



## CHAPTER 64

# Configuring Fabric Congestion Control and QoS

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Fibre Channel Congestion Control (FCC) is a Cisco proprietary flow control mechanism that alleviates congestion on Fibre Channel networks.

Quality of service (QoS) offers the following advantages:

- Provides relative bandwidth guarantee to application traffic.
- Controls latency experienced by application traffic.
- Prioritizes one application over another (for example, prioritizing transactional traffic over bulk traffic) through bandwidth and latency differentiation.

This chapter provides details on the QoS and FCC features provided in all switches. It includes the following sections:

- [FCC, page 64-1](#)
- [QoS, page 64-3](#)
- [Example Configuration, page 64-10](#)
- [Ingress Port Rate Limiting, page 64-11](#)
- [Default Settings, page 64-12](#)

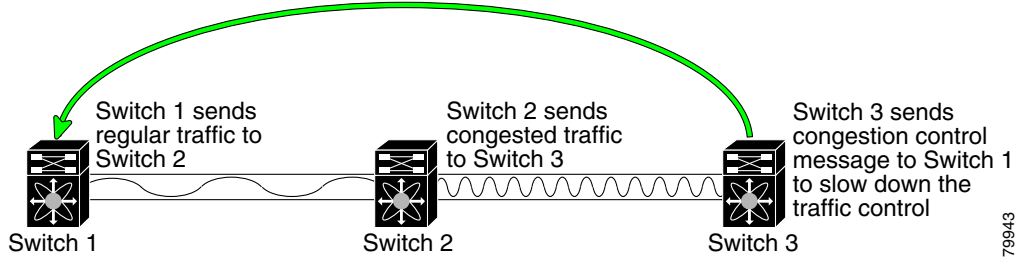
## FCC

FCC reduces the congestion in the fabric without interfering with the standard Fibre Channel protocols. This section contains the following topics:

- [About FCC, page 64-1](#)
- [FCC Process, page 64-2](#)
- [Enabling FCC, page 64-2](#)
- [Assigning FCC Priority, page 64-3](#)

## About FCC

Figure 64-1 FCC Mechanisms



Edge quench congestion control provides feedback to the source about the rate at which frames should be injected into the network (frame intervals).

**Note**

FCC is not supported on the Cisco Fabric Switch for HP c-Class BladeSystem and Cisco Fabric Switch for IBM BladeCenter.

## FCC Process

When a node in the network detects congestion for an output port, it generates an edge quench message. These frames are identified by the Fibre Channel destination ID (DID) and the source ID. A switch from other vendors simply forwards these frames.

Any receiving switch in the Cisco MDS 9000 Family handles frames in one of these ways:

- It forwards the frame.

- It limits the rate of the frame flow in the congested port.

The behavior of the flow control mechanism differs based on the Fibre Channel DID:

- If the Fibre Channel DID is directly connected to one of the switch ports, the input rate limit is applied to that port.

- If the destination of the edge quench frame is a Cisco domain or the next hop is a Cisco MDS 9000 Family switch, the frame is forwarded.

- If neither of these mechanisms is true, then the frame is processed in the port going towards the FC DID.

All switches (including the edge switch) along the congested path process path quench frames. However, only the edge switch processes edge quench frames.

## Enabling FCC

**Tip**

Step 1

Switches

FC Services

FCC

**General**

- Step 2**
- Step 3**            **Enable**
- Step 4**            **Apply Changes**
- 

**Assigning FCC Priority**

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- |               |                 |                    |            |                |
|---------------|-----------------|--------------------|------------|----------------|
| <b>Step 1</b> | <b>Switches</b> | <b>FC Services</b> | <b>FCC</b> | <b>General</b> |
|---------------|-----------------|--------------------|------------|----------------|
- Step 2**
- Step 3**            **Priority**
- Apply Changes**
- 

**QoS**

model. The DiffServ standard is defined in RFCs 2474 and 2475.

All switches support the following types of traffic:

- [About Control Traffic, page 64-3](#)
- [Enabling or Disabling Control Traffic, page 64-4](#)
- [About Data Traffic, page 64-4](#)
- [VSAN Versus Zone-Based QoS, page 64-5](#)
- [Configuring Data Traffic, page 64-6](#)
- [About Class Map Creation, page 64-6](#)
- [Creating a Class Map, page 64-7](#)
- [About Service Policy Definition, page 64-8](#)
- [About Service Policy Enforcement, page 64-8](#)
- [About the DWRR Traffic Scheduler Queue, page 64-8](#)
- [Changing the Weight in a DWRR Queue, page 64-9](#)

**About Control Traffic**

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from a another vendor's switch. High priority frames originating from other vendor switches are marked as high priority as they enter a switch in the Cisco MDS 9000 Family.

## Enabling or Disabling Control Traffic



Tip

Step 1

QoS

Control

Step 2

Step 3

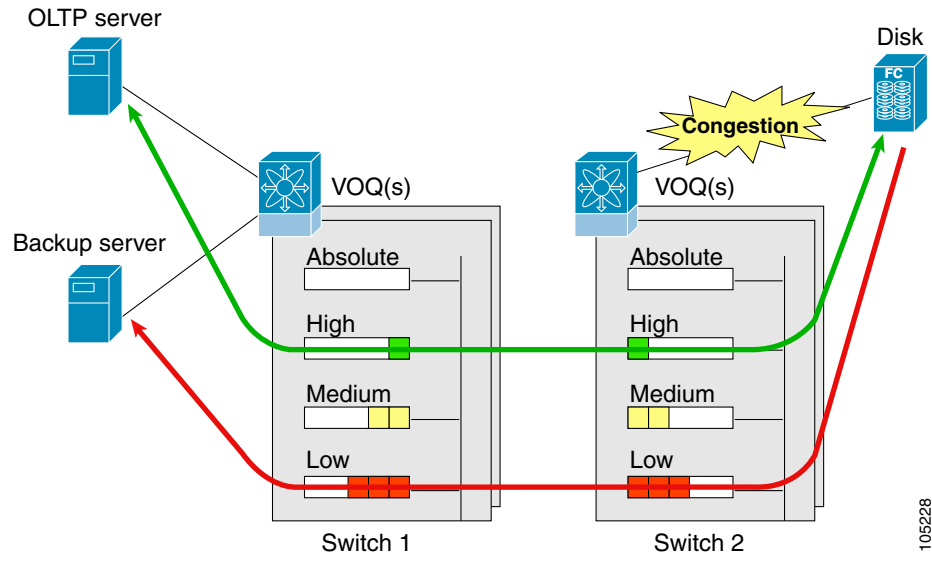
enable    disable

Apply Changes

Online transaction processing (OLTP), which is a low volume, latency sensitive application, requires quick access to requested information. Backup processing application require high bandwidth but are not sensitive to latency. In a network that does not support service differentiation, all traffic is treated identically—they experience similar latency and are allocated similar bandwidths. The QoS feature in the Cisco MDS 9000 Family switches provides these guarantees.

Data traffic can be prioritized in distinct levels of service differentiation: low, medium, or high priority. You can apply QoS to ensure that Fibre Channel data traffic for your latency-sensitive applications receive higher priority over throughput-intensive applications such as data warehousing (see [Figure 64-2](#)).

**Figure 64-2** *Prioritizing Data Traffic*



[page 64-2](#)). [“Enabling FCC” section on](#)

## VSAN Versus Zone-Based QoS

**Table 64-1 QoS Configuration Differences**

VSAN-Based QoS	Zone-Based QoS
	NX-OS software detects a mismatch for the QoS parameter, the link is isolated.
Takes effect only when QoS is enabled.	Takes effect only when QoS is enabled.



## About Class Map Creation

Use the class map feature to create and define a traffic class with match criteria to identify traffic belonging to that class. The class map name is restricted to 63 alphanumeric characters and defaults to the match-all option. Flow-based traffic uses one of the following values:

WWN—The source WWN or the destination WWN.

Fibre Channel ID (FC ID) —The source ID (SID) or the destination ID (DID). The possible values for mask are FFFFFFFF (the entire FC ID is used—this is the default), FFFF00 (only domain and area FC ID is used), or FF0000 (only domain FC ID is used).



An SID or DID of 0x000000 is not allowed.



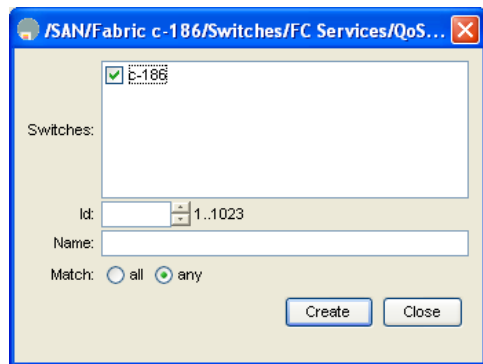
**Figure 64-3 Quality of Service Control Tab**

Switch	Status	Command	LastCommand	Result
sw172-22-46-224	enabled	noSelection	noSelection	none
sw172-22-46-221	enabled	noSelection	noSelection	none
sw172-22-46-220	enabled	noSelection	noSelection	none
sw172-22-46-233	enabled	noSelection	noSelection	none
sw172-22-46-223	enabled	noSelection	noSelection	none
sw172-22-46-225	enabled	noSelection	noSelection	none
sw172-22-46-222	enabled	noSelection	noSelection	none
sw172-22-46-174	enabled	noSelection	noSelection	none

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**Class Maps Create Row**

**Create Class Maps Dialog Box**



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**ID**

**Step 5**

**Step 6**

**Step 7**

## About Service Policy Definition



### Note

[http://www.cisco.com/en/US/tech/tk543/tk757/technologies\\_tech\\_note09186a00800949f2.shtml](http://www.cisco.com/en/US/tech/tk543/tk757/technologies_tech_note09186a00800949f2.shtml) for further information on implementing QoS DSCP values.



Class maps are processed in the order in which they are configured in each policy map.

## About Service Policy Enforcement

When you have configured a QoS data traffic policy, you must enforce the data traffic configuration by applying that policy to the required VSAN(s). If you do not apply the policy to a VSAN, the data traffic configuration is not enforced. You can only apply one policy map to a VSAN.



### Note

You can apply the same policy to a range of VSANs.

## About the DWRR Traffic Scheduler Queue

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describes the QoS behavior for Generation 1, Generation 2, and Generation 3 switching modules.



**Table 64-2 QoS Behavior for Generation 1 and Generation 2 Switching Modules**

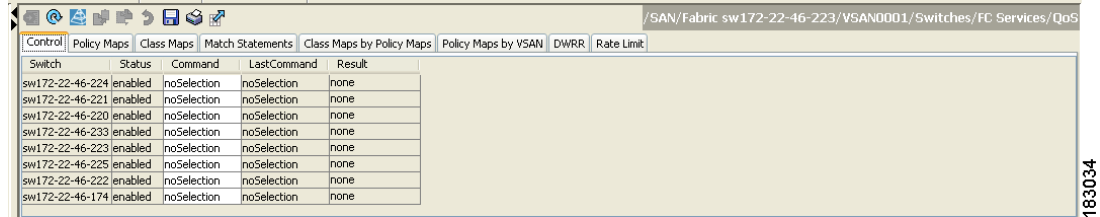
Source Module Type	Destination Module Type	QoS Behavior Description

To change the weight in a DWRR queue using Fabric Manager, follow these steps:

Expand **FC Services**, expand **QoS** and then select **Control** in the Physical Attributes pane.

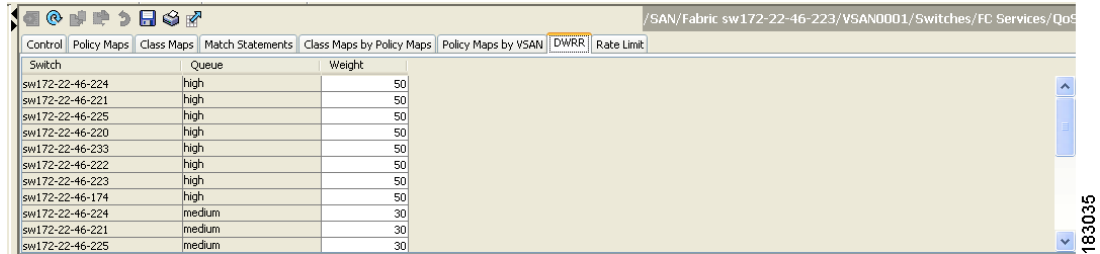
The QoS control traffic information is displayed in the Information pane shown in [Figure 64-5](#). The default is the **Control** tab.

**Figure 64-5 Quality of Service Control Tab**



**DWRR**

**QoS Queue Status and Weight**



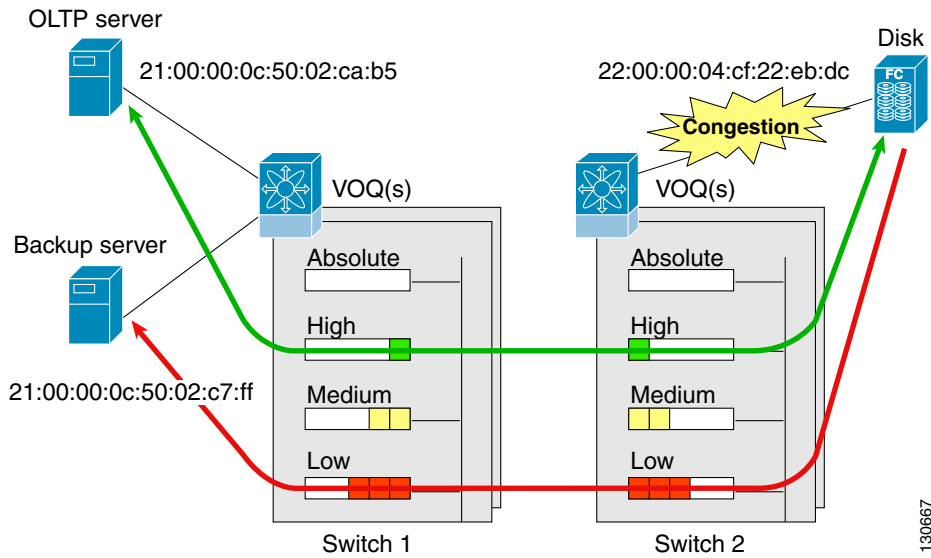
Step 3

Step 4

Apply Changes icon to save your changes

# Example Configuration

Figure 64-7 Example Application for Traffic Prioritization



Step 1

Step 2

Step 3

# Ingress Port Rate Limiting

to 100% and the default is 100%.



**Note**

Port rate limiting can only be configured on Cisco MDS 9100 Series switches, Cisco MDS 9216i switches, and MPS-14/2 modules.

This feature can only be configured if the QoS feature is enabled and if this configuration is performed on a Cisco MDS 9100 series switch, Cisco MDS 9216i switch, or MPS-14/2 module.

To configure the port rate limiting value using Fabric Manager, follow these steps:

**Step 1** Expand \_\_\_\_\_, expand \_\_\_\_\_ and then select \_\_\_\_\_ in the Physical Attributes pane.

The QoS control traffic information is displayed in the Information pane shown in [Figure 64-8](#). The default is the \_\_\_\_\_ tab.

**Figure 64-8 Quality of Service Control Tab**

Switch	Status	Command	LastCommand	Result
sw172-22-46-224	enabled	noSelection	noSelection	none
sw172-22-46-221	enabled	noSelection	noSelection	none
sw172-22-46-220	enabled	noSelection	noSelection	none
sw172-22-46-233	enabled	noSelection	noSelection	none
sw172-22-46-223	enabled	noSelection	noSelection	none
sw172-22-46-225	enabled	noSelection	noSelection	none
sw172-22-46-222	enabled	noSelection	noSelection	none
sw172-22-46-174	enabled	noSelection	noSelection	none

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**Rate Limit**

