

## Configuring the Switch Fabric Modules

---

This chapter describes the integrated 720-Gbps switch fabric that is supported on Supervisor Engine 720 and the external Switch Fabric Module (WS-C6500-SFM) and Switch Fabric Module 2 (WS-X6500-SFM 2) that is supported on the Supervisor Engine 2 on the Catalyst 6500 series switches.

**Note**

---

For complete syntax and usage information for the commands that are used in this chapter, refer to the *Catalyst 6500 Series Switch Command Reference* publication.

---

This chapter uses the following terminology:

- **CEF720**—Any module that has a part number that conforms to WS-X67xx-xxx (such as WS-X6724-SFP). These modules connect to the integrated 720-Gbps switch fabric on the Supervisor Engine 720.
- **CEF256**—Any module that has a part number that conforms to WS-X65xx-xxx (such as WS-X6548-GE-TX), the Optical Services Modules, the enhanced FlexWAN module, and most service modules, such as the Firewall Services Module (FWSM), the Secure Socket Layer Services Module (SSLM), the Virtual Private Network Services Module (VPNSM), the Network Analysis Module 1 (NAM-1), the NAM-2, the Intrusion Detection System Module (IDS-2), the Content Services Gateway (CSG), and the Communications Media Module (CMM). These modules connect to either the integrated 720-Gbps switch fabric on the Supervisor Engine 720 or to the external 256-Gbps Switch Fabric Modules that are supported by the Supervisor Engine 2, and they connect to the 32-Gbps switching bus.
- **Non-fabric-enabled**—Any module that does not fall into the CEF720 or CEF256 categories. These modules have no fabric connections and connect only to the 32-Gbps switching bus.

This chapter consists of these sections:

- [Understanding How the Integrated 720-Gbps Switch Fabric Works, page 46-2](#)
- [Understanding How the External Switch Fabric Module Works, page 46-2](#)
- [Forwarding Modes, page 46-3](#)
- [Configuring and Monitoring the Integrated Switch Fabric and Switch Fabric Module on the Switch, page 46-4](#)

**Note**

---

The WS-C6500-SFM is supported in the Catalyst 6500 series 6- and 9-slot chassis only. The WS-X6500-SFM 2 is supported in the Catalyst 6500 series 6-slot, 9-slot, and 13-slot chassis and in the Catalyst 6509-NEB chassis.

---

# Understanding How the Integrated 720-Gbps Switch Fabric Works


**Note**

The integrated 720-Gbps switch fabric is supported only on Supervisor Engine 720.


**Note**

With software release 8.3(1) and later releases, in redundant systems, the integrated 720-Gbps switch fabric supports a high-availability failover to the standby switch fabric. High availability must be enabled for the failover to work (enter the **set system highavailability enable** command).

The integrated 720-Gbps switch fabric, which is built into Supervisor Engine 720, creates a dedicated connection between the CEF256 and CEF720 modules and provides an uninterrupted transmission of frames between these modules. In addition to the direct connection between the CEF256 and CEF720 modules that is provided by the integrated 720-Gbps switch fabric, these modules have a direct connection to the 32-Gbps switching bus.

# Understanding How the External Switch Fabric Module Works


**Note**

The external Switch Fabric Modules are supported only with Supervisor Engine 2 in the Catalyst 6500 series switch.

The external Switch Fabric Modules create a dedicated connection between the CEF256 modules and provide an uninterrupted transmission of frames between these modules. The external Switch Fabric Modules do not support the CEF720 modules because these modules do not work with a Supervisor Engine 2. In addition to using the Switch Fabric Module, the CEF256 modules connect to the 32-Gbps switching bus. [Table 46-1](#) lists the switch fabric connection speed for each module.

**Table 46-1** Switch Fabric Connection Speed by Module Type

Switch Fabric Type	Module Type <sup>1</sup>	
	CEF256	CEF720
Switch Fabric Module (256-Gbps)	1 x 16-Gbps	Not supported
Switch Fabric Module 2 (256-Gbps)	1 x 16-Gbps	Not supported
Integrated switch fabric on Supervisor Engine 720 (720-Gbps)	1 x 16-Gbps	1 x 40-Gbps: WS-X6724-SFP  2 x 40-Gbps: WS-X6748-GE-TX WS-X6748-SFP WS-X6704-10GE

1. The speeds shown are bidirectional.

Enter the **set system crossbar-fallback bus-mode | none** command to specify how the packets are handled if the Switch Fabric Module is removed or fails. If you specify the **bus-mode** keyword, the switching is done in flow-through mode. If you specify the **none** keyword, the switch ports are disabled and switching stops. For more detailed information, see the “[Configuring a Fallback Option](#)” section on page 46-4.

The external Switch Fabric Module does not have a console. A two-line LCD display on the front panel shows fabric utilization, software revision, and basic system information.

**Note**

The term *9-slot switch* refers to the WS-C6509-NEB and WS-C6509-NEB-A switches.

Install the WS-C6500-SFM in either slot 5 or 6 in the 6-slot and 9-slot switches. Install the WS-X6500-SFM 2 in either slot 7 or 8 in the 13-slot switches and slots 5 or 6 in the 6-slot and 9-slot switches. The Switch Fabric Module that is first installed functions as the primary module. For redundancy, you can install a standby Switch Fabric Module.

When you install two Switch Fabric Modules at the same time in a 6- or 9-slot chassis, insert the primary module into slot 5 and the backup module into slot 6. If you reset the module in slot 5, the module in slot 6 becomes active.

When you install two Switch Fabric Modules at the same time in a 13-slot chassis, insert the primary module into slot 7 and the backup module into slot 8. If you reset the module in slot 7, the module in slot 8 becomes active.

## Forwarding Modes

The CEF256/CEF720 modules operate in one of three modes when using centralized forwarding:

- Compact mode—Operational mode when all modules in the system are CEF256 or CEF720 (no non-fabric-enabled modules can be present for this mode). In this mode, the CEF256/CEF720 modules send a “compact” 32-byte header for each frame to the supervisor engine over the switching bus. Once a forwarding decision is made, the CEF256/CEF720 modules send the entire frame through the switch fabric to the egress module.
- Truncated mode—Operational mode when at least one non-fabric-enabled module is present in the system. In this mode, the CEF256/CEF720 modules send the first 64 bytes of each frame to the supervisor engine over the switching bus. Once a forwarding decision is made, the CEF256/CEF720 modules send the entire frame through the switch fabric to the egress module.
- Flow-through mode—Operational mode for the CEF256 modules when there is no switch fabric present. In this mode, the CEF256 modules send the entire packet to the supervisor engine over the switching bus. This mode is not applicable for the CEF720 modules, which require the presence of the switch fabric.

[Table 46-2](#) shows the switch modes that are used with the CEF256, CEF720, and non-fabric-enabled modules installed.

**Table 46-2 Switching Modes with Switch Fabric Module Installed**

Types of Modules Installed	Switching Modes
CEF256 or CEF720 modules (no non-fabric-enabled modules are installed)	Compact
CEF256 and/or CEF720 modules (non-fabric-enabled modules are installed)	Truncated
CEF256 and non-fabric-enabled modules	Flow-through
Non-fabric-enabled modules	Flow-through

## Configuring and Monitoring the Integrated Switch Fabric and Switch Fabric Module on the Switch

The integrated 720-Gbps switch fabric and the Switch Fabric Modules do not require any user configuration but support a number of **show** commands for monitoring purposes. A fully automated startup sequence brings the module online and runs the connectivity diagnostics on the ports.

From the supervisor engine, you can reset the module by entering the **reset module** command, disable and enable the module by entering the **set module enable | disable** command, and power down the module by entering the **set module powerdown module** command.

These sections describe how to configure the integrated 720-Gbps switch fabric and Switch Fabric Modules:

- [Configuring a Fallback Option, page 46-4](#)
- [Configuring the Switching Mode, page 46-5](#)
- [Redundancy, page 46-6](#)
- [Monitoring the Integrated Switch Fabric and Switch Fabric Module, page 46-6](#)
- [Configuring the LCD Banner, page 46-12](#)

### Configuring a Fallback Option

The **set system crossbar-fallback {bus-mode | none}** command allows you to configure a fallback option if the Switch Fabric Module connection fails.

If a switch is in compact mode, setting the crossbar-fallback to **none** prohibits the switch from running in any other switching mode. Assuming there are no non-fabric-enabled modules in the switch, the switching mode will be compact. Then if the crossbar-fallback is set to **none** and a non-fabric-enabled module is inserted, the module will not be powered up because that would force the switch out of compact mode. Also, if crossbar-fallback is set to **none** and the last Switch Fabric Module is removed, ports on all modules will be disabled. If a port fails to become disabled, the module on which it resides will be powered down. With no Switch Fabric Module, the switch cannot run in compact mode so the switch is effectively disabled since crossbar-fallback is set to **none**.

To configure a fallback option for the Switch Fabric Module, perform this task in privileged mode:

Task	Command
Configure a fallback option for the Switch Fabric Module.	<b>set system crossbar-fallback {bus-mode   none}</b>

This example shows how to configure a fallback option to bus-mode:

```
Console> (enable) set system crossbar-fallback bus-mode
System crossbar-fallback set to bus-mode.
Console> (enable)
```

## Configuring the Switching Mode

To improve performance, you can manually specify the switching mode that the system uses. If you have one or more non-fabric-enabled modules that are installed in the chassis, configure the switch to use flow-through mode. If you have only the CEF256 or CEF720 modules that are installed in the chassis, configure the switch to use compact mode.



### Note

Non-fabric-enabled modules do not support compact mode.



### Note

If there is a combination of a Supervisor Engine 720 with switch-fabric capability and CEF720 modules in the chassis, the **bus-only** operation is not permitted. The system stays in truncated mode.

To configure the switch to use flow-through mode if you have the non-fabric-enabled modules installed, perform this task:

Task	Command
Configure the switch to use flow-through mode.	<b>set system switchmode allow bus-only</b>

This example shows how to configure the switch to use flow-through mode:

```
Console> (enable) set system switchmode allow bus-only
Console> (enable)
```

To configure the switch to use truncated mode when CEF256 and/or CEF720 and non-fabric-enabled modules are installed, perform this task:

Task	Command
Configure the switch to use truncated mode.	<b>set system switchmode allow truncated</b>

This example shows how to configure the switch to use truncated mode:

```
Console> (enable) set system switchmode allow truncated
Console> (enable)
```

## Redundancy

No configuration is required for the Switch Fabric Module redundancy. The module in slot 5 functions as the primary module, and a redundant Switch Fabric Module in slot 6 automatically takes over if the primary module fails. The Catalyst 6506 and 6509 switches support a mixed redundant configuration with a WS-C6500-SFM and a WS-X6500-SFM 2. The Catalyst 6513 switch supports a redundant configuration with the WS-C6500-SFM2s only.

No configuration is required for the integrated 720-Gbps switch fabric redundancy. The integrated switch fabric in the active Supervisor Engine 720 functions as the primary switch fabric. A supervisor engine switchover will also cause a switch fabric switchover.

## Monitoring the Integrated Switch Fabric and Switch Fabric Module

This section describes how to monitor the integrated switch fabric and the Switch Fabric Module:

- [Displaying the Module Information, page 46-6](#)
- [Displaying the Fabric Channel Counters, page 46-7](#)
- [Displaying the Fabric Channel Switching Mode and Channel Status, page 46-7](#)
- [Displaying the Fabric Channel Utilization, page 46-8](#)
- [Displaying the Fabric Errors, page 46-9](#)
- [Displaying the Backplane Traffic and Fabric Channel Input and Output, page 46-10](#)
- [Displaying the Switching Mode Configuration, page 46-11](#)
- [Displaying the Integrated Switch Fabric Status, page 46-11](#)



### Note

Enter all the **show** commands that are supported by the integrated 720-Gbps switch fabric and the Switch Fabric Modules from the supervisor engine.

## Displaying the Module Information

To display the module information, perform this task:

Task	Command
Display the module information.	<b>show module</b> <i>mod</i> <sup>1</sup>

1. The **show module** command is not supported for the integrated switch fabric.

This example shows how to display the module information:

```

Console> show module
Mod Slot Ports Module-Type           Model                               Sub Status
-----
1  1    2    1000BaseX Supervisor             WS-X6K-SUP2-2GE                 yes ok
4  4    24    100BaseFX MM Ethernet           WS-X6224-MM-MT                  no ok
5  5    0      Switch Fabric Module             WS-C6500-SFM                    no ok

Mod Module-Name          Serial-Num
-----
1                          Munish
4                          SAD02390156
5                          SAD042818BR

Mod MAC-Address(es)      Hw   Fw   Sw
-----
1  00-40-0b-ff-00-00 to 00-40-0b-ff-00-01 0.219  6.1(0.146) 6.2(0.33-Eng)KEY
   00-50-3e-7e-71-56 to 00-50-3e-7e-71-57
   00-01-64-f8-ca-00 to 00-01-64-f8-cd-ff
4  00-10-7b-c2-3a-c0 to 00-10-7b-c2-3a-d7 0.204  4.2(0.24)V 6.2(0.14)KEY
5  00-40-0b-ff-00-00              0.204  6.1(0.133) 6.2(0.14)KEY

Mod Sub-Type              Sub-Model          Sub-Serial  Sub-Hw
-----
1  L3 Switching Engine II WS-F6K-PFC2       SAD04110B5S 0.305
Console> (enable)

```

## Displaying the Fabric Channel Counters

To display the fabric channel counters, perform this task:

Task	Command
Display the fabric channel counters.	<b>show fabric channel counters</b> { <i>mod</i>   <i>all</i> } [ <i>hex</i> ]

This example shows how to display the fabric channel counters:

```

Console> show fabric channel counters 5
Channel 0 counters:
0  rxTotalPkts           =           0
1  txTotalPkts           =           0
2  rxGoodPkts            =           0
3  rxErrors              =           0
4  txErrors              =           0
5  txDropped             =           0

```

## Displaying the Fabric Channel Switching Mode and Channel Status

To display the fabric channel switching mode and channel status, perform this task:

Task	Command
Display the fabric channel switching mode and channel status.	<b>show fabric channel switchmode</b> [ <i>mod</i> ]

This example shows how to display the fabric channel switching mode and channel status:

```
Console> show fabric channel switchmode
Global switching mode:truncated
```

Module	Num	Fab	Chan	Fab	Chan	Switch Mode	Channel Status
1		1	0, 0			flow through	ok
4		0	n/a			n/a	n/a
5		18	0, 0			n/a	ok
5		18	1, 1			n/a	unused
5		18	2, 2			n/a	unused
5		18	3, 3			n/a	unused
5		18	4, 4			n/a	unused
5		18	5, 5			n/a	unused
5		18	6, 6			n/a	unused
5		18	7, 7			n/a	unused
5		18	8, 8			n/a	unused
5		18	9, 9			n/a	unused
5		18	10, 10			n/a	unused
5		18	11, 11			n/a	unused
5		18	12, 12			n/a	unused
5		18	13, 13			n/a	unused
5		18	14, 14			n/a	unused
5		18	15, 15			n/a	unused
5		18	16, 16			n/a	unused
5		18	17, 17			n/a	unused

In the **show fabric channel switchmode** command output, the Switch Mode field displays one of the following modes:

- Flow-through mode
- Truncated mode
- Compact mode



**Note**

For definitions for the different modes, see the [“Understanding How the External Switch Fabric Module Works”](#) section on page 46-2.

## Displaying the Fabric Channel Utilization

To display the fabric channel utilization, perform this task:

Task	Command
Display the fabric channel utilization.	<b>show fabric channel utilization</b>

This example shows how to display the fabric channel utilization:

```

Console> show fabric channel utilization
Fab Chan Input Output
-----
Fab Chan Speed Input Output
-----
          0 n/a    0%    0%
          1 n/a    0%    0%
          2 n/a    0%    0%
          3 n/a    0%    0%
          4 20G   0%    0%
          5 n/a    0%    0%
          6 n/a    0%    0%
          7 20G   0%    0%
          8  8G   0%    0%
          9 n/a    0%    0%
         10 n/a    0%    0%
         11 n/a    0%    0%
         12 n/a    0%    0%
         13 n/a    0%    0%
         14 n/a    0%    0%
         15 n/a    0%    0%
         16 20G   0%    0%
         17 n/a    0%    0%

```

## Displaying the Fabric Errors

To display the fabric errors of one or all modules, perform this task:

Task	Command
Display the fabric errors.	<b>show fabric errors</b> { <i>mod</i>   <b>all</b> }

This example shows how to display the fabric errors:

```

Console> (enable) show fabric errors all
Module errors:
Slot Channel CRC Hbeat Sync DDR sync
-----
2 0 0 0 0 0

Fabric errors:
Slot Channel Sync Buffer Timeout
-----
2 0 0 0 0

Console> (enable)

```

## Displaying the Backplane Traffic and Fabric Channel Input and Output

To display the backplane traffic and fabric channel input and output, perform either of these tasks:

Task	Command
Display the system status including the backplane traffic and fabric channel input and output.	<b>show system</b>
Display the backplane traffic and fabric channel input and output.	<b>show traffic</b>



### Note

Supervisor Engine 720 with PFC3A does not support a hardware traffic meter. When you enter the **show system** and **show traffic** commands on this module, you do not receive backplane traffic information.

This example shows how to display the system status including backplane traffic and fabric channel input and output:

```

Console> (enable) show system
PS1-Status PS2-Status
-----
ok          none

Fan-Status Temp-Alarm Sys-Status Uptime d,h:m:s Logout
-----
ok          off          ok          13,19:01:16  20 min

PS1-Type          PS2-Type
-----
WS-CAC-1300W     none

Modem  Baud  Backplane-Traffic Peak Peak-Time
-----
disable 9600  0%                0% Tue Oct 19 2004, 12:04:18

PS1 Capacity: 1153.32 Watts (27.46 Amps @42V)

System Name          System Location          System Contact          CC
-----
-----

Slot Channel Fab Chan Input Output
-----
2          0          1          0%          0%

Core Dump          Core File
-----
disabled          slot0:crashdump

Crash Info          Crash Info File
-----
enabled          bootflash:crashinfo

System Information Logging Host          Interval
-----
Disabled          -          1440

System Information Log File
-----

```

```
tftp:sysinfo

Index          System Information Logging Commands
-----
-----

Syslog Dump           Syslog File
-----
disabled              bootflash:sysloginfo

No profile is configured for the system
Console> (enable)
```

This example shows how to display backplane traffic and fabric channel input and output:

```
Console> (enable) show traffic
Threshold: 100%

Backplane-Traffic Peak Peak-Time
-----
0%                0% Tue Oct 19 2004, 12:04:18

Slot Channel Fab Chan Input Output
-----
2          0          1    0%    0%

Console> (enable)
```

## Displaying the Switching Mode Configuration

To display the switching mode configuration, perform this task:

Task	Command
Display the switching mode configuration.	<b>show system switchmode</b>

This example shows how to display the switching mode configuration:

```
Console> show system switchmode
Switchmode allow:truncated
Switchmode threshold:2
Console> (enable)
```

## Displaying the Integrated Switch Fabric Status

To display the integrated switch fabric status and forwarding speed, perform this task:

Task	Command
Display the integrated switch fabric status and speed.	<b>show fabric status</b>

This example shows how to display the integrated switch fabric status and speed:

```

Console> show fabric status
Mod Speed Fabric
      status
-----
   5  20G active
Console> (enable)

```

## Configuring the LCD Banner

You can modify the LCD banner from the supervisor engine by entering the **set banner lcd** command to include the following information:

- Chassis serial number
- Switch IP address
- System name
- Supervisor engine version
- Multilayer Switch Feature Card (MSFC) version on active and standby supervisor engine
- System contact

After the LCD banner content is modified, this information is sent to the Switch Fabric Modules that are installed in the chassis and displayed in the LCDs.



### Note

The **set banner lcd** command is not supported in the systems with an integrated switch fabric.

To modify the LCD banner content, perform this task in privileged mode:

	Task	Command
Step 1	Modify the LCD banner content.	<b>set banner lcd</b> <i>c [text] c</i>
Step 2	Verify the LCD banner change.	<b>show banner</b>

This example shows how to modify the LCD banner for the Switch Fabric Module:

```

Console> (enable) set banner lcd &HelloWorld!&
LCD banner set
Console> (enable) show banner
MOTD banner:

LCD config:
Hello
World!

```