



CEM over MPLS QoS

The QoS EXP matching feature allows you to classify and mark network traffic by modifying the Multiprotocol Label Switching (MPLS) experimental bits (EXP) field in IP packets. This module contains conceptual information and the configuration tasks for classifying and marking network traffic using the MPLS EXP field.

This QoS EXP matching feature is supported on the following CEM interface modules:

- 48-Port T1 or E1 CEM interface module
- 48-Port T3 or E3 CEM interface module
- 1-port OC-48/STM-16 or 4-port OC-12/OC-3 / STM-1/STM-4 + 12 port T1/E1 + 4-port T3/E3 CEM interface module
- 1-port OC-192 or 8-port Low rate CEM interface module
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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 <https://cfng.cisco.com/>. An account on Cisco.com is not required.

Information About CEM over MPLS QoS

Classifying and Marking MPLS EXP Overview

The QoS EXP matching feature allows you to organize network traffic by setting values for the MPLS EXP field in MPLS packets. By choosing different values for the MPLS EXP field, you can mark packets so that packets have the priority that they require during periods of congestion. Setting the MPLS EXP value allows you to:

- Classify traffic

The classification process selects the traffic to be marked. Classification accomplishes this by partitioning traffic into multiple priority levels, or classes of service. Traffic classification is the primary component of class-based QoS provisioning.

- Police and mark traffic

Policing causes traffic that exceeds the configured rate to be discarded or marked to a different drop level. Marking traffic is a way to identify packet flows to differentiate them. Packet marking allows you to partition your network into multiple priority levels or classes of service.

Prerequisites for CEM over MPLS QoS

The device must be configured as an MPLS provider edge (PE) or provider (P) chassis, which can include the configuration of a valid label protocol and underlying IP routing protocols.

Restrictions for CEM over MPLS QoS

- MPLS classification and marking can only occur in an operational MPLS Network.
- MPLS EXP classification and marking is supported on the main chassis interfaces for MPLS packet switching and imposition (simple IP imposition and Ethernet over MPLS (EoMPLS) imposition) and on Ethernet virtual circuits (EVCs) or Ethernet flow points (EFPs) for EoMPLS imposition.
- MPLS EXP topmost classification is not supported for bridged MPLS packets on Ethernet virtual circuits (EVC) or Ethernet flow points (EFP).
- MPLS EXP marking in the ingress direction only.
- If a packet is classified by IP type of service (ToS) or class of service (CoS) at ingress, it cannot be reclassified by MPLS EXP at egress (imposition case). However, if a packet is classified by MPLS at ingress it can be reclassified by Quality of Service (QoS) group at egress (disposition case).
- If a packet is encapsulated in MPLS, the MPLS payload cannot be checked for other protocols such as IP for classification or marking. Only MPLS EXP marking affects packets encapsulated by MPLS.

How to Classify and Mark MPLS EXP

Classifying MPLS Encapsulated Packets

You can use the **match mpls experimental topmost** command to define traffic classes based on the packet EXP values, inside the MPLS domain. You can use these classes to define services policies to mark the EXP traffic using the **police** command.

```
enable
configure terminal
class-map [match-all | match-any] class-map-name
match mpls experimental topmost mpls-exp-value
end
```

Marking MPLS EXP on Imposed Labels

In typical configurations, marking MPLS packets at imposition is used with ingress classification on IP ToS or CoS fields. However, generic matching with the class default value is supported with other ingress attributes such as **vlan**.



Note For EVC configuration, a policy map that performs matching based on the CoS, and that sets the EXP imposition value, should be used to copy CoS values to the EXP value.



Note The **set mpls experimental imposition** command works only on packets that have new or additional MPLS labels added to them.

```
enable
configure terminal
policy-map policy-map-name
class class-map-name
set mpls experimental imposition mpls-exp-value
end
```

Classifying and Marking MPLS EXP



Note The **set mpls experimental topmost** command works only on packets that are already MPLS encapsulated.

```
enable
configure terminal
policy-map policy-map-name
class class-map-name
set mpls experimental topmost mpls-exp-value
end
```

Configuration Examples

Example: Defining an MPLS EXP Class Map

Example: Defining an MPLS EXP Class Map

The following example defines a class map named exp3 that matches packets that contains MPLS experimental value 3:

```
Router(config)# class-map exp3
Router(config-cmap)# match mpls experimental topmost 3
Router(config-cmap)# exit
```

Example: Defining a Policy Map and Applying the Policy Map to an Ingress Interface

Example: Defining a Policy Map and Applying the Policy Map to an Ingress Interface

The following example uses the class map created in the example above to define a policy map. This example also applies the policy map to a physical interface for ingress traffic.

```
Router(config)# policy-map change-exp-3-to-2
Router(config-pmap)# class exp3
Router(config-pmap-c)# set mpls experimental topmost 2
Router(config-pmap)# exit
Router(config)# interface GigabitEthernet 0/0/0
Router(config-if)# service-policy input change-exp-3-to-2
Router(config-if)# exit
```

Example: Defining a Policy Map and Applying the Policy Map to an Egress Interface

Example: Defining a Policy Map and Applying the Policy Map to an Egress Interface

The following example uses the class map created in the example above to define a policy map. This example also applies the policy map to a physical interface for egress traffic.

```
Router(config)# policy-map WAN-out
Router(config-pmap)# class exp3
Router(config-pmap-c)# shape average 10000000
Router(config-pmap-c)# exit
Router(config-pmap)# exit
Router(config)# interface GigabitEthernet 0/0/0
Router(config-if)# service-policy output WAN-out
Router(config-if)# exit
```

Example: Defining an MPLS EXP Imposition Policy Map

Example: Defining an MPLS EXP Imposition Policy Map

The following example defines a policy map that sets the MPLS EXP imposition value to 2 based on the IP precedence value of the forwarded packet.

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# class-map prec012
Router(config-cmap)# match ip prec 0 1 2
Router(config-cmap)# exit
Router(config)# policy-map mark-up-exp-2
Router(config-pmap)# class prec012
Router(config-pmap-c)# set qos-group 3
Router(config-pmap-c)# exit
Router(config-pmap)# exit
```

Example: Applying the MPLS EXP Imposition Policy Map to a Main Interface

Example: Applying the MPLS EXP Imposition Policy Map to a Main Interface

The following example applies a policy map to Gigabit Ethernet interface 0/0/0:

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# interface GigabitEthernet 0/0/0
Router(config-if)# service-policy input mark-up-exp-2
Router(config-if)# exit
```

Example: Applying the MPLS EXP Imposition Policy Map to an EVC

Example: Applying the MPLS EXP Imposition Policy Map to an EVC

The following example applies a policy map to the Ethernet Virtual Connection specified by the **service instance** command:

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# interface GigabitEthernet 0/0/0
Router(config-if)# service instance 100 ethernet
Router(config-if-srv)# xconnect 100.0.0.1 encapsulation mpls 100
Router(config-if-srv)# service-policy input mark-up-exp-2
Router(config-if-srv)# exit
Router(config-if)# exit
```

Example: Defining an MPLS EXP Label Switched Packets Policy Map

Example: Defining an MPLS EXP Label Switched Packets Policy Map

The following example defines a policy map that sets the MPLS EXP topmost value to 2 according to the MPLS EXP value of the forwarded packet:

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# class-map exp012
Router(config-cmap)# match mpls experimental topmost 0 1 2
Router(config-cmap)# exit
Router(config-cmap)# policy-map mark-up-exp-2
Router(config-pmap)# class exp012
Router(config-pmap-c)# set mpls experimental topmost 2
Router(config-pmap-c)# exit
Router(config-pmap)# exit
```

Example: Applying the MPLS EXP Label Switched Packets Policy Map to a Main Interface

Example: Applying the MPLS EXP Label Switched Packets Policy Map to a Main Interface

The following example shows how to apply the policy map to a main interface:

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# interface GigabitEthernet 0/0/0
Router(config-if)# service-policy input mark-up-exp-2
Router(config-if)# exit
```

Additional References for CEM over MPLS QoS

Related Documents

Related Topic	Document Title
Cisco IOS commands	Cisco IOS Master Commands List, All Releases

Standards

Standards	Title
—	There are no standards for this feature.

MIBs

MIB	MIBs Link
—	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

RFCs	Title
—	There are no RFCs for this feature.

Technical Assistance

Description	Link
<p>The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies.</p> <p>To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds.</p> <p>Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.</p>	http://www.cisco.com/cisco/web/support/index.html

