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Cisco Nexus 2000 Series Fabric Extender Software Configuration Guide

Release 4.0(1a)N2(1)

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Preface

This preface describes the audience, organization, and conventions of the *Cisco Nexus 2000 Series Fabric Extender Software Configuration Guide*. It also provides information on how to obtain related documentation.

Audience

This guide is for experienced network administrators who are responsible for configuring and maintaining Cisco Nexus 2000 Series Fabric Extender.

Organization

This guide is organized as follows:

Chapter	Description
Chapter 1 “Overview”	Provides an overview of Fabric Extender.
Chapter 2 “Configuring the Fabric Extender”	Provides the instructions of how to configure the Fabric Extender.
Chapter 3 “Fabric Extender Features”	Provides details and examples of the features supported by the Fabric Extender.

Document Conventions

Command descriptions use these conventions:

boldface font	Commands and keywords are in boldface.
<i>italic font</i>	Arguments for which you supply values are in italics.
[]	Elements in square brackets are optional.
[x y z]	Optional alternative keywords are grouped in brackets and separated by vertical bars.

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Screen examples use these conventions:

screen font	Terminal sessions and information the switch displays are in screen font.
boldface screen font	Information you must enter is in boldface screen font.
<i>italic screen font</i>	Arguments for which you supply values are in italic screen font.
< >	Nonprinting characters, such as passwords, are in angle brackets.
[]	Default responses to system prompts are in square brackets.
!, #	An exclamation point (!) or a pound sign (#) at the beginning of a line of code indicates a comment line.

This document uses the following conventions:



Note

Means reader *take note*. Notes contain helpful suggestions or references to material not covered in the manual.



Caution

Means reader *be careful*. In this situation, you might do something that could result in equipment damage or loss of data.

Related Documentation

Documentation for Cisco Nexus 5000 Series Switches and Cisco Nexus 2000 Series Fabric Extender is available at the following URL:

http://www.cisco.com/en/US/products/ps9670/tsd_products_support_series_home.html

The following are related Cisco Nexus 5000 Series and Cisco Nexus 2000 Series Fabric Extender documents:

Cisco Nexus 5000 Series CLI Software Configuration Guide, Cisco NX-OS Release 4.0

Cisco Nexus 5000 Series Command Reference, Cisco NX-OS Release 4.0

Cisco Nexus 5000 Series Hardware Installation Guide

Cisco Nexus 5000 Series System Messages Reference

Cisco Nexus 5000 Series Release Notes

Cisco Nexus 2000 Series Fabric Extender Software Configuration Guide, Cisco NX-OS Release 4.0

Cisco Nexus 2000 Series Fabric Extender Hardware Installation Guide

Cisco Nexus 5000 Series Fabric Manager Software Configuration Guide, Cisco NX-OS Release 4.0

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CHAPTER 1

Overview

This chapter provides an overview of the Cisco Nexus 2000 Series Fabric Extender and includes the following sections:

- [About the Cisco Nexus 2000 Series Fabric Extender, page 1-1](#)
- [Fabric Extender Terminology, page 1-2](#)
- [Oversubscription, page 1-3](#)
- [Management Model, page 1-3](#)
- [Forwarding Model, page 1-4](#)
- [Connection Model, page 1-5](#)
- [Port Numbering Convention, page 1-7](#)
- [Fabric Extender Image Management, page 1-7](#)
- [Fabric Extender Hardware, page 1-7](#)

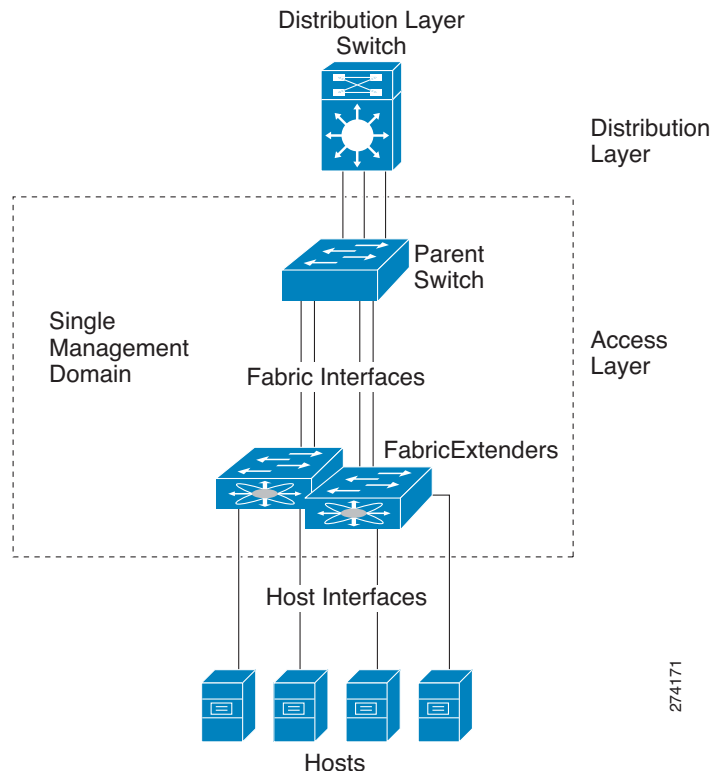
About the Cisco Nexus 2000 Series Fabric Extender

The Cisco Nexus 2000 Series Fabric Extender is a new category of data center products that provides a highly scalable and flexible server networking solution. It works in conjunction with the Cisco Nexus 5000 Series switches to provide high-density, low-cost connectivity for server aggregation. Scaling across 1-Gigabit Ethernet, 10-Gigabit Ethernet, unified fabric, rack, and blade server environments, the Fabric Extender is designed to simplify data center architecture and operations.

The Fabric Extender integrates with its parent switch, the Cisco Nexus 5000 Series switch, to allow automatic provisioning and configuration taken from the settings on the parent switch. This integration allows large numbers of servers and hosts to be supported using the same feature set as the parent switch, including security and quality of service (QoS) configuration parameters, with a single management domain as shown in [Figure 1-1](#). The Fabric Extender and its parent switch enable a large multi-path, loop-free, active-active data center topology without the use of Spanning Tree Protocol (STP).

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Figure 1-1 Single Management Domain



The Cisco Nexus 2148T Fabric Extender forwards all traffic to its parent Cisco Nexus 5000 Series switch over 10-Gigabit Ethernet fabric uplinks, allowing all traffic to be inspected by policies established on the Cisco Nexus 5000 Series switch.

No software is included with the Cisco Nexus 2148T. Software is automatically downloaded and upgraded from its parent switch. For details, see the [“Fabric Extender Image Management”](#) section on page 1-7.

Fabric Extender Terminology

Some terms used in this document are as follows:

- Fabric interface—A 10-Gigabit Ethernet uplink port designated for connection from the Fabric Extender to its parent switch. A fabric interface cannot be used for any other purpose. It must be directly connected to the parent switch.



Note A fabric interface includes the corresponding interface on the parent switch. This interface is enabled when you enter the **switchport mode fex-fabric** command.

- EtherChannel fabric interface—An EtherChannel uplink connection from the Fabric Extender to its parent switch. This connection consists of fabric interfaces bundled into a single logical channel.
- Host interface—An Ethernet host interface for connection to a server or host system. These ports are 1-Gigabit Ethernet interfaces.

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**Note**

Do not connect a bridge or switch to a host interface. These interfaces are designed to provide end host or server connectivity.

Oversubscription

In a switching environment, oversubscription is the practice of connecting multiple devices to the same interface to optimize port usage. An interface can support a connection that runs at its maximum speed but because most interfaces are not run their maximum speed, you can take advantage of unused bandwidth by sharing ports. In the case of the Cisco Nexus 2000 Series Fabric Extender, oversubscription, which is a function of the available fabric interfaces to active host interfaces, provides cost-effective scalability and flexibility for Ethernet environments.

The Cisco Nexus 2148T Fabric Extender has four 10-Gigabit Ethernet fabric interfaces and 48 1-Gigabit BaseT Ethernet host interfaces. With this system, you can have any number configurations. For example, you can configure:

- No oversubscription (40 host interfaces for four fabric interfaces)
- 1.2 to 1 oversubscription (48 host interfaces for four fabric interfaces)
- 4.8 to 1 oversubscription (48 host interfaces for one fabric interface)

Management Model

The Cisco Nexus 2000 Series Fabric Extender is managed by its parent switch over the fabric interfaces through a zero-touch configuration model. The Fabric Extender is discovered by the switch by detecting the fabric interfaces of the Fabric Extender.

After discovery, if the Fabric Extender has been correctly associated with the parent switch, the following steps are performed:

1. The switch checks the software image compatibility and upgrades the Fabric Extender if necessary.
2. The switch and Fabric Extender establish in-band IP connectivity with each other. The switch assigns the Fabric Extender an IP address in the range of loopback addresses (127.0.0.0/8), to avoid conflicts with IP addresses that may be in use on the network.
3. The switch pushes the configuration data to the Fabric Extender. The Fabric Extender does not store any configuration locally.
4. The Fabric Extender updates the switch with its operational status. All Fabric Extender information is displayed using the switch commands for monitoring and troubleshooting.

**Note**

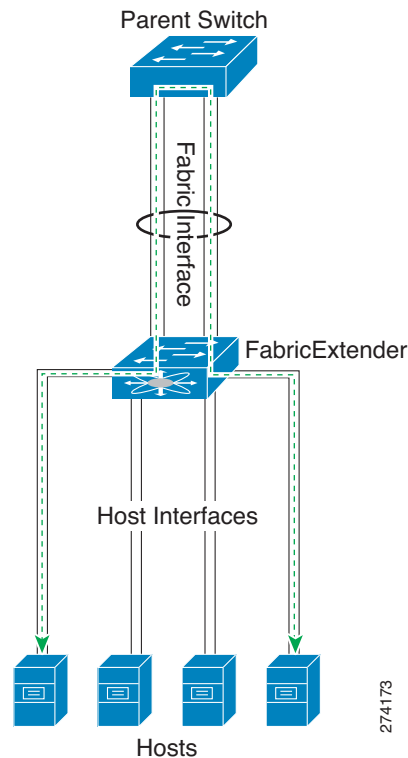
In Cisco NX-OS Release 4.0(1a)N2(1), a Cisco Nexus 2000 Series Fabric Extender can only be managed by one parent switch.

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Forwarding Model

The Cisco Nexus 2000 Series Fabric Extender does not perform any local switching. All traffic is sent to the parent switch that provides central forwarding and policy enforcement, including host-to-host communications between two systems connected to the same Fabric Extender as shown in [Figure 1-2](#).

Figure 1-2 Forwarding Model



The forwarding model facilitates feature consistency between the Fabric Extender and its parent switch.



Note

The Fabric Extender provides end-host connectivity into the network fabric. As a result, Bridge Protocol Data Unit (BPDU) Guard is enabled on all its host interfaces. If you connect a bridge or switch to a host interface, that interface is placed in an error-disabled state when a BPDU is received.

You cannot disable BPDU Guard on the host interfaces of the Fabric Extender.

The Fabric Extender supports egress multicast replication from the network to the host. Packets sent from the parent switch for multicast addresses attached to the Fabric Extender are replicated by the Fabric Extender ASICs and then sent to corresponding hosts.

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Connection Model

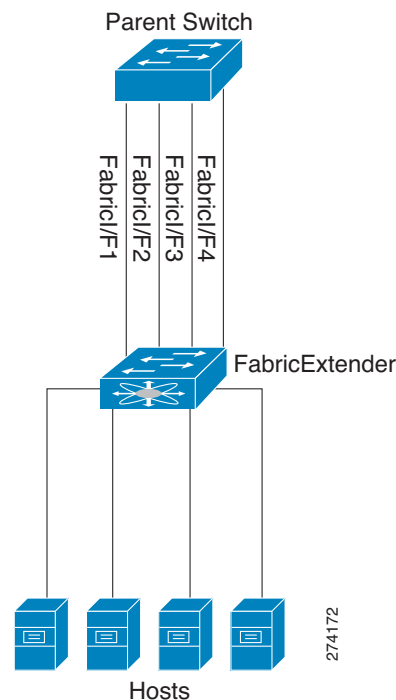
Two methods (the static pinning fabric interface connection and the EtherChannel fabric interface connection) allow the traffic from an end host to the parent switch to be distributed when going through the Cisco Nexus 2000 Series Fabric Extender. This section describes the following topics:

- [Static Pinning Fabric Interface Connection, page 1-5](#)
- [EtherChannel Fabric Interface Connection, page 1-6](#)

Static Pinning Fabric Interface Connection

To provide a deterministic relationship between the host interfaces and the parent switch, you can configure the Fabric Extender to use individual fabric interface connections. This configuration connects the 10-Gigabit Ethernet fabric interfaces as shown in [Figure 1-3](#). You can use any number of fabric interfaces up to the maximum available on the model of the Fabric Extender.

Figure 1-3 Static Pinning Fabric Interface Connections



When the Fabric Extender is brought up, its host interfaces are distributed equally among the available fabric interfaces. As a result, the bandwidth that is dedicated to each end host towards the parent switch is never changed by the switch but instead is always specified by you.



Note

If a fabric interface fails, all its associated host interfaces are brought down and remain down until the fabric interface is restored.

You must use the **pinning max-links** command to create a number of pinned fabric interface connections so that the parent switch can determine a distribution of host interfaces. The host interfaces are divided by the number of the max-links and distributed accordingly. The default value is max-links 1.

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**Caution**

Changing the value of the max-links is disruptive; all the host interfaces on the Fabric Extender are brought down and back up as the parent switch reassigns its static pinning.

The pinning order of the host interfaces is initially determined by the order in which the fabric interfaces were configured. When the parent switch is restarted, the configured fabric interfaces are pinned to the host interfaces in an ascending order by the port number of the fabric interface.

To guarantee a deterministic and sticky association across a reboot, you can manually redistribute the pinning. See the [“Redistributing the Links”](#) section on page 2-5.

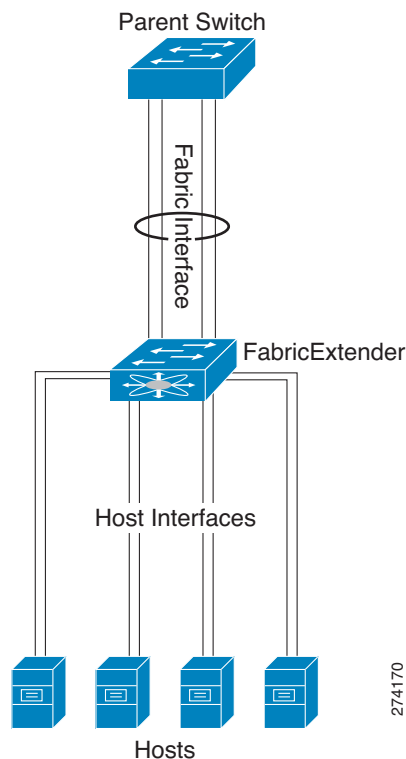
**Note**

The redistribution of the host interfaces will always be in an ascending order by the port number of the fabric interface.

EtherChannel Fabric Interface Connection

To provide load balancing between the host interfaces and the parent switch, you can configure the Fabric Extender to use an EtherChannel fabric interface connection. This connection bundles 10-Gigabit Ethernet fabric interfaces into a single logical channel as shown in [Figure 1-4](#).

Figure 1-4 *EtherChannel Fabric Interface Connection*



When you configure the Fabric Extender to use an EtherChannel fabric interface connection to its parent switch, the switch load balances the traffic from the hosts that are connected to the host interface ports by using the following load-balancing criteria to select the link:

- For a Layer 2 frame, the switch uses the source and destination MAC addresses.

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- For a Layer 3 frame, the switch uses the source and destination MAC addresses and the source and destination IP addresses.



Note

A fabric interface that fails in the EtherChannel will not trigger a change to the host interfaces. Traffic is automatically redistributed across the remaining links in the EtherChannel fabric interface.

Port Numbering Convention

The following port numbering convention is used for the Fabric Extender:

interface ethernet *chassis/slot/port*

where

- *chassis* is configured by the administrator. A Fabric Extender must be directly connected to its parent switch via individual fabric interfaces or an EtherChannel fabric interface. You configure a chassis ID on a physical Ethernet interface or EtherChannel on the switch to identify the Fabric Extender discovered via those interfaces.

The chassis ID ranges from 100 to 199.



Note

The chassis ID is required only to access a host interface on the Fabric Extender. A value of less than 100 indicates a slot on the parent switch.

- *slot* identifies the slot number on the Fabric Extender.
- *port* identifies the port number on a specific slot and chassis ID.

Fabric Extender Image Management

No software ships with the Cisco Nexus 2000 Series Fabric Extender. The Fabric Extender image is bundled into the system image of the parent switch. The image is automatically verified and, if required, updated during the association process between the switch and the Fabric Extender.

When you enter the **install all** command, it upgrades the software on the parent Cisco Nexus 5000 Series switch and also upgrades the software on any attached Fabric Extender. To minimize downtime as much as possible, the Fabric Extender remains online while the installation process loads its new software image. Once the software image has successfully loaded, the parent switch and the Fabric Extender both automatically reboot. This process is required to maintain version compatibility between the switch and the Fabric Extender.

Fabric Extender Hardware

The Cisco Nexus 2000 Series Fabric Extender architecture allows hardware configurations with various host interface counts and speeds.

This section describes the hardware of the Fabric Extender and includes the following topics:

- [Chassis, page 1-8](#)
- [Ethernet Interfaces, page 1-8](#)

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Chassis

The Cisco Nexus 2148T is a 1 RU chassis that is designed for rack mounting. The chassis supports redundant hot-swappable fans and power supplies.

Ethernet Interfaces

The Cisco Nexus 2148T has 48 1-Gigabit BaseT Ethernet host interfaces for its downlink connection to servers or hosts and four 10-Gigabit Ethernet fabric interfaces with SFP+ interface adapters for its uplink connection to the parent switch.



CHAPTER 2

Configuring the Fabric Extender

This chapter describes how to configure a Cisco Nexus 2000 Series Fabric Extender with a Cisco Nexus 5000 Series switch and includes the following sections:

- [Associating a Fabric Extender to a Fabric Interface, page 2-1](#)
- [Configuring the Fabric Extender, page 2-4](#)
- [Redistributing the Links, page 2-5](#)
- [Upgrading the Fabric Extender, page 2-6](#)
- [Displaying Fabric Extender Information, page 2-6](#)

Associating a Fabric Extender to a Fabric Interface

A Fabric Extender is connected to the switch through physical Ethernet interfaces or an EtherChannel. By default, the switch does not allow the attached Fabric Extender to connect until it has been assigned a chassis ID and is associated with the connected interface.



Note

The Fabric Extender may connect to the switch through a number of separate physical Ethernet interfaces or at most one EtherChannel interface.



Caution

In Release 4.0(1a)N2(1), you cannot connect the Ethernet interfaces of the Expansion Modules in the Cisco Nexus 5000 Series switch to a Fabric Extender. Only the Ethernet interfaces on the switch chassis (slot 1) can be used as fabric interfaces.

This section includes the following topics:

- [Associating a Fabric Extender to an Ethernet Interface, page 2-2](#)
- [Associating a Fabric Extender to an EtherChannel, page 2-2](#)
- [Disassociating a Fabric Extender from an Interface, page 2-4](#)

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Associating a Fabric Extender to an Ethernet Interface

To associate the Fabric Extender to an Ethernet interface, perform this task:

	Command	Purpose
Step 1	switch# configure terminal	Enters configuration mode.
Step 2	switch(config)# interface ethernet slot/port	Specifies an Ethernet interface to configure.
Step 3	switch(config-if)# switchport mode fex-fabric	Sets the interface to support an external Fabric Extender.
Step 4	switch(config-if)# fex associate chassis	Associates the chassis ID to the Fabric Extender unit attached to the interface. The range of the chassis ID is from 100 to 199.
Step 5	switch# show interface ethernet port/slot fex-intf	(Optional) Displays the association of a Fabric Extender to an Ethernet interface.

This example shows how to associate the Fabric Extender to an Ethernet interface on the switch:

```
switch# configure terminal
switch(config)# interface ethernet 1/40
switch(config-if)# switchport mode fex-fabric
switch(config-if)# fex associate 100
```

This example shows how to display the association of the Fabric Extender and the switch:

```
switch# show interface ethernet 1/40 fex-intf
Fabric                FEX
Interface             Interfaces
-----
Eth1/40               Eth100/1/48  Eth100/1/47  Eth100/1/46  Eth100/1/45
                    Eth100/1/44  Eth100/1/43  Eth100/1/42  Eth100/1/41
                    Eth100/1/40  Eth100/1/39  Eth100/1/38  Eth100/1/37
                    Eth100/1/36  Eth100/1/35  Eth100/1/34  Eth100/1/33
                    Eth100/1/32  Eth100/1/31  Eth100/1/30  Eth100/1/29
                    Eth100/1/28  Eth100/1/27  Eth100/1/26  Eth100/1/25
                    Eth100/1/24  Eth100/1/23  Eth100/1/22  Eth100/1/21
                    Eth100/1/20  Eth100/1/19  Eth100/1/18  Eth100/1/17
                    Eth100/1/16  Eth100/1/15  Eth100/1/14  Eth100/1/13
                    Eth100/1/12  Eth100/1/11  Eth100/1/10  Eth100/1/9
                    Eth100/1/8   Eth100/1/7   Eth100/1/6   Eth100/1/5
                    Eth100/1/4   Eth100/1/3   Eth100/1/2   Eth100/1/1
```

Associating a Fabric Extender to an EtherChannel

To associate the Fabric Extender to an EtherChannel, perform this task:

	Command	Purpose
Step 1	switch# configure terminal	Enters configuration mode.
Step 2	switch(config)# interface port-channel channel	Specifies an EtherChannel to configure.

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	Command	Purpose
Step 3	switch(config-if)# switchport mode fex-fabric	Sets the EtherChannel to support an external Fabric Extender.
Step 4	switch(config-if)# fex associate chassis	Associates the chassis ID to the Fabric Extender unit attached to the interface. The range of the chassis ID is from 100 to 199.
Step 5	switch# show interface port-channel channel fex-intf	(Optional) Displays the association of a Fabric Extender to an EtherChannel interface.

This example shows how to associate the Fabric Extender to an EtherChannel interface on the switch:

```
switch# configure terminal
switch(config)# interface port-channel 4
switch(config-if)# switchport mode fex-fabric
switch(config-if)# fex associate 100
switch(config-if)# exit
switch(config)# interface ethernet 1/37
switch(config-if)# switchport mode fex-fabric
switch(config-if)# fex associate 100
switch(config-if)# channel-group 4
switch(config-if)# exit
switch(config)# interface ethernet 1/38
switch(config-if)# switchport mode fex-fabric
switch(config-if)# fex associate 100
switch(config-if)# channel-group 4
switch(config-if)# exit
switch(config)# interface ethernet 1/39
switch(config-if)# switchport mode fex-fabric
switch(config-if)# fex associate 100
switch(config-if)# channel-group 4
switch(config-if)# exit
switch(config)# interface ethernet 1/40
switch(config-if)# switchport mode fex-fabric
switch(config-if)# fex associate 100
switch(config-if)# channel-group 4
```



Note

You have to associate each Ethernet interface that is a members of the EtherChannel as a fabric interface as shown in the above example.

This example shows how to display the association of the Fabric Extender and the switch:

```
switch# show interface port-channel 4 fex-intf
Fabric          FEX
Interface       Interfaces
-----
Po4             Eth100/1/48  Eth100/1/47  Eth100/1/46  Eth100/1/45
                Eth100/1/44  Eth100/1/43  Eth100/1/42  Eth100/1/41
                Eth100/1/40  Eth100/1/39  Eth100/1/38  Eth100/1/37
                Eth100/1/36  Eth100/1/35  Eth100/1/34  Eth100/1/33
                Eth100/1/32  Eth100/1/31  Eth100/1/30  Eth100/1/29
                Eth100/1/28  Eth100/1/27  Eth100/1/26  Eth100/1/25
                Eth100/1/24  Eth100/1/23  Eth100/1/22  Eth100/1/21
                Eth100/1/20  Eth100/1/19  Eth100/1/18  Eth100/1/17
                Eth100/1/16  Eth100/1/15  Eth100/1/14  Eth100/1/13
                Eth100/1/12  Eth100/1/11  Eth100/1/10  Eth100/1/9
                Eth100/1/8   Eth100/1/7   Eth100/1/6   Eth100/1/5
                Eth100/1/4   Eth100/1/3   Eth100/1/2   Eth100/1/1
```

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Disassociating a Fabric Extender from an Interface

To disassociate the Fabric Extender from an interface, perform this task:

Command	Purpose
<code>switch(config-if)# no fex associate</code>	Disassociates the Fabric Extender unit attached to the interface.

Configuring the Fabric Extender

To configure global features for a Fabric Extender, perform this tasks:

	Command	Purpose
Step 1	<code>switch# configure terminal</code>	Enters configuration mode.
Step 2	<code>switch(config)# fex chassis</code>	Enters configuration mode for the specified Fabric Extender chassis ID. The range of the chassis ID is from 100 to 199.
Step 3	<code>switch(config-fex)# description desc</code>	Specifies the description. The default is the string FEXxxxx where xxx is the chassis ID. If the chassis ID is 123, the description is FEX0123.
	<code>switch(config-fex)# no description</code>	Deletes the description.
	<code>switch(config-fex)# pinning max-links uplinks</code>	Defines the number of uplinks. The default is 1. The range is from 1 to 4. This command is only applicable if the Fabric Extender is connected to its parent switch using one or more statically pinned fabric interfaces. There can only be one EtherChannel connection.
	<code>switch(config-fex)# no pinning max-links</code>	Resets the number of uplinks to the default.
	<code>switch(config-fex)# serial serial</code>	Defines a serial number string. If this command is configured, then a switch will only allow the corresponding chassis ID to associate (using the fex associate command) if the Fabric Extender reports a matching serial number string. Configuring a serial number other than that of the given Fabric Extender will force the Fabric Extender offline.
	<code>switch(config-fex)# no serial</code>	Deletes the serial number string.
	<code>switch(config-fex)# beacon</code>	Turns on the beacon LED. This LED allows you to locate a specific Fabric Extender in a rack.
	<code>switch(config-fex)# no beacon</code>	Turns off the beacon LED.

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Caution

Changing the number of uplinks with the **pinning max-links** command or the **no pinning max-links** command disrupts all the host interface ports of the Fabric Extender.

Redistributing the Links

When you provision the Fabric Extender with statically pinned interfaces (see the “[Static Pinning Fabric Interface Connection](#)” section on page 1-5), the downlink host interfaces on the Fabric Extender are pinned to the fabric interfaces in the order they were initially configured. If you want to maintain a specific relationship of host interfaces to fabric interface across reboots, you should re-pin the links.

You may want to perform this function in these two situations:

- A change in the max-links configuration.
- If you need to maintain the pinning order of host interfaces to fabric interfaces.

Changing the Number of Links

If you initially configured port 33 on the parent switch as your only fabric interface, all 48 host interfaces are pinned to this port. If you provision another port, for example 35, then you must enter the **pinning max-links 2** command to redistribute the host interfaces. All host interfaces are brought down and host interfaces 1 to 24 are pinned to fabric interface 33 and host interfaces 25 to 48 are pinned to fabric interface 35.

Maintaining the Pinning Order

The pinning order of the host interfaces is initially determined by the order in which the fabric interfaces were configured. In this example, four fabric interfaces were configured in the following order:

```
switch# show interface ethernet 1/35 fex-intf
Fabric          FEX
Interface       Interfaces
-----
Eth1/35         Eth100/1/12   Eth100/1/11   Eth100/1/10   Eth100/1/9
                Eth100/1/8    Eth100/1/7    Eth100/1/6    Eth100/1/5
                Eth100/1/4    Eth100/1/3    Eth100/1/2    Eth100/1/1

switch# show interface ethernet 1/33 fex-intf
Fabric          FEX
Interface       Interfaces
-----
Eth1/33         Eth100/1/24   Eth100/1/23   Eth100/1/22   Eth100/1/21
                Eth100/1/20   Eth100/1/19   Eth100/1/18   Eth100/1/17
                Eth100/1/16   Eth100/1/15   Eth100/1/14   Eth100/1/13

switch# show interface ethernet 1/38 fex-intf
Fabric          FEX
Interface       Interfaces
-----
Eth1/38         Eth100/1/36   Eth100/1/35   Eth100/1/34   Eth100/1/33
                Eth100/1/32   Eth100/1/31   Eth100/1/30   Eth100/1/29
                Eth100/1/28   Eth100/1/27   Eth100/1/26   Eth100/1/25
```

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```
switch# show interface ethernet 1/40 fex-intf
Fabric          FEX
Interface      Interfaces
-----
Eth1/40        Eth100/1/48  Eth100/1/47  Eth100/1/46  Eth100/1/45
                Eth100/1/44  Eth100/1/43  Eth100/1/42  Eth100/1/41
                Eth100/1/40  Eth100/1/39  Eth100/1/38  Eth100/1/37
```

The next time that you reboot the Fabric Extender, the configured fabric interfaces are pinned to the host interfaces in an ascending order by port number of the fabric interface. If you want to configure the same fixed distribution of host interfaces without restarting the Fabric Extender, enter the **fex pinning redistribute** command (see the “[Static Pinning Fabric Interface Connection](#)” section on page 1-5).

To redistribute the host interfaces on the Fabric Extender, perform this task:

Command	Purpose
switch# fex pinning redistribute chassis	Redistributes the host connections. The range of the chassis ID is from 100 to 199.

This example shows how to redistribute the host interfaces on a Fabric Extender:

```
switch# fex pinning redistribute 100
```



Caution

The **fex pinning redistribute** command disrupts all the host interface ports of the Fabric Extender.

Upgrading the Fabric Extender

To upgrade a Cisco Nexus 2000 Series Fabric Extender, perform these steps:

-
- Step 1 Download the new kickstart and system images to the parent switch.
 - Step 2 Enter the **install all** command.

While the installation is in progress, the Fabric Extender remains online.

The new image is pushed to the Fabric Extender by the parent switch. Once the software image has successfully been installed, the parent switch reboots. The Fabric Extender is also rebooted automatically to maintain the software version compatibility between the parent switch and the Fabric Extender. When the parent switch comes up, it rediscovers the Fabric Extender and brings it online.

This process is the least disruptive process for the hosts and servers connected to the Fabric Extender.

Displaying Fabric Extender Information

This section describes the **show** commands that are available to display the configuration and status of the Fabric Extender and includes the following topics:

- [Displaying Configuration Information, page 2-7](#)
- [Displaying Chassis Management Information, page 2-10](#)

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Displaying Configuration Information

To display configuration information about the defined interfaces, perform one of these tasks:

Command	Purpose
switch# show fex [<i>chassis</i> [<i>detail</i>]]	Displays information about a specific Fabric Extender or all attached units.
switch# show interface <i>type number</i> fex-intf	Displays the Fabric Extender ports pinned to a specific switch interface.
switch# show interface fex-fabric	Displays the switch interfaces that have detected a Fabric Extender uplink.

This example shows how to display all the attached Fabric Extender units:

```
switch# show fex
      FEX          FEX          FEX          FEX
Number      Description      State      Model          Serial
-----
      100          FEX0100          Online    N5K-C5110T-BF-1GE  FOX1242GJSQ
```

This example shows how to display the detailed status of a specific Fabric Extender:

```
switch# show fex 100 detail
FEX: 100 Description: FEX0100 state: Online
  FEX version: 4.0(1a)N2(0.101) [Switch version: 4.0(1a)N2(0.101)]
  Extender Model: N5K-C5110T-BF-1GE, Extender Serial: JAF1241BLFN
  Part No: 73-12009-02
  Card Id: 70, Mac Addr: 00:0d:ec:b1:28:42, Num Macs: 64
  Module Sw Gen: 17 [Switch Sw Gen: 17]
pinning-mode: static Max-links: 1
Fabric port for control traffic: Eth1/40
Fabric interface state:
  Eth1/40 - Interface Up. State: Active
Fex Port      State Fabric Port Primary Fabric
Eth100/1/1    Up    Eth1/40    Eth1/40
Eth100/1/2    Down  Eth1/40    Eth1/40
Eth100/1/3    Down  Eth1/40    Eth1/40
Eth100/1/4    Down  Eth1/40    Eth1/40
Eth100/1/5    Down  Eth1/40    Eth1/40
Eth100/1/6    Down  Eth1/40    Eth1/40
Eth100/1/7    Down  Eth1/40    Eth1/40
Eth100/1/8    Down  Eth1/40    Eth1/40
Eth100/1/9    Down  Eth1/40    Eth1/40
Eth100/1/10   Down  Eth1/40    Eth1/40
Eth100/1/11   Down  Eth1/40    Eth1/40
Eth100/1/12   Down  Eth1/40    Eth1/40
Eth100/1/13   Down  Eth1/40    Eth1/40
Eth100/1/14   Down  Eth1/40    Eth1/40
Eth100/1/15   Up    Eth1/40    Eth1/40
Eth100/1/16   Down  Eth1/40    Eth1/40
Eth100/1/17   Down  Eth1/40    Eth1/40
Eth100/1/18   Down  Eth1/40    Eth1/40
Eth100/1/19   Down  Eth1/40    Eth1/40
Eth100/1/20   Down  Eth1/40    Eth1/40
Eth100/1/22   Down  Eth1/40    Eth1/40
Eth100/1/24   Down  Eth1/40    Eth1/40
Eth100/1/25   Down  Eth1/40    Eth1/40
Eth100/1/26   Down  Eth1/40    Eth1/40
```

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```

Eth100/1/27 Down Eth1/40 Eth1/40
Eth100/1/28 Down Eth1/40 Eth1/40
Eth100/1/29 Down Eth1/40 Eth1/40
Eth100/1/30 Down Eth1/40 Eth1/40
Eth100/1/31 Up Eth1/40 Eth1/40
Eth100/1/32 Down Eth1/40 Eth1/40
Eth100/1/33 Down Eth1/40 Eth1/40
Eth100/1/34 Down Eth1/40 Eth1/40
Eth100/1/35 Down Eth1/40 Eth1/40
Eth100/1/36 Down Eth1/40 Eth1/40
Eth100/1/37 Down Eth1/40 Eth1/40
Eth100/1/38 Down Eth1/40 Eth1/40
Eth100/1/39 Down Eth1/40 Eth1/40
Eth100/1/40 Down Eth1/40 Eth1/40
Eth100/1/41 Down Eth1/40 Eth1/40
Eth100/1/42 Down Eth1/40 Eth1/40
Eth100/1/43 Down Eth1/40 Eth1/40
Eth100/1/44 Down Eth1/40 Eth1/40
Eth100/1/45 Down Eth1/40 Eth1/40
Eth100/1/46 Down Eth1/40 Eth1/40
Eth100/1/47 Up Eth1/40 Eth1/40
Eth100/1/48 Down Eth1/40 Eth1/40

```

Logs:

```

[12/10/2008 00:11:40.698999] Module timed out
[12/10/2008 00:11:44.501221] Module register received
[12/10/2008 00:11:44.502240] Registration response sent
[12/10/2008 00:11:44.587581] Module Online Sequence
[12/10/2008 00:11:49.140170] Module Online
[12/10/2008 00:18:46.662135] Module disconnected
[12/10/2008 00:18:46.663222] Offlining Module
[12/10/2008 00:18:46.663856] Module Offline Sequence
[12/10/2008 00:18:49.317584] Module Offline
[12/10/2008 00:19:30.427864] Module register received
[12/10/2008 00:19:30.428875] Registration response sent
[12/10/2008 00:19:30.456882] Module Online Sequence
[12/10/2008 00:19:32.62827] Module Online
[12/10/2008 00:20:37.196648] Module disconnected
[12/10/2008 00:20:37.197782] Offlining Module
[12/10/2008 00:20:37.199299] Module Offline Sequence
[12/10/2008 00:20:39.859971] Module Offline
[12/10/2008 00:21:13.945372] Module register received
[12/10/2008 00:21:13.946435] Registration response sent
[12/10/2008 00:21:13.974962] Module Online Sequence
[12/10/2008 00:21:15.737667] Module Online

```

This example shows how to display the Fabric Extender interfaces pinned to a specific switch interface:

```

switch# show interface ethernet 1/40 fex-intf
Fabric          FEX
Interface       Interfaces
-----
Eth1/40         Eth100/1/48  Eth100/1/47  Eth100/1/46  Eth100/1/45
                Eth100/1/44  Eth100/1/43  Eth100/1/42  Eth100/1/41
                Eth100/1/40  Eth100/1/39  Eth100/1/38  Eth100/1/37
                Eth100/1/36  Eth100/1/35  Eth100/1/34  Eth100/1/33
                Eth100/1/32  Eth100/1/31  Eth100/1/30  Eth100/1/29
                Eth100/1/28  Eth100/1/27  Eth100/1/26  Eth100/1/25
                Eth100/1/24  Eth100/1/22  Eth100/1/20  Eth100/1/19
                Eth100/1/18  Eth100/1/17  Eth100/1/16  Eth100/1/15
                Eth100/1/14  Eth100/1/13  Eth100/1/12  Eth100/1/11
                Eth100/1/10  Eth100/1/9   Eth100/1/8   Eth100/1/7
                Eth100/1/6   Eth100/1/5   Eth100/1/4   Eth100/1/3
                Eth100/1/2   Eth100/1/1

```

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This example shows how to display the switch interfaces that are connected to a Fabric Extender uplink:

```
switch# show interface fex-fabric
      Fabric      Fabric      Fex      FEX
Fex  Port        Port State  Uplink   Model    Serial
-----
---  Eth1/1      Discovered  1      N5K-C5110T-BF-1GE  FOX1242GJSQ
---  Eth1/2      Discovered  4      N5K-C5110T-BF-1GE  FOX1242GJSQ
---  Eth1/3      Discovered  2      N5K-C5110T-BF-1GE  FOX1242GJSQ
100  Eth1/40      Active      3      N5K-C5110T-BF-1GE  FOX1242GJSQ
```



Note

The above example shows a Fabric Extender with four uplink connections, only one of which is currently active.

This example shows how to display the SFP+ transceiver and diagnostic optical monitoring (DOM) information for Fabric Extender uplinks:

```
switch# show interface ethernet 1/40 transceiver
Ethernet1/40
  sfp is present
  name is CISCO-EXCELIGHT
  part number is SPP5101SR-C1
  revision is A
  serial number is ECL120901AV
  nominal bitrate is 10300 Mbits/sec
  Link length supported for 50/125mm fiber is 82 m(s)
  Link length supported for 62.5/125mm fiber is 26 m(s)
  cisco id is --
  cisco extended id number is 4

switch# show interface ethernet 1/40 transceiver fex-fabric
Ethernet1/40
  sfp is present
  name is CISCO-EXCELIGHT
  part number is SPP5101SR-C1
  revision is A
  serial number is ECL120601U0
  nominal bitrate is 10300 Mbits/sec
  Link length supported for 50/125mm fiber is 82 m(s)
  Link length supported for 62.5/125mm fiber is 26 m(s)
  cisco id is --
  cisco extended id number is 4
```



Note

The first **show** command above shows the SFP+ transceiver that is plugged into the parent switch interface. The second **show** command displays the SFP+ transceiver that is plugged into the uplink port on the Fabric Extender.

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Displaying Chassis Management Information

To display configuration information used on the switch supervisor to manage the Fabric Extender, perform one of these tasks:

Command	Purpose
switch# show diagnostic result fex chassis	Displays results from the diagnostic test for a Fabric Extender chassis.
switch# show inventory fex chassis	Displays inventory information for a Fabric Extender chassis.
switch# show module fex chassis	Displays module information about a Fabric Extender chassis.

This example shows how to display the module information about all connected Fabric Extender units:

```
switch# show module fex
FEX Mod Ports Card Type                               Model                               Status.
-----
100 1    48    Fabric Extender 48x1GE Module                       N2K-C2148T-1GE                       ok

FEX Mod Sw                               Hw                               World-Wide-Name(s) (WWN)
-----
100 1    4.0(1a)N2(1)  0.2    --

FEX Mod  MAC-Address(es)                               Serial-Num
-----
100 1    000d.ecb1.3f00 to 000d.ecb1.3f2fff                   JAF1244ATER
```

This example shows how to display the module information about a specific Fabric Extender unit:

```
switch# show module fex 100
FEX Mod Ports Card Type                               Model                               Status.
-----
100 1    48    Fabric Extender 48x1GE Module                       N2K-C2148T-1GE                       ok

FEX Mod Sw                               Hw                               World-Wide-Name(s) (WWN)
-----
100 1    4.0(1a)N2(1)  0.2    --

FEX Mod  MAC-Address(es)                               Serial-Num
-----
100 1    000d.ecb1.3f00 to 000d.ecb1.3f2fff                   JAF1244ATER
```

This example shows how to display the inventory information about a specific Fabric Extender unit:

```
switch# show inventory fex 100
NAME: "FEX 100 CHASSIS", DESCR: "N2K-C2148T-1GE CHASSIS"
PID: N2K-C2148T-1GE    , VID: V00 , SN: JAF1244ATER

NAME: "FEX 100 Module 1", DESCR: "Fabric Extender Module: 48x1GE, 4X10GE Supervisor"
PID: N2K-C2148T-1GE    , VID: V00 , SN: FOX1242GJT4

NAME: "FEX 100 Fan 1", DESCR: "Fabric Extender Fan module"
PID: N2K-C2148-FAN    , VID: N/A , SN: N/A

NAME: "FEX 100 Power Supply 1", DESCR: "Fabric Extender AC power supply"
PID: N5K-PAC-200W    , VID: 00V0 , SN: PAC12473L2J
```

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This example shows how to display diagnostic test results for a specific Fabric Extender unit:

```
switch# show diagnostic result fex 100
FEX-100: 48x1GE/Supervisor SerialNo   : JAF1241BLFN
Overall Diagnostic Result for FEX-100  : OK

Test results: (. = Pass, F = Fail, U = Untested)
TestPlatform:
0)          SPROM: -----> .
1)          MV88E6095: -----> .
2)          Fan: -----> .
3)          PowerSupply: -----> F
4)          TempSensor: -----> .

TestForwardingPorts:
Eth   1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Port -----
. . . . .

Eth   25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
Port -----
. . . . .

TestFabricPorts:
Fabric 1  2  3  4
Port -----
. . . .
```

This example shows how to display the environment status for a specific Fabric Extender unit:

```
switch# show environment fex 100

Temperature Fex 100:
-----
Module   Sensor      MajorThresh  MinorThres  CurTemp     Status
          (Celsius)   (Celsius)   (Celsius)
-----
1        Outlet-1    60           50          29          ok
1        Inlet-1     50           40          21          ok

Fan Fex: 100:
-----
Fan      Model              Hw      Status
-----
Chassis  N2K-C2148-FAN     --      ok
PS-1     N5K-PAC-200W      --      failure
PS-2     N5K-PAC-200W      --      ok

Power Supply Fex 100:
-----
Voltage: 12 Volts
-----
PS  Model              Power      Power      Status
   (Watts)   (Amp)
-----
1  --              --          --          fail/shutdown
2  N5K-PAC-200W    200.04     16.67       ok

Mod Model              Power      Power      Power      Power      Status
   Requested Requested  Allocated Allocated
-----
```

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```

----- (Watts) (Amp) ----- (Watts) (Amp) -----
1  N5K-C5110T-BF-1GE  96.00  8.00  96.00  8.00  powered-up

```

Power Usage Summary:

```

-----
Power Supply redundancy mode:                redundant

Total Power Capacity                        200.04 W

Power reserved for Supervisor(s)           96.00 W
Power currently used by Modules             0.00 W

-----
Total Power Available                        104.04 W
-----

```

This example shows how to display the SPROM for a specific Fabric Extender unit:

```

switch# show sprom fex 100 all
DISPLAY FEX 100 SUP sprom contents
Common block:
Block Signature : 0xabab
Block Version   : 3
Block Length    : 160
Block Checksum  : 0x1774
EEPROM Size     : 4096
Block Count     : 3
FRU Major Type  : 0x6002
FRU Minor Type  : 0x0
OEM String      : Cisco Systems, Inc.
Product Number  : N2K-C2148T-1GE
Serial Number   : JAF1244ATER
Part Number     : 73-12009-02
Part Revision   : 07
Mfg Deviation   : 0
H/W Version     : 0.2
Mfg Bits        : 0
Engineer Use    : 0
snmpOID         : 9.12.3.1.9.72.8.0
Power Consump   : -800
RMA Code        : 0-0-0-0
CLEI Code       : COMEB00ARA
VID             : V00
Supervisor Module specific block:
Block Signature : 0x6002
Block Version   : 2
Block Length    : 103
Block Checksum  : 0x592
Feature Bits    : 0x0
HW Changes Bits : 0x2
Card Index      : 11011
MAC Addresses   : 00-00-00-00-00-00
Number of MACs  : 0
Number of EPLD  : 0
Port Type-Num   : 1-48;2-4
Sensor #1       : 60,50
Sensor #2       : 60,50
Sensor #3       : 60,50
Sensor #4       : 60,50
Sensor #5       : 50,40
Sensor #6       : 50,40
Sensor #7       : 50,40

```


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```
00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00
00 00
```

License software-module specific block:

```
Block Signature : 0x6006
Block Version   : 1
Block Length    : 16
Block Checksum  : 0x77
```

lic usage bits:

```
00 00 00 00 00 00 00 00
```

DISPLAY FEX 100 power-supply 1 srom contents:

Common block:

```
Block Signature : 0xabab
Block Version   : 3
Block Length    : 124
Block Checksum  : 0x1610
EEPROM Size     : 124
Block Count     : 1
FRU Major Type  : 0xab01
FRU Minor Type  : 0x1
OEM String      : Cisco Systems, Inc.
Product Number  : N5K-PAC-200W
Serial Number   : PAC12473L2J
Part Number     : 341-0335-01
Part Revision   : 01
CLEI Code       : COUPADSBA
VID             : 00V0
snmpOID        : 0.0.0.0.0.0.0.0
H/W Version     : 0.1
Current        : 1667
RMA Code       : 0-0-0-0
```

DISPLAY FEX 100 power-supply 2 srom contents:

Common block:

```
Block Signature : 0x0
Block Version   : 0
Block Length    : 0
Block Checksum  : 0x0
EEPROM Size     : 0
Block Count     : 0
FRU Major Type  : 0x0
FRU Minor Type  : 0x0
OEM String      :
Product Number  :
Serial Number   :
Part Number     :
Part Revision   :
CLEI Code       :
VID             : V00
snmpOID        : 0.0.0.0.0.0.0.0
```

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```
H/W Version      : 0.0
Current          : 0
RMA Code        : 0-0-0-0
```

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CHAPTER 3

Fabric Extender Features

The Cisco Nexus 2000 Series Fabric Extender allows a single switch—and a single consistent set of switch features—to be supported across a large number of hosts and servers. By supporting a large server-domain under a single management entity, policies can be enforced more efficiently.

Some of the features of the parent switch cannot be extended onto the Fabric Extender.

This chapter describes the supported features of the Fabric Extender and includes the following sections:

- [Host Interfaces, page 3-1](#)
- [VLANs and Private VLANs, page 3-1](#)
- [Quality of Service, page 3-2](#)
- [Access Control Lists, page 3-2](#)
- [Switched Port Analyzer, page 3-2](#)
- [Fabric Interface Features, page 3-3](#)

Host Interfaces

Host interfaces are for host or server connectivity only; host interfaces cannot connect to another network. These interfaces are always enabled as edge ports; as they come up, these ports immediately transition to the forwarding state. Host interfaces are always enabled with BPDU Guard. If a BPDU is received, the port is immediately placed in an error-disabled state which keeps the link down.

You can enable host interfaces to accept Cisco Discovery Protocol (CDP) packets. This protocol only works when it is enabled for both ends of a link.

Ingress and egress packet counters are provided on each host interface.

IGMP snooping is supported on all host interfaces.

EtherChannel port bundling is not supported on host interfaces. The Fabric Extender supports a single EtherChannel on its fabric interfaces, allowing you to bundle its uplinks to the parent switch.

VLANs and Private VLANs

The Fabric Extender supports Layer 2 VLAN trunks and IEEE 802.1Q VLAN encapsulation. Host interfaces can be members of private VLANs with the following restrictions:

- You can configure a host interface as an isolated or community access port only.

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- You cannot configure a host interface as a promiscuous port.
- You cannot configure a host interface as a PVLAN trunk port.

Quality of Service

The Fabric Extender provides two user queues for its quality of service (QoS) support, one for all no-drop classes and one for all drop classes. The classes configured on its parent switch are mapped to one of these two queues; traffic for no-drop classes is mapped one queue and traffic for all drop classes is mapped to the other. Egress policies are also restricted to these two classes.

The parent switch provides two predefined class maps for matching broadcast or multicast traffic; class-all-flood and class-ip-multicast. These classes are ignored on the Fabric Extender.

Host interfaces support pause frames, implemented using IEEE 802.3x link-level flow control (LLC). By default, flow control send is on and flow control receive is off on all host interfaces. Autonegotiation is enabled on the host interfaces. Per class flow control is set according to the QoS classes.

Host interfaces support jumbo frames (up to 9216 bytes); however a per-host interface maximum transmission unit (MTU) is not supported. Instead, MTU is set according to the QoS classes. You modify MTU by setting policy and class maps on the parent switch. Because the Fabric Extender has only two user queues, the MTU for the drop-queue is set to the maximum MTU of all drop classes MTU on the no-drop queue is set to the maximum MTU of all no-drop classes.

For more information about quality of service, see the *Cisco Nexus 5000 Series CLI Software Configuration Guide*.

Access Control Lists

The Fabric Extender supports the full range of ingress access control lists (ACLs) that are available on its parent switch.



Note

These ACLs are supported only if the Fabric Extender-to-parent switch fabric connection is in static pinning mode (for more information, see the [“Static Pinning Fabric Interface Connection”](#) section on page 1-5).

Switched Port Analyzer

You can configure the host interfaces on the Fabric Extender as Switched Port Analyzer (SPAN) source ports. Fabric Extender ports cannot be configured as a SPAN destination. Only one SPAN session is supported for all the host interfaces on the same Fabric Extender. Ingress source (Rx), egress source (Tx), or both monitoring is supported.



Note

All IP multicast traffic on the set of VLANs that a Fabric Extender host interface belongs to is captured in the SPAN session. It is not possible to separate the traffic by IP multicast group membership.

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If ingress and egress monitoring is configured for host interfaces on the same Fabric Extender, you may see a packet twice: once as the packet ingresses on an interface with Rx configured, and again as the packet egresses on an interface with Tx configured.

Fabric Interface Features

The Fabric Extender fabric interfaces support static EtherChannel and priority flow control (PFC). PFC allows you to apply pause functionality to specific classes of traffic on an interface (instead of all the traffic on the interface). During the initial discovery and association process, SFP+ validation and digital optical monitoring (DOM) are performed as follows:

- The Fabric Extender performs a local check on the uplink SFP+ transceiver. If it fails the security check, the LED flashes but the link is still allowed to come up.
- The Fabric Extender local check is bypassed if it is running its backup image.
- The parent switch performs SFP validation again during fabric interface bring up. It keeps the fabric interface down if SFP validation fails.

Once an interface on the parent switch is configured in fex-fabric mode, all other features that were configured on that port and are not relevant to this mode are deactivated. If the interface is reconfigured to remove fex-fabric mode, the previous configurations are reactivated.



Note

Per class flow control mode is enabled by default on the fabric interfaces. When a fabric interface is configured on the parent switch, PFC mode is enabled by default and cannot be changed.

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