CHAPTER 5

Configuring Fibre Channel Interfaces

This chapter describes how to configure the Fibre Channel interfaces.

This chapter includes the following topics:

Information About Fibre Channel Interfaces

This section includes the following topics:

Generations of Modules and Switches

Cisco MDS 9000 Family hardware modules and switches are categorized into generations based on the time of introduction, capabilities, features, and compatibilities:

- Generation 1—Modules and switches with a maximum port speed of 2 Gbps.
- Generation 2—Modules and switches with a maximum port speed of 4 Gbps.
- Generation 3—Modules and switches with a maximum port speed of 8 Gbps.

The Cisco MDS 9500 Series switches, Cisco MDS 9222i, Cisco MDS 9216A, and Cisco MDS 9216i switches support the Generation 2 modules. Each module or switch can have one or more ports in port groups that share common resources such as bandwidth and buffer credits.

In addition to supporting Generation 2 modules, the Cisco MDS 9500 Series switches and the Cisco MDS 9222i switch support the Generation 3 modules. Similar to Generation 2, each Generation 3 module can have one or more ports in port groups that share common resources such as bandwidth and buffer credits.

Generation 3 Fibre Channel modules are supported on the Cisco MDS 9506 and 9509 switches with Supervisor-2 modules. The MDS 9513 Director supports 4/44-port Host-Optimized Fibre Channel switching module with either Fabric 1 or Fabric 2 modules, but requires Fabric 2 module for support of the 48-port and the 24-port 8-Gbps Fibre Channel switching modules. The MDS 9222i switch supports the 4/44-port Host-Optimized Fibre Channel switching module. MDS NX-OS Release 4.1(1) is required to support the Generation 3 modules.

Note Because Generation 1 modules do not support as many buffer-to-buffer credits as Generation 4 modules supports, you cannot configure an ISL on E or TE ports between a Generation 1 module such as the 16-port 1-, 2-Gbps Fibre Channel Switching Module (DS-X9016) and a Generation 4 module such as the 32-port 8-Gbps Advanced Fibre Channel module (DS-X9232-256K9).

Table 5-1 identifies the Generation 2 and Generation 3 modules, as well as the Fabric switches.

Table 5-1 Fibre Channel Modules and Fabric Switches

Part Number	Product Name and Description
Generation 3 Modules	
DS-X9248-96K9	48-port 8-Gbps Fibre Channel switching module
DS-X9224-96K9	24-port 8-Gbps Fibre Channel switching module
DS-X9248-48K9	4/44-port 8-Gbps Host-Optimized Fibre Channel switching module
DS-13SLT-FAB2	Fabric 2 module that enables the 24-port and the 48-port 8-Gbps Fibre Channel switching module to use the full 96-Gbps backplane bandwidth with any-to-any connectivity.
Generation 3 Fabric Switch	
DS-C9148-K9	Cisco MDS 9148 Fabric switch 48-port 8-Gbps Fabric switch
Generation 2 Modules	
DS-X9148	48-port 4-Gbps Fibre Channel switching module
DS-X9124	24-port 4-Gbps Fibre Channel switching module
DS-X9304-18K9	18-port 4-Gbps Fibre Channel switching module with 4-Gigabit Ethernet ports
DS-X9112	12-port 4-Gbps Fibre Channel switching module
DS-X9704	4-port 10-Gbps Fibre Channel switching module
DS-X9530-SF2-K9	Supervisor-2 module for Cisco MDS 9500 Series switches.
Generation 2 Fabric Switches	
DS-C9134-K9	Cisco MDS 9134 Fabric switch 32-port 4-Gbps Fabric switch with 2 additional 10-Gbps ports

Table 5-1 Fibre Channel Modules and Fabric Switches (continued)

Part Number	Product Name and Description
DS-C9124	Cisco MDS 9124 Fabric switch 24-port 4-Gbps Fabric switch
DS-C9222i-K9	Cisco MDS 9222i Multiservice Modular switch 18-port 4-Gbps switch with 4-Gigabit Ethernet IP storage services ports, and a modular expansion slot to host Cisco MDS 9000 Family switching and services modules

Note Generation 2 Fibre Channel switching modules are not supported on the Cisco MDS 9216 switch; however, they are supported by both the Supervisor-1 module and the Supervisor-2 module.

For detailed information about the installation and specifications for these modules and switches, refer to the hardware installation guide for your switch.

Port Groups

Each module or switch can have one or more ports in port groups that share common resources such as bandwidth and buffer credits. Port groups are defined by the hardware consisting of sequential ports. For example, ports 1 through 12, ports 13 through 24, ports 25 through 36, and ports 37 through 48 are the port groups on the 48-port 4-Gbps Fibre Channel switching modules.

Table 5-2 shows the port groups for the Generation 2 and Generation 3 Fibre Channel modules, and Generation 2 and Generation 3 Fabric switches.

Table 5-2 Bandwidth and Port Groups for the Fibre Channel Modules and Fabric Switches

Part Number	Product Name/ Description	Number of Ports Per Port Group	Bandwidth Per Port Group (Gbps)	Maximum Bandwidth Per Port (Gbps)
Generation 3 Modules				
DS-X9248-96K9	48-port 8-Gbps Fibre Channel switching module	6	12.8	8 Gbps
DS-X9224-96K9	24-port 8-Gbps Fibre Channel switching module	3	12.8	8 Gbps
DS-X9248-48K9	4/44-port 8-Gbps Host-Optimized Fibre Channel switching module	12	12.8	8/4 Gbps[1]
Generation 3 Fabric Switches				
DS-C9148-K9 (Cisco MDS 9148 Fabric switch)	48-port 8-Gbps Fabric switch	4	32	8 Gbps

Table 5-2 Bandwidth and Port Groups for the Fibre Channel Modules and Fabric Switches

Part Number	Product Name/ Description	Number of Ports Per Port Group	Bandwidth Per Port Group (Gbps)	Maximum Bandwidth Per Port (Gbps)
Generation 2 Modules				
DS-X9148	48-port 4-Gbps Fibre Channel switching module	12	12.8	4 Gbps
DS-X9124	24-port 4-Gbps Fibre Channel switching module	6	12.8	4 Gbps
DS-X9304-18K9 (MSM-18/4 Multiservice module)	18-port 4-Gbps Fibre Channel switching module with 4-Gigabit Ethernet ports	6	12.8	4 Gbps
DS-X9112	12-port 4-Gbps Fibre Channel switching module	3	12.8	4 Gbps
DS-X9704	4-port 10-Gbps Fibre Channel switching module	1	10	10 Gbps
Generation 2 Fabric Switches				
DS-C9134-K9 (Cisco MDS 9134 Fabric switch)	32-port 4-Gbps Fabric switch	4	16	4 Gbps
	2-port 10-Gbps Fabric switch	1	10	10 Gbps
DS-C9124K9 (Cisco MDS 9124 Fabric switch)	24-port 4-Gbps Fabric switch	4	16	4 Gbps
DS-C9222i-K9 (Cisco MDS 9222i Multiservice Modular switch)	18-port 4-Gbps, 4 Gigabit Ethernet ports and a modular expansion slot.	6	12.8	4 Gbps

1. A maximum of 4 ports (one per port group) in a 4/44-port 8-Gbps switching module can operate at 8 Gbps bandwidth in dedicated or shared mode. All the other ports can operate at a maximum of 4 Gbps in shared mode or dedicated mode.

Port Rate Modes

In Generation 2 and Generation 3 modules, you can configure the port rate modes. The *port rate mode* configuration is used to determine the bandwidth allocation for ports in a port group. Two port rate modes are supported:

- Dedicated Rate Mode—A port is allocated required fabric bandwidth to sustain line traffic at the maximum operating speed configured on the port. For more information, see the "Dedicated Rate Mode" section on page 5-6.

- Shared Rate Mode—Multiple ports in a port group share data paths to the switch fabric and share bandwidth. For more information, see the "Shared Rate Mode" section on page 5-7.

Note In Generation 1 modules, you cannot configure the port rate modes. The mode is determined implicitly based on the port mode and line card type.

Note Port rate modes are not supported on the Cisco Fabric Switch for HP c-Class Blade System, and the Cisco Fabric Switch for IBM Blade Center.

Table 5-3 shows the modules that support dedicated, shared, and the default rate modes.

Table 5-3 Port Rate Mode Support on Generation 2 and Generation 3 Modules and Switches

Part Number	Product Name/ Description	Supports Dedicated Rate Mode	Supports Shared Rate Mode	Default Speed Mode and Rate Mode on All Ports
Generation 3 Modules				
DS-X9248-96K9	48-Port 8-Gbps Fibre Channel switching module	Yes	Yes[1]	Auto, Shared
DS-X9224-96K9	24-Port 8-Gbps Fibre Channel switching module	Yes	Yes[1]	Auto, Shared
DS-X9248-48K9	4/44-Port 8-Gbps Host-Optimized Fibre Channel switching module	Yes	Yes[1]	Auto Max 4 Gbps, Shared
Generation 3 Fabric Switches				
DS-C9148-K9 (Cisco MDS 9148 Fabric switch)	48-port 8-Gbps Fabric switch	Yes	No	Auto, Dedicated
Generation 2 Modules				
DS-X9148	48-port 4-Gbps Fibre Channel switching module[2]	Yes	Yes	Auto, Shared
DS-X9124	24-port 4-Gbps Fibre Channel switching module	Yes	Yes	Auto, Shared
DS-X9304-18K9 (MSM-18/4 Multiservice module)	18-port 4-Gbps Fibre Channel switching module with 4-Gigabit Ethernet ports	Yes	Yes	Auto, Shared
DS-X9112	12-port 4-Gbps Fibre Channel switching module	Yes	No	Auto, Dedicated
DS-X9704	4-port 10-Gbps Fibre Channel switching module	Yes	No	Auto, Dedicated
Generation 2 Fabric Switches				

Table 5-3 Port Rate Mode Support on Generation 2 and Generation 3 Modules and Switches

Part Number	Product Name/ Description	Supports Dedicated Rate Mode	Supports Shared Rate Mode	Default Speed Mode and Rate Mode on All Ports
DS-C9134-K9 (Cisco MDS 9134 Fabric switch)	32-port 4-Gbps Fabric switch	Yes	Yes	Auto, Shared
	2-port 10-Gbps Fabric switch	Yes	No	Auto, Dedicated
DS-C9124 (Cisco MDS 9124 Fabric switch)	24-port 4-Gbps Fabric switch[3]	Yes	No	Auto, Dedicated
DS-C9222i-K9 (Cisco MDS 9222i Multiservice Modular switch)	18-port 4-Gbps Fibre Channel switch with 4-Gigabit Ethernet IP storage services ports, and a modular expansion slot to host Cisco MDS 9000 Family Switching and Services Modules	Yes	Yes	Auto, Shared

1. Shared rate mode is supported on Fx ports only and no ISLs.
2. All ports in a 48-port 4-Gbps switching module can operate in dedicated rate mode with a 1-Gbps operating speed. However, if you configure one or more ports to operate in 2-Gbps or 4-Gbps dedicated rate mode, some of the other ports in the port group would have to operate in shared mode.
3. All ports in a 24-port 4-Gbps switching module can operate in dedicated rate mode with a 2-Gbps operating speed. However, if you configure one or more ports to operate in 4-Gbps dedicated rate mode, some of the other ports in the port group would have to operate in shared mode

Dedicated Rate Mode

When port rate mode is configured as dedicated, a port is allocated required fabric bandwidth and related resources to sustain line rate traffic at the maximum operating speed configured for the port. In this mode, ports do not use local buffering and all receive buffers are allocated from a global buffer pool (see the "Buffer Pools" section on page 6-2).

Table 5-4 shows the bandwidth provided by the various port speed configurations on the 8-Gbps Fibre Channel switching modules.

Table 5-4 Bandwidth Reserved for the Port Speeds on Generation 3 Switching Modules

Configured Speed	Reserved Bandwidth
Auto	8 Gbps
8-Gbps	
Auto with 4-Gbps maximum	4 Gbps
4-Gbps	
Auto with 2-Gbps maximum	2 Gbps
2-Gbps	
1-Gbps	1 Gbps

Table 5-5 shows the amount of bandwidth reserved for a configured port speed on 4-Gbps switching modules.

Table 5-5 Bandwidth Reserved for the Port Speeds on Generation 2 Switching Modules

Configured Speed	Reserved Bandwidth
Auto	4 Gbps
4-Gbps	
Auto with 2-Gbps maximum	2 Gbps
2-Gbps	
1-Gbps	1 Gbps

Note The 4-Port 10-Gbps Fibre Channel module ports in auto mode only support auto speed mode at 10 Gbps.

Shared Rate Mode

When port rate mode is configured as shared, multiple ports within a port group share data paths to the switch fabric so that fabric bandwidth and related resources are shared. Often, the available bandwidth to the switch fabric may be less than the negotiated operating speed of a port. Ports in this mode use local buffering for the BB_credit buffers.

All ports in 4-Gbps Fibre Channel switching modules where bandwidth is shared support 1-Gbps, 2-Gbps, or 4-Gbps traffic. However, it is possible to configure one or more ports in a port group to operate in dedicated rate mode with 1-Gbps, 2-Gbps or 4-Gbps operating speed.

All ports in the 48-Port and 24-Port 8-Gbps Fibre Channel switching modules where bandwidth is shared support 1-Gbps, 2-Gbps, 4-Gbps, or 8-Gbps traffic.

In the 4/44-Port 8-Gbps Host-Optimized Fibre Channel switching module, all the ports where bandwidth is shared support 1-Gbps, 2-Gbps, 4-Gbps in a maximum of 44 ports, or 8 Gbps in a maximum of 4 ports.

Dedicated Rate Mode Configurations for the 8-Gbps Modules

Table 5-6 shows the maximum possible dedicated rate mode configuration scenarios for the Generation 3 Fibre Channel modules.

Table 5-6 Dedicated Rate Mode Bandwidth Reservation for Generation 3 Fibre Channel Modules

Part Number	Product Name/ Description	Dedicated Bandwidth per Port	Maximum Allowed Ports that can come up	Ports in Shared Mode
DS-X9224-96K9	24-port 8-Gbps Fibre Channel switching module	8 Gbps	8 Ports	All the remaining ports are 8 Gbps shared.
		4 Gbps	24 Ports	
DS-X9248-96K9	48-port 8-Gbps Fibre Channel switching module	8 Gbps	8 Ports	All the remaining ports are 8 Gbps shared.
		4 Gbps	24 Ports	
		2 Gbps	48 Ports	

Table 5-6 Dedicated Rate Mode Bandwidth Reservation for Generation 3 Fibre Channel Modules (continued)

Part Number	Product Name/ Description	Dedicated Bandwidth per Port	Maximum Allowed Ports that can come up	Ports in Shared Mode
DS-X9248-48K9	4/44-port 8-Gbps Host-Optimized Fibre Channel switching module	8 Gbps	4 Ports	All the remaining ports are 4 Gbps shared (8 Gbps of bandwidth can be provided only to one port per port group in Dedicated or Shared rate mode).
		4 Gbps	12 Ports	
		2 Gbps	24 Ports	
		1 Gbps	48 Ports	
DS-X9248-256K9	48-port 8-Gbps Advanced Fibre Channel switching module	10 Gbps	24 Ports	All the remaining ports are 8 Gbps shared.
		8 Gbps	32 Ports	
		4 Gbps	48 Ports	
		2 Gbps	48 Ports	
		1 Gbps	48 Ports	
DS-X9232-256K9	32-port 8-Gbps Advanced Fibre Channel switching module	10 Gbps	24 Ports	All the remaining ports are 8 Gbps shared.
		8 Gbps	32 Ports	
		4 Gbps	32 Ports	
		2 Gbps	32 Ports	
		1 Gbps	32 Ports	

Port Speed

The port speed on an interface, combined with the rate mode, determines the amount of shared resources available to the ports in the port group on a 48-port, 24-port 4-Gbps, or any 8-Gbps Fibre Channel switching module. Especially in the case of dedicated rate mode, the port group resources are reserved even though the bandwidth is not used. For example, on Generation 2 modules, if an interface is configured for autosensing (auto) and dedicated rate mode, then 4 Gbps of bandwidth is reserved even though the maximum operating speed is 2 Gbps. For the same interface, if autosensing with a maximum speed of 2 Gbps (auto max 2000) is configured, then only 2 Gbps of bandwidth is reserved and the unused 2 Gbps is shared with the other interface in the port group.

Note

- The Generation 2, 4-port 10-Gbps switching module supports 10-Gbps traffic only.
- On Generation 3, 8-Gbps modules, setting the port speed to auto enables autosensing, which negotiates to a maximum speed of 8 Gbps.
- On Generation 2, 4-Gbps modules, setting the port speed to auto enables autosensing, which negotiates to a maximum speed of 4 Gbps.

Dynamic Bandwidth Management

On port switching modules where bandwidth is shared, the bandwidth available to each port within a port group can be configured based on the port rate mode and speed configurations. Within a port group, some ports can be configured in dedicated rate mode while others operate in shared mode.

Ports configured in dedicated rate mode are allocated the required bandwidth to sustain a line rate of traffic at the maximum configured operating speed, and ports configured in shared mode share the available remaining bandwidth within the port group. Bandwidth allocation among the shared mode ports is based on the operational speed of the ports. For example, if four ports operating at speeds 1 Gbps, 1 Gbps, 2 Gbps, and 4 Gbps share bandwidth of 8 Gbps, the ratio of allocation would be 1:1:2:4.

Unutilized bandwidth from the dedicated ports is shared among only the shared ports in a port group as per the ratio of the configured operating speed. A port cannot be brought up unless the reserved bandwidth is quaranteed for the shared ports (see Table 5-7). For dedicated ports, configured bandwidth is taken into consideration while calculating available bandwidth for the port group. This behavior can be changed using bandwidth fairness by using the **rate-mode bandwidth-fairness module** *number* command.

For example, consider a 48-port 8-Gbps module. This module has 6 ports per port group with 12.8 Gbps bandwidth. Ports three to six are configured at 4 Gbps. If the first port is configured at 8 Gbps dedicated rate mode, and the second port is configured at 4-Gbps dedicated rate mode, then no other ports can be configured at 4 Gbps or 8 Gbps because the left over bandwidth of 0.8 Gbps (12.8-(8+4)) cannot meet the required 0.96 Gbps for the remaining four ports. A minimum of 0.24 Gbps reserved bandwidth is required for the for the rest of the four ports. However, if the two ports (for example, 5 and 6) are taken out of service (which is not same as shutdown), required reserved bandwidth for the two ports (3 and 4) is 0.48 and port 2 can be configured at 4 Gbps in dedicated rate mode. This behavior can be overridden by the bandwidth fairness command in which case reserved bandwidth is not enforced. Once the port is up, ports 3 and 4 can share the unutilized bandwidth from ports 1 and 2.

Bandwidth Reservation: 48-Port 96-Gbps Fibre Channel Module

RateMode Config Macro	Description
Dedicated 4 Gbps on the first port of each group and the remaining ports 8 Gbps shared	Allocates a rate mode of 4 Gbps on the first port of each group and the remaining ports share 8 Gbps depending on the operational speed of the ports.
Dedicated 8 Gbps on the first port of each group and the remaining ports 8 Gbps shared	Allocates a rate mode of 8 Gbps on the first port of each group and the remaining ports share 8 Gbps depending on the operational speed of the ports.
Shared 8 Gbps on all ports (initial and default settings)	Allocates a rate mode of 8 Gbps on all the available ports. This is the default setting.

Bandwidth Reservation: 48-Port 48-Gbps Fibre Channel Module

RateMode Config Macro	Description
Dedicated 2 Gbps on the first port of each group and the remaining ports 4 Gbps shared	Allocates a rate mode of 2 Gbps on the first port of each group and the remaining ports share 4 Gbps depending on the operational speed of the ports.
Dedicated 8 Gbps on the first port of each group and the remaining ports 4 Gbps shared	Allocates a rate mode of 8 Gbps on the first port of each group and the remaining ports share 4 Gbps depending on the operational speed of the ports.
Shared auto with maximum of 4 Gbps on all ports (initial and default settings)	Allocates a maximum rate mode of 4 Gbps on all the available ports. This is the default setting.

Bandwidth Reservation: 24-Port 48-Gbps Fibre Channel Module

RateMode Config Macro	Description
Dedicated 8 Gbps on the first port of each group and the remaining ports 8 Gbps shared	Allocates a rate mode of 8Gbps on the first port of each group and the remaining ports share 8 Gbps depending on the operational speed of the ports.
Shared Auto on all ports (initial and default settings)	Allocates a rate mode of 8 Gbps on all the available ports. This is the default setting.

Bandwidth Reservation: 48-Port 256-Gbps Fibre Channel Module

RateMode Config Macro	Description
Dedicated 8 Gbps on the first 4 ports in each 6-port port group and the remaining ports 8 Gbps shared	Allocates a rate mode of 8 Gbps on the first 4 ports in each 6-port port group and the remaining ports share 8 Gbps depending on the operational speed of the ports.
Dedicated 8 Gbps on the first port of each group and the remaining ports 8 Gbps shared	Allocates a rate mode of 8 Gbps on the first port of each group and the remaining ports share 8 Gbps depending on the operational speed of the ports.
Shared 8 Gbps on all ports	Allocates a rate mode of 8 Gbps on all the available ports. This is the default setting.

RateMode Config Macro	Description
Dedicated 4 Gbps on all ports	Allocates a rate mode of 4 Gbps on all the available ports.
Dedicated 10 Gbps on following ports: • 4, 5, 6, 7, 8, 10 (ports 1,2, 3, 9, 11, 12 disabled) • 16, 17, 18, 19, 20, 22 (ports 13, 14, 15, 21, 23, 24 disabled) • 28, 29, 30, 31, 32, 34 (ports 25, 26, 27, 33, 35, 36 disabled) • 40, 41, 42, 43, 44, 46 (ports 37, 38, 39, 45, 47, 48 disabled)	Allocates a rate mode of 10 Gbps on all the available ports.

Bandwidth Reservation: 32-Port 256-Gbps Fibre Channel Module

RateMode Config Macro	Description
Dedicated 8 Gbps on all ports — initial and default settings	Allocates a rate mode of 8 Gbps on all the available ports.
Shared 8 Gbps on all ports—initial and default settings	Allocates a rate mode of shared 8 Gbps on all the available ports.
Dedicated 10 Gbps on following ports: • 2, 3, 4, 5, 6, 8 (ports 1 and 7 disabled) • 10, 11, 12, 13, 14, 16 (ports 9 and 15 disabled) • 18, 19, 20, 21, 22, 24 (ports 17 and 23 disabled) • 26, 27, 28, 29, 30, 32 (ports 25 and 31 disabled)	Allocates a rate mode of 10Gbps on the following ports.

Out-of-Service Interfaces

On supported modules and fabric switches, you might need to allocate all the shared resources for one or more interfaces to another interface in the port group or module. You can take interfaces out of service to release shared resources that are needed for dedicated bandwidth. When an interface is taken out of service, all shared resources are released and made available to the other interface in the port group or module. These shared resources include bandwidth for the shared mode port, rate mode, BB_credits, and extended BB_credits. All shared resource configurations are returned to their default values when the interface is brought back into service. Corresponding resources must be made available in order for the port to be successfully returned to service.

Caution If you need to bring an interface back into service, you might disrupt traffic if you need to release shared resources from other interfaces in the same port group.

Oversubscription Ratio Restrictions

The 48-port and 24-port 4-Gbps, and all 8-Gbps Fibre Channel switching modules support oversubscription on switches with shared rate mode configurations. By default, all 48-port and 24-port 4-Gbps, and 8-Gbps Fibre Channel switching modules have restrictions on oversubscription ratios enabled. As of Cisco SAN-OS Release 3.1(1) and NX-OS Release 4.1(1), you can disable restrictions on oversubscription ratios.

Table 5-7 describes the bandwidth allocation for oversubscribed interfaces configured in shared mode on the 4-Gbps and 8-Gbps modules.

Table 5-7 Bandwidth Allocation for Oversubscribed Interfaces

Switching Module	Configured Speed	Reserved Bandwidth (Gbps)		Maximum Bandwidth (Gbps)
		Ratios enabled	Ratios disabled	
48-Port 8-Gbps Fibre Channel Module	Auto 8 Gbps	0.36	0.2	8
	Auto Max 4 Gbps	0.24	0.1	4
	Auto Max 2 Gbps	0.12	0.05	2
24-Port 8-Gbps Fibre Channel Module	Auto 8 Gbps	0.8	0.8	8
	Auto Max 4 Gbps	0.4	0.4	4
	Auto Max 2 Gbps	0.2	0.2	2
4/44-Port 8-Gbps Host-Optimized Fibre Channel Module	8 Gbps	0.87	0.16	8
	Auto Max 4 Gbps	0.436	0.08	4
	Auto Max 2 Gbps	0.218	0.04	2
	1 Gbps	0.109	0.02	1
48-port 4-Gbps Fibre Channel switching module	Auto 4 Gbps	0.8	0.09	4
	Auto Max 2 Gbps	0.4	0.045	2
	1 Gbps	0.2	0.0225	1
24-port 4-Gbps Fibre Channel switching module	Auto 4 Gbps	1	0.27	4
	Auto Max 2 Gbps	0.5	0.135	2
	1 Gbps	0.25	0.067	1

All ports in the 48-port and 24-port 4-Gbps modules can be configured to operate at 4 Gbps in shared mode even if other ports in the port group are configured in dedicated mode, regardless of available bandwidth. However, when oversubscription ratio restrictions are enabled, you may not have all shared 4-Gbps module ports operating at 4 Gbps.

All ports in the 48-port and 24-port 8-Gbps modules can be configured to operate at 8 Gbps in shared mode even if other ports in the port group are configured in dedicated mode, regardless of available bandwidth. However, when oversubscription ratio restrictions are enabled you may not have all shared 8-Gbps module ports operating at 8 Gbps.

On the 48-port and 24-port 8-Gbps modules, if you have configured one 8-Gbps dedicated port in one port group, no other ports in the same port group can be configured to operate at 8-Gbps dedicated mode. You can have any number of 8-Gbps shared and 4-Gbps dedicated or shared ports. On the 4/44-port 8-Gbps module, only one port per port group can be configured in 8-Gbps dedicated or shared mode.

In the following example, a 24-port 4-Gbps module has oversubscription ratios enabled and three dedicated ports in one port group operating at 4-Gbps. No other ports in the same port group can be configured to operate at 4 Gbps.

For dedicated ports, oversubscription ratio restrictions do not apply to the shared pool in port groups. So if oversubscription ratio restrictions are disabled, and you have configured three 4-Gbps dedicated ports in one port group, then you can configure all other ports in the same port group to operate at a shared rate of 4 Gbps.

When disabling restrictions on oversubscription ratios, all ports in shared mode on 48-port and 24-port 4-Gbps or any 8-Gbps Fibre Channel switching modules must be shut down. When applying restrictions on oversubscription ratios, you must take shared ports out of service.

Note When restrictions on oversubscription ratios are disabled, the bandwidth allocation among the shared ports is proportionate to the configured speed. If the configured speed is auto on Generation 2 modules, then bandwidth is allocated assuming a speed of 4 Gbps. For example, if you have three shared ports configured at 1, 2, and 4 Gbps, then the allocated bandwidth ratio is 1:2:4.
As of Cisco SAN-OS Release 3.0 and NX-OS Release 4.1(1) or when restrictions on oversubscription ratios are enabled, the port bandwidths are allocated in equal proportions, regardless of port speed, so, the bandwidth allocation for the same three ports mentioned in the example would be 1:1:1.

Bandwidth Fairness

This feature improves fairness of bandwidth allocation among all ports and provides better throughput average to individual data streams. Bandwidth fairness can be configured per module.

As of Cisco SAN-OS Release 3.1(2), all 48-port and 24-port 4-Gbps Fibre Channel switching modules, as well as 18-port Fibre Channel/4-port Gigabit Ethernet Multiservice modules, have bandwidth fairness enabled by default. As of Cisco NX-OS Release 4.1(1), all the 8-Gbps Fibre Channel switching modules have bandwidth fairness enabled by default.

Caution When you disable or enable bandwidth fairness, the change does not take effect until you reload the module.

Note This feature is supported only on the 48-port and 24-port 4-Gbps modules, the 8-Gbps modules, and the 18/4-port Multiservice Module (MSM).

Upgrade or Downgrade Scenario

When you are upgrading from a release earlier than Cisco SAN-OS Release 3.1(2), all modules operate with bandwidth fairness disabled until the next module reload. After the upgrade, any new module that is inserted has bandwidth fairness enabled.

When you are downgrading to a release earlier than Cisco SAN-OS Release 3.1(2), all modules keep operating in the same bandwidth fairness configuration prior to the downgrade. After the downgrade, any new module that is inserted has bandwidth fairness disabled.

Note After the downgrade, any insertion of a module or module reload will have bandwidth fairness disabled.

Guidelines and Limitations

This section includes the following topics:

Combining Generation 1, Generation 2, and Generation 3 Modules

Cisco MDS NX-OS Release 4.1(1) and later supports combining Generation 1, Generation 2, and Generation 3 modules and switches with the following considerations:

- MDS NX-OS Release 4.1(1) and later features are not supported on Generation 1 switches and modules.
- Generation 3 modules do not support the following Generation 1 hardware:
  - Supervisor 1 module
  - 4-Port IP Storage Services module
  - 8-Port IP Storage Services module
  - MDS 9216 Switch
  - MDS 9216A switch
  - MDS 9020 switch
  - MDS 9120 switch
  - MDS 9140 switch
- Supervisor-1 modules must be upgraded to Supervisor-2 modules on the MDS 9506 and MDS 9509 Directors.
- IPS-4 and IPS-8 modules must be upgraded to the MSM-18/4 Multiservice modules.
- Fabric 1 modules must be upgraded to Fabric 2 modules on the MDS 9513 Director to use the 48-port or the 24-port 8-Gbps module.
- MDS DCNM-SAN Release 4.x supports MDS SAN-OS Release 3.x and NX-OS 4.x in mixed mode through Interswitch Link (ISL) connectivity.

Note When a Cisco or another vendor switch port is connected to a Generation 1 module port (ISL connection), the receive buffer-to-buffer credits of the port connected to the Generation 1 module port must not exceed 255.

Port Index Limitations

Cisco MDS 9000 switches allocate index identifiers for the ports on the modules. These port indexes cannot be configured. You can combine Generation 1, Generation 2, and Generation 3 switching modules, with either Supervisor-1 modules or Supervisor-2 modules. However, combining switching modules and supervisor modules has the following port index limitations:

- Supervisor-1 modules only support a maximum of 252 port indexes, regardless of the type of switching modules.
- Supervisor-2 modules support a maximum of 1020 port indexes when all switching modules in the chassis are Generation 2 or Generation 3.
- Supervisor-2 modules only support a maximum of 252 port indexes when only Generation 1 switching modules, or a combination of Generation 1, Generation 2, or Generation 3 switching modules, are installed in the chassis.

Note On a switch with the maximum limit of 252 as port index, any new module that exceeds the limit does not power up when installed.

Generation 1 switching modules have specific numbering requirements. If these requirements are not met, the module does not power up. The port index numbering requirements include the following:

- If port indexes in the range of 256 to 1020 are assigned to operational ports, Generation 1 switching modules do not power up.
- A block of contiguous port indexes is available. If this block of port indexes is not available, Generation 1 modules do not power up. Table 5-8 shows the port index requirements for the Generation 1 modules.

Note If the switch has Supervisor-1 modules, the block of 32 contiguous port indexes must begin on the slot boundary. The slot boundary for slot 1 is 0, for slot 2 is 32, and so on. For Supervisor-2 modules, the contiguous block can start anywhere.

Table 5-8 Port Index Requirements for Generation 1 Modules

Generation 1 Module	Number of Port Indexes Required	
	Supervisor-1 Module	Supervisor-2 Module
16-port 2-Gbps Fibre Channel module	16	16
32-port 2-Gbps Fibre Channel module	32	32
8-port Gigabit Ethernet IP Storage Services module	32	32
4-port Gigabit Ethernet IP Storage Services module	32	16
32-port 2-Gbps Fibre Channel Storage Services Module (SSM).	32	32
14-port Fibre Channel/2-port Gigabit Ethernet Multiprotocol Services (MPS-14/2) module	32	22

The allowed mix of Generation 1 and Generation 2 switching modules in a chassis is determined at run-time, either when booting up the switch or when installing the modules. In some cases, the sequence in which switching modules are inserted into the chassis determines if one or more modules is powered up.

When a module does not power up because of a resource limitation, you can see the reason by viewing the module information in the Information pane.

For information on recovering a module powered-down because port indexes are not available, refer to the *Cisco MDS 9000 Family Troubleshooting Guide*.

Tip Whenever using mixed Generation 1 and Generation 2 modules, power up the Generation 1 modules first. During a reboot of the entire switch, the Generation 1 modules power up first (default behavior).

PortChannel Limitations

PortChannels have the following restrictions:

- The maximum number of PortChannels allowed is 256 if all switching modules are Generation 2 or Generation 3, or both.
- The maximum number of PortChannels allowed is 128 whenever there is a Generation 1 switching module in use with a Generation 2 or Generation 3 switching module.
- Ports need to be configured in dedicated rate mode on the Generation 2 and Generation 3 switching module interfaces to be used in the PortChannel.

Note The number of PortChannels allowed does not depend on the type of supervisor module. However, Generation 3 modules require the Supervisor 2 module on the MDS 9506 and 9509 switches.

The Generation1, Generation 2, and Generation 3 modules have the following restrictions for PortChannel configuration:

- Generation 1 switching module interfaces do not support auto speed with a maximum of 2 Gbps.
- Generation 1 and Generation 2 module interfaces do not support auto speed with maximum of 4 Gbps.
- Generation 2 and Generation 3 switching module interfaces cannot be forcefully added to a PortChannel if sufficient resources are not available.

When configuring PortChannels on switches with Generation 1, Generation 2, and Generation 3 switching modules, follow one of these procedures:

- Configure the PortChannel, and then configure the Generation 2 and Generation 3 interfaces to auto with a maximum of 2 Gbps.
- Configure the Generation 1 switching modules followed by the Generation 2 switching modules, and then the Generation 3 switching modules, and then configure the PortChannel.

When configuring PortChannels on switches with only Generation 2 and Generation 3 switching modules, follow one of these procedures:

- Configure the PortChannel, and then configure the Generation 3 interfaces to auto with a maximum of 4 Gbps.

- Configure the Generation 2 switching modules, followed by the Generation 3 switching modules, and then configure the PortChannel.

Table 5-9 describes the results of adding a member to a PortChannel for various configurations.

Table 5-9 PortChannel Configuration and Addition Results

PortChannel Members	Configured Speed		New Member Type	Addition Type	Result
	PortChannel	New Member			
No members	Any	Any	Generation 1 or Generation 2 or Generation 3	Force	Pass
	Auto	Auto	Generation 1 or Generation 2 or Generation 3	Normal or force	Pass
	Auto	Auto max 2000	Generation 2 or Generation 3	Normal	Fail
				Force	Pass or fail[1]
	Auto	Auto max 4000	Generation 3		
	Auto max 2000	Auto	Generation 2 or Generation 3	Normal	Fail
				Force	Pass
	Auto max 2000	Auto max 4000	Generation 3		
	Auto max 4000	Auto	Generation 2 or Generation 3		
	Auto max 4000	Auto max 2000	Generation 2 or Generation 3		
Generation 1 interfaces	Auto	Auto	Generation 2 or Generation 3	Normal	Fail
				Force	Pass
	Auto max 2000	Auto	Generation 1	Normal or force	Pass
	Auto max 2000	Auto	Generation 2 or Generation 3	Normal	Fail
				Force	Pass or fail[1]
	Auto max 4000	Auto	Generation 1 or Generation 2		
	Auto max 4000	Auto	Generation 3		
Generation 2 interfaces	Auto	Auto	Generation 1	Normal or force	Fail
	Auto max 2000	Auto	Generation 1	Normal or force	Pass
	Auto max 2000	Auto	Generation 2 or Generation 3	Normal	Fail
				Force	Pass
	Auto	Auto max 2000	Generation 2 or Generation 3	Normal	Fail
				Force	Pass

Table 5-9 PortChannel Configuration and Addition Results (continued)

PortChannel Members	Configured Speed		New Member Type	Addition Type	Result
	PortChannel	New Member			
Generation 3 interfaces	Auto	Auto	Generation 1	Normal or force	Fail
	Auto max 2000	Auto	Generation 1	Normal or force	Pass
	Auto max 2000	Auto	Generation 2	Normal	Fail
				Force	Pass
	Auto	Auto max 2000	Generation 2	Normal	Fail
				Force	Pass
	Auto max 2000	Auto	Generation 3	Normal	Fail
				Force	Pass
	Auto	Auto max 2000	Generation 3	Normal	Fail
				Force	Pass

1. If resources are not available.

Default Settings

Table 5-10 lists the default settings for Generation 2 interface parameters.

Table 5-10 Default Generation 2 Interface Parameters

Parameter	Default			
	48-Port 4-Gbps Switching Module	24-Port 4-Gbps Switching Module	12-Port 4-Gbps Switching Module	4-Port 10-Gbps Switching Module
Speed mode	**auto**[1]	**auto**[1]	**auto**[1]	**auto**[2]
Rate mode	**shared**	**shared**	**dedicated**	**dedicated**
Port mode	Fx	Fx	auto[3]	auto[4]
BB_credit buffers	16	16	250	250
Performance buffers	–	–	145[5]	145[5]

1. Auto speed mode on the 4-Gbps switching modules enables autosensing and negotiates to a maximum speed of 4 Gbps.
2. The 4-port 10-Gbps switching module only supports 10-Gbps traffic.
3. Auto port mode on the 12-port 4-Gbps switching module interfaces can operate in E port mode, TE port mode, and Fx port mode.
4. Auto port mode on the 4-port 10-Gbps switching module interfaces can operate in E port mode, TE port mode, and F port mode.
5. Performance buffers are shared among all ports on the module.

Table 5-11 lists the default settings for Generation 3 interface parameters.

Table 5-11 Default Generation 3 Interface Parameters

Parameter	Default		
	48-Port 8-Gbps Switching Module	24-Port 8-Gbps Switching Module	4/44-Port 8-Gbps Host-Optimized Switching Module
Speed mode	**auto**[1]	**auto**[1]	**auto_max_4G**[2]
Rate mode	**shared**	**shared**	**shared**
Port mode	Fx	Fx	Fx
BB_credit buffers	32	32	32

1. Auto speed mode on the 8-Gbps switching modules enables autosensing and negotiates to a maximum speed of 8 Gbps.
2. Auto_max_4G speed mode on the 4/44-port 8-Gbps switching module negotiates to a maximum speed of 4 Gbps.

Configuring Fibre Channel Interfaces

This section includes the following topics:

Task Flow for Migrating Interfaces from Shared Mode to Dedicated Mode

The 48-Port, 24-Port, and 4/44-Port 8-Gbps Fibre Channel switching modules support the following features:

- 1-Gbps, 2-Gbps, 4-Gbps, and 8-Gbps speed traffic
- Shared and dedicated rate mode
- ISL and Fx port modes
- Extended BB_credits

The 48-port and 24-port 4-Gbps Fibre Channel switching modules support the following features:

- 1-Gbps, 2-Gbps, and 4-Gbps speed traffic
- Shared and dedicated rate mode
- ISL (E or TE) and Fx (F or FL) port modes
- Extended BB_credits

Note If you change the port bandwidth reservation parameters on a 48-port or 24-port 4-Gbps module, the change affects only the changed port. No other ports in the port group are affected.

To configure the 4-Gbps and 8-Gbps Fibre Channel switching modules when starting with the default configuration or when migrating from shared rate mode to dedicated rate mode, follow these steps:

Step 1 Take unused interfaces out of service to release resources for other interfaces, if necessary.

See the "Taking Interfaces Out of Service" section on page 5-27.

Step 2 Configure the traffic speed to use (1 Gbps, 2 Gbps, 4 Gbps, 8 Gbps, or autosensing with a maximum of 2 Gbps or 4 Gbps).

See the "Configuring Port Speed" section on page 5-23.

Step 3 Configure the rate mode (dedicated or shared).

See the "Configuring Rate Mode" section on page 5-24.

Step 4 Configure the port mode.

See the "Configuring Interface Modes" section on page 2-22.

Note ISL ports cannot operate in shared rate mode.

Step 5 Configure the BB_credits and extended BB_credits, as necessary.

See the "Configuring Buffer-to-Buffer Credits" section on page 6-20 and the "Configuring Extended BB_credits" section on page 6-22.

Task Flow for Migrating Interfaces from Dedicated Mode to Shared Mode

To configure the 4-Gbps and 8-Gbps Fibre Channel switching modules migrating from dedicated rate mode to shared rate mode, follow these steps:

Step 1 Take unused interfaces out of service to release resources for other interfaces, if necessary.

See the "Taking Interfaces Out of Service" section on page 5-27.

Step 2 Configure the BB_credits and extended BB_credits, as necessary.

See the "Configuring Buffer-to-Buffer Credits" section on page 6-20, and the "Extended BB_Credits" section on page 6-16.

Step 3 Configure the port mode.

See the "Configuring Interface Modes" section on page 2-22.

Note ISL ports cannot operate in shared rate mode.

Step 4 Configure the rate mode (dedicated or shared) to use.

See the "Configuring Rate Mode" section on page 5-24.

Step 5 Configure the traffic speed (1 Gbps, 2 Gbps, 4 Gbps, or autosensing with a maximum of 2 Gbps or 4 Gbps) to use.

See the "Configuring Port Speed" section on page 5-23.

Task Flow for Configuring 12-Port 4-Gbps Module Interfaces

The 12-port 4-Gbps switching modules support the following features:

- 1-Gbps, 2-Gbps, and 4-Gbps speed traffic
- Only dedicated rate mode
- ISL (E or TE) and Fx (F or FL) port modes
- Extended BB_credits
- Performance buffers

To configure 4-port 10-Gbps switching modules when starting with the default configuration, follow these steps:

Step 1 Configure the traffic speed (1 Gbps, 2 Gbps, 4 Gbps, or autosensing with a maximum of 2 Gbps or 4 Gbps) to use.

See the "Configuring Port Speed" section on page 5-23.

Step 2 Configure the port mode.

See the "Configuring Interface Modes" section on page 2-22.

Step 3 Configure the BB_credits, performance buffers, and extended BB_credits, as necessary.

See the "Configuring Buffer-to-Buffer Credits" section on page 6-20, and the "Configuring Extended BB_credits" section on page 6-22.

Task Flow for Configuring 4-Port 10-Gbps Module Interfaces

The 4-port 10-Gbps switching modules support the following features:

- Only 10-Gbps speed traffic
- Only dedicated rate mode
- ISL (E or TE) and F port modes
- Extended BB_credits
- Performance buffers

To configure 4-port 10-Gbps switching modules when starting with the default configuration, follow these steps:

Step 1 Configure the port mode.

See the "Configuring Interface Modes" section on page 2-22.

Step 2 Configure the BB_credits, performance buffers, and extended BB_credits, as necessary.

See the "Configuring Buffer-to-Buffer Credits" section on page 6-20, and the "Configuring Extended BB_credits" section on page 6-22.

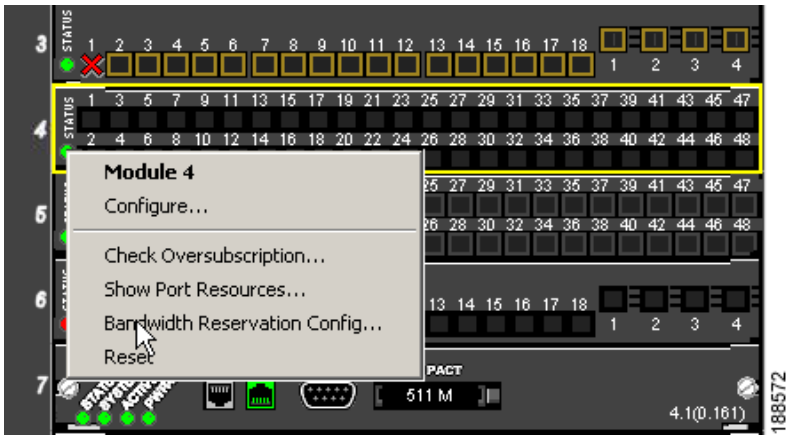
Reserving Bandwidth Quickly for the 8-Gbps Module Interfaces

Detailed Steps

To quickly reserve bandwidth for all the ports in the port groups on the Generation 3 Fibre Channel modules using the Device Manager, follow these steps:

Step 1 In the Device Manager window, right-click the 8-Gbps Fibre Channel module.

Figure 5-1 Device Manager - 8 Gbps Module - Pop-Up Menu



Step 2 From the popup menu, select **Bandwidth Reservation Config...**

Step 3 In the Bandwidth Reservation Configuration dialog box that is displayed, choose a bandwidth reservation scheme. (Figure 5-2).

Figure 5-2 RateMode Configuration Dialog Box

Table 5-12 describes the default RateMode configuration schemes available in the Bandwidth Reservation Configuration dialog box for the 8-Gbps modules.

Table 5-12 RateMode Configuration Schemes

Module	Available RateMode Config Macros
DS-X9248-96K9 48-Port 8-Gbps Fibre Channel module	• Dedicated 4 Gbps on the first port of each group and the remaining ports 8 Gbps shared • Dedicated 8 Gbps on the first port of each group and the remaining ports 8 Gbps shared • Shared 8 Gbps on all ports (initial and default settings)
DS-X9224-96K9 24-Port 8-Gbps Fibre Channel module	• Dedicated 8 Gbps on the first port of each group and the remaining ports 8G shared • Shared Auto[1] on all ports (initial and default settings)
DS-X9248-48K9 4/44-Port 8-Gbps Host-Optimized Fibre Channel module	• Dedicated 2 Gbps on the first port of each group and the remaining ports 4 Gbps shared • Dedicated 8 Gbps on the first port of each group and the remaining ports 4 Gbps shared • Shared Auto with Maximum of 4 Gbps on all ports (initial and default settings)

1. Auto is 8 Gbps.

Step 4 Click **Apply**.

Configuring Port Speed

Restrictions

- Changing port speed and rate mode disrupts traffic on the port. Traffic on other ports in the port group is not affected.

Detailed Steps

To configure dedicated bandwidth on an interface using DCNM-SAN, follow these steps:

Step 1 From the Fabric pane, select a switch or select a group of switches (SAN, fabric, VSAN) from the Logical Domains pane.

Step 2 Expand **Switches,** expand **FC Interfaces** and select **Physical** from the Physical Attributes pane.

You see the **Physical > General** tab in the Interfaces pane.

Step 3 Scroll until you see the row containing the switch and port you want to configure.

Step 4 Select auto, 1Gb, 4Gb, or autoMax2G from the Speed Admin column.

Note The Generation 3, 8-Gbps Fibre Channel switching modules support the following speed configurations: 1G, 2G, 4G, 8G, autoMax2G, autoMax4G and the auto speed configuration configures autosensing for the interface with 8 Gbps of bandwidth reserved.

The auto parameter enables autosensing on the interface. The autoMax2G parameter enables autosensing on the interface with a maximum speed of 2 Gbps.

Note If you change the port bandwidth reservation parameters on a 48-port or 24-port 4-Gbps, or any 8-Gbps Fibre Channel switching module, the change affects only the changed port. No other ports in the port group are affected.

Step 5 Click the **Apply Changes** icon.

Configuring Rate Mode

Restrictions

- Changing port speed and rate mode disrupts traffic on the port.

Detailed Steps

To configure the rate mode (dedicated or shared) on an interface on a 4-Gbps or 8-Gbps Fibre Channel switching module using DCNM-SAN, follow these steps:

Step 1 Select a switch from the Fabric pane, or select a group of switches (SAN, fabric, VSAN) from the Logical Domains pane.

Step 2 Expand **Switches > FC Interfaces** and then select **Physical** from the Physical Attributes pane.

You see the **Physical > General** tab in the Interfaces pane.

Step 3 Scroll until you see the row containing the switch and port you want to configure.

Step 4 Select **dedicated** or **shared** from the Rate Mode column.

Step 5 Click the **Apply Changes** icon.

Disabling Restrictions on Oversubscription Ratios

Prerequisites

- Before disabling restrictions on oversubscription ratios, ensure that you have explicitly shut down shared ports.

Restrictions

- This feature is only supported on 48-port and 24-port 4-Gbps, and 8-Gbps Fibre Channel switching modules.

Detailed Steps

To disable restrictions on oversubscription ratios on multiple 48-port or 24-port 4-Gbps, or any 8-Gbps Fibre Channel switching modules using DCNM-SAN, follow these steps:

Step 1 Choose **Switches > Hardware**.

Step 2 Click the **Module Config** tab. You see the Module Config dialog box.

Step 3 From the RateModeOversubscriptionLimit drop-down list, select **disabled** for each module for which you want to disable restrictions on oversubscription ratios.

Step 4 Click **Apply** to save the changes.

To disable restrictions on oversubscription ratios on a single 48-port or 24-port 4-Gbps, or any 8-Gbps Fibre Channel switching module using Device Manager, follow these steps:

Step 1 Right-click a module and select **Configure**.

You see the Module dialog box.

Step 2 Click the **disabled** radio button to disable restrictions on oversubscription ratios.

Step 3 Click **Apply** to save the changes.

Enabling Restrictions on Oversubscription Ratios

Prerequisites

- You must enable restrictions on oversubscription ratios before you can downgrade modules to a previous release.
- Before enabling restrictions on oversubscription ratios, ensure that you have explicitly configured shared ports to out-of-service mode.

Detailed Steps

To enable restrictions on oversubscription ratios on multiple 48-port or 24-port 4-Gbps, or any 8-Gbps Fibre Channel switching modules using DCNM-SAN, follow these steps:

Step 1 Choose **Switches > Hardware**.

Step 2 Click the **Module Config** tab. You see the Module Config dialog box.

Step 3 From the RateMode Oversubscription Limit drop-down list, select **enabled** for each module for which you want to enable restrictions on oversubscription ratios.

Step 4 Click **Apply** to save the changes.

To enable restrictions on oversubscription ratios on a single 48-port or 24-port 4-Gbps, or any 8-Gbps Fibre Channel switching module using Device Manager, follow these steps:

Step 1 Right-click a module and select **Configure**.

You see the Module dialog box.

Step 2 Click the **enabled** radio button to enable restrictions on oversubscription ratios.

Step 3 Click **Apply** to save the changes.

Enabling Bandwidth Fairness

Detailed Steps

To enable bandwidth fairness on multiple 48-port or 24-port 4-Gbps, or any 8-Gbps Fibre Channel switching modules using DCNM-SAN, follow these steps:

Step 1 Choose **Switches > Hardware**.

Step 2 Click the **Module Config** tab. You see the Module Config dialog box.

Step 3 From the BandwidthFairness Admin drop-down list, select **enable** for each module for which you want to enable bandwidth fairness.

Step 4 Click **Apply** to save the changes.

To enable bandwidth fairness on a single 48-port or 24-port 4-Gbps Fibre Channel switching module using Device Manager, follow these steps:

Step 1 Right-click a module and select **Configure**.

You see the Module dialog box.

Step 2 Click the **enable** radio button to enable bandwidth fairness.

Step 3 Click **Apply** to save the changes.

Disabling Bandwidth Fairness

Restrictions

- If you disable bandwidth fairness, up to a 20 percent increase in internal bandwidth allocation is possible for each port group; however, bandwidth fairness is not guaranteed when there is a mix of shared and full-rate ports in the same port group.

Detailed Steps

To disable bandwidth fairness on multiple 48-port or 24-port 4-Gbps, or 8-Gbps Fibre Channel switching modules using DCNM-SAN, follow these steps:

Step 1 Choose **Switches** > **Hardware**.

Step 2 Click the **Module Config** tab. You see the Module Config dialog box.

Step 3 From the BandwidthFairness Admin drop-down list, select **disable** for each module for which you want to disable bandwidth fairness.

Step 4 Click **Apply** to save the changes.

To disable bandwidth fairness on a single 48-port or 24-port 4-Gbps, or 8-Gbps Fibre Channel switching module using Device Manager, follow these steps:

Step 1 Right-click a module and select **Configure**.

You see the Module dialog box.

Step 2 Click the **disable** radio button to disable bandwidth fairness.

Step 3 Click **Apply** to save the changes.

Taking Interfaces Out of Service

You can take interfaces out of service on Generation 2 and Generation 3 switching modules. When an interface is out of service, all the shared resources for the interface are released as well as the configuration associated with those resources.

Prerequisites

- The interface must be disabled before it can be taken out of service.

Restrictions

- The interface cannot be a member of a PortChannel.

- Taking interfaces out of service releases all the shared resources to ensure that they are available to other interfaces. This causes the configuration in the shared resources to revert to default when the interface is brought back into service. Also, an interface cannot come back into service unless the default shared resources for the port are available. The operation to free up shared resources from another port is disruptive.

Detailed Steps

To take an interface out of service using DCNM-SAN, follow these steps:

Step 1 Select a switch from the Fabric pane, or select a group of switches (SAN, fabric, VSAN) from the Logical Domains pane.

Step 2 Expand **Switches**, and expand **FC Interfaces > Physical** in the Physical Attributes pane.

Step 3 Click **General** tab. You see the **General** tab information in the Information pane.

Step 4 Scroll down until you see the row containing the switch and port you want to configure.

Step 5 Scroll right (if necessary) until you see the **Status Service** column.

Step 6 Select **in** or **out** from the Status Service column.

Step 7 Click the **Apply Changes** icon.

Releasing Shared Resources in a Port Group

When you want to reconfigure the interfaces in a port group on a Generation 2 or Generation 3 module, you can return the port group to the default configuration to avoid problems with allocating shared resources.

Restrictions

- The interface cannot be a member of a PortChannel.
- Releasing shared resources disrupts traffic on the port. Traffic on other ports in the port group is not affected.

Detailed Steps

To release the shared resources for a port group using DCNM-SAN, follow these steps:

Step 1 Select a switch from the Fabric pane, or select a group of switches (SAN, fabric, VSAN) from the Logical Domains pane.

Step 2 Expand **Switches**, and expand **FC Interfaces > Physical** in the Physical Attributes pane.

Step 3 Click **General** tab. You see the **General** tab information in the Information pane.

Step 4 Scroll down until you see the row containing the switch and port you want to configure.

Step 5 Scroll right (if necessary) until you see the **Status Service** column.

Step 6 Select the status **out** from the **Status Service** column.

Step 7 Click the **Apply Changes** icon.

Step 8 Select the status **in** from the **Status Service** column.

Step 9 Click the **Apply Changes** icon.

Verifying Fibre Channel Interfaces Configuration

Displaying SFP Diagnostic Information

Displaying Diagnostics for Multiple Ports

To view diagnostic information for multiple ports using Device Manager, follow these steps:

Step 1 Choose **Interface > FC All** and click the **Diagnostics** tab or hold down the **Control** key, and then click each port for which you want to view diagnostic information.

Step 2 Right-click the selected ports, and then select **Configure**.

You see the FC Interfaces dialog box.

Step 3 Click **Refresh** to view the latest diagnostic information.

To view diagnostic information for a single port using Device Manager, follow these steps:

Step 1 Right-click a port, and then select **Configure**.

You see the port licensing options for the selected port.

Step 2 Click **Refresh** to view the latest information.