore, when you use the **service-policy** command, you need to specify the direction of the traffic policy by using the **input** or **output** keyword.

For instance, the **service-policy output policy-map1** command would apply the QoS features in the traffic policy to the interface in the output direction. All packets leaving the interface (output) are evaluated according to the criteria specified in the traffic policy named policy-map1.



Note For Cisco releases, queueing mechanisms are not supported in the input direction. Nonqueueing mechanisms (such as traffic policing and traffic marking) are supported in the input direction. Also, classifying traffic on the basis of the source MAC address (using the **match source-address mac** command) is supported in the input direction only.

How to Configure a Quality of Service Feature on an EVC

Creating a Traffic Class for Use on the EVC

To create a traffic class, use the **class-map** command to specify the traffic class name. Then use one or more **match** commands to specify the appropriate match criteria. Packets matching the criteria that you specify are placed in the traffic class.

To create the traffic class for use on the EVC, complete the following steps.

SUMMARY STEPS

1. **enable**

2. **configure terminal**
3. **class-map** [**match-all** | **match-any**] *class-name*
4. **match cos** *cos-number*
5. Enter additional **match** commands, if applicable; otherwise, proceed with the next step.
6. **end**

DETAILED STEPS

Procedure

	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	**class-map** [**match-all**	**match-any**] *class-name* **Example:** `Router(config)# class-map match-any class1`	Creates a class map and enters class-map configuration mode. • The class map is used for matching packets to the specified class. **Note** The **match-all** keyword specifies that all match criteria must be met. The **match-any** keyword specifies that one of the match criteria must be met. Use these keywords only if you will be specifying more than one **match** command.
Step 4	**match cos** *cos-number* **Example:** `Router(config-cmap)# match cos 2`	Matches a packet on the basis of a Layer 2 CoS number. **Note** The **match cos** command is an example of a **match** command you can use.
Step 5	Enter additional **match** commands, if applicable; otherwise, proceed with the next step.	--
Step 6	**end** **Example:** `Router(config-cmap)# end`	(Optional) Exits class map configuration mode and returns to privileged EXEC mode.

Creating a Policy-Map for Use on the EVC

To create a traffic policy (or policy-map) for use on the EVC, complete the following steps.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **policy-map** *policy-map-name*
4. **class** {*class-name*| **class-default**}
5. **police** *bps* [*burst-normal*] [*burst-max*] [**conform-action** *action*] [**exceed-action** *action*] [**violate-action** *action*]
6. Enter the commands for any additional QoS feature that you want to enable, if applicable; otherwise, proceed to the next step.
7. **end**

DETAILED STEPS

Procedure

	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:
	`Router(config)#`
	`policy-map policy1`
		Creates or specifies the name of the traffic policy and enters QoS policy-map configuration mode.

Step 4	**class** {*class-name*| **class-default**}
	Example:
	`Router(config-pmap)#`
	`class class1`
		Specifies the name of a class and enters QoS policy-map class configuration mode.
		Note
		This step associates the traffic class with the traffic policy.

Step 5	**police** *bps* [*burst-normal*] [*burst-max*] [**conform-action** *action*] [**exceed-action** *action*] [**violate-action** *action*] **Example:**	(Optional) Configures traffic policing. **Note**

	Command or Action	Purpose
	`Router(config-pmap-c)# police 3000`	The **police**command is an example of a command that you can use in a policy-map to enable a QoS feature.
Step 6	Enter the commands for any additional QoS feature that you want to enable, if applicable; otherwise, proceed to the next step.	--
Step 7	**end** **Example:** `Router(config-pmap-c)# end`	(Optional) Exits QoS policy-map class configuration mode and returns to privileged EXEC mode.

Configuring the EVC and Attaching a Traffic Policy to the EVC

The traffic policy (policy-map) applies the enabled QoS feature to the traffic class once you attach the policy-map to the EVC.

To configure the EVC and attach a traffic policy to the EVC, complete the following steps.

Note One of the commands used to attach the traffic policy to the EVC is the **service-policy** command. When you use this command, you must specify either the **input** or **output** keyword along with the policy-map name. The policy-map contains the QoS feature you want to use. Certain QoS features can only be used in either the input or output direction. For more information about these keywords and the QoS features supported, see the input and output Keywords of the service-policy Command. Also, if you attach a traffic policy to an interface containing multiple EVCs, the traffic policy will be attached to *all* of the EVCs on the interface.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *interface-type interface-number*
4. **service instance** *id* **ethernet** [*evc-name*]
5. **encapsulation dot1q** *vlan-id* [,*vlan-id*[-*vlan-id*]] [**native**]
6. **rewrite ingress tag translate 1-to-1 dot1q** *vlan-id* **symmetric**
7. **bridge domain** *domain-number*
8. **service-policy** {**input** | **output**} *policy-map-name*
9. **end**
10. **show policy-map interface** *type number* **service instance** *service-instance-number*

DETAILED STEPS

Procedure

	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	**interface** *interface-type interface-number* **Example:** `Router(config)# interface gigabitethernet 0/0/1`	Configures an interface type and enters interface configuration mode. • Enter the interface type and interface number.
Step 4	**service instance** *id* **ethernet** [*evc-name*] **Example:** `Router(config-if)# service instance 333 ethernet evc1`	Configures an Ethernet service instance on an interface and enters Ethernet service configuration mode. • Enter the service instance identification number and, if applicable, the EVC name (optional).
Step 5	**encapsulation dot1q** *vlan-id* [,*vlan-id*[-*vlan-id*]] [**native**] **Example:** `Router(config-if-srv)# encapsulation dot1q 10`	Defines the matching criteria to map 802.1Q frames ingress on an interface to the appropriate service instance.
Step 6	**rewrite ingress tag translate 1-to-1 dot1q** *vlan-id* **symmetric** **Example:** `Router(config-if-srv)# rewrite ingress tag translate 1-to-1 dot1q 300 symmetric`	Specifies the encapsulation adjustment to be performed on a frame ingressing a service instance.
Step 7	**bridge domain** *domain-number* **Example:** `Router(config-if-srv)# bridge domain 1`	Configures a bridge domain. • Enter the bridge domain number.

Step 8	**service-policy** {**input** | **output**} *policy-map-name*
	Example:
	`Router(config-if-srv)#`
	`service-policy input policy1`
		Attaches a policy-map to an interface.
		• Enter either the **input** or **output** keyword and the policy-map name.

	Command or Action	Purpose
Step 9	**end** **Example:** `Router(config-if-srv)# end`	(Optional) Returns to privileged EXEC mode.
Step 10	**show policy-map interface** *type number* **service instance** *service-instance-number* **Example:** `Router# show policy-map interface gigabitethernet 1/0/0 service instance 30`	(Optional) Displays the statistics and the configurations of the input and output policies that are attached to an interface. • Enter the interface type, interface number, and service instance number.

Configuration Examples for EVC Quality of Service

Example Creating a Traffic Class for Use on the EVC

In this example, traffic with a CoS value of 2 is placed in the traffic class called class1:

```
Router> enable
Router# configure terminal
Router(config)# class-map match-any class1
Router(config-cmap)# match cos 2
Router(config-cmap)# end
```

Example Creating a Policy-Map for Use on the EVC

In this example, traffic policing has been configured in the policy-map called policy1. Traffic policing is the QoS feature applied to the traffic in class1:

```
Router> enable
Router# configure terminal
Router(config)#
 policy-map policy1
Router(config-pmap)#
 class class1
```

```
Router(config-pmap-c)# police 3000

Router(config-pmap-c)# end
```

Example Configuring the EVC and Attaching a Traffic Policy to the EVC

In this example, an EVC has been configured and a traffic policy called policy1 has been attached to the EVC:

```
Router> enable

Router# configure terminal

Router(config)# interface gigabitethernet 0/0/1

Router(config-if)# service instance 333 ethernet evc1

Router(config-if-srv)# encapsulation dot1q 10

Router(config-if-srv)# rewrite ingress tag translate 1-to-1 dot1q 300 symmetric

Router(config-if-srv)# bridge domain 1

Router(config-if-srv)# service-policy input policy1

Router(config-if-srv)# end
```

Example Verifying the Traffic Class and Traffic Policy Information for the EVC

The following is sample output of the **show policy-map interface service instance**command. It displays the QoS features configured for and attached to the EFP on the GigabitEthernet interface 1/1/7.

```
Router# show policy-map interface gigabitethernet 1/1/7 service instance 10
 GigabitEthernet1/1/7: EFP 10
  Service-policy input: multiaction
    Class-map: c1 (match-all)
      0 packets, 0 bytes
      5 minute offered rate 0000 bps, drop rate 0000 bps
      Match: ip precedence 3
      police:
          cir 300000 bps, bc 2000 bytes
        conformed 0 packets, 0 bytes; actions:
          set-prec-transmit 7
          set-qos-transmit 10
        exceeded 0 packets, 0 bytes; actions:
          drop
        conformed 0000 bps, exceed 0000 bps
    Class-map: class-default (match-any)
```

```
0 packets, 0 bytes
5 minute offered rate 0000 bps, drop rate 0000 bps
Match: any
```

Additional References

Related Documents

Related Topic	Document Title
Cisco IOS commands	Cisco IOS Master Commands List, All Releases
QoS commands: complete command syntax, command modes, command history, defaults, usage guidelines, and examples	*Cisco IOS Quality of Service Solutions Command Reference*
Packet classification	"Classifying Network Traffic" module
Selective Packet Discard	“IPv6 Selective Packet Discard” module

Standards

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

MIBs

MIB	MIBs Link
No new or modified MIBs are supported, and support for existing MIBs has not been modified.	To locate and download MIBs for selected platforms, Cisco IOS 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, and support for existing RFCs has not been modified.	--

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 Configuring EVC Quality of Service

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 https://cfnng.cisco.com/. An account on Cisco.com is not required.

Table 3: Feature Information for EVC Quality of Service

Feature Name	Releases	Feature Information
EVC Quality of Service	Cisco IOS XE Release 3.3 Cisco IOS Release 15.5(2)T	This document contains information about how to enable quality of service (QoS) features (such as traffic classification and traffic policing) for use on an Ethernet virtual circuit (EVC). The EVC Quality of Service feature was introduced on the Cisco ASR 1000 Series Aggregation Services Router. The following commands were introduced or modified: **service-policy**, **show policy-map interface service instance**.