



Cisco Nexus 2000 Series NX-OS Fabric Extender Software Configuration Guide for Cisco Nexus 7000 Series Switches, Release 6.x

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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.

This chapter includes the following sections:

- [Audience, page vii](#)
- [Document Conventions, page vii](#)
- [Related Documentation for Cisco Nexus 7000 Series NX-OS Software, page ix](#)
- [Documentation Feedback, page xi](#)
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Audience

This publication is for network administrators who configure and maintain Cisco Nexus devices.

Document Conventions

Command descriptions use the following conventions:

Convention	Description
bold	Bold text indicates the commands and keywords that you enter literally as shown.
<i>Italic</i>	Italic text indicates arguments for which the user supplies the values.
[x]	Square brackets enclose an optional element (keyword or argument).
[x y]	Square brackets enclosing keywords or arguments separated by a vertical bar indicate an optional choice.

Convention	Description
{x y}	Braces enclosing keywords or arguments separated by a vertical bar indicate a required choice.
[x {y z}]	Nested set of square brackets or braces indicate optional or required choices within optional or required elements. Braces and a vertical bar within square brackets indicate a required choice within an optional element.
<i>variable</i>	Indicates a variable for which you supply values, in context where italics cannot be used.
string	A nonquoted set of characters. Do not use quotation marks around the string or the string will include the quotation marks.

Examples use the following conventions:

Convention	Description
<code>screen font</code>	Terminal sessions and information the switch displays are in screen font.
<code>boldface screen font</code>	Information you must enter is in boldface screen font.
<i><code>italic screen font</code></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 for Cisco Nexus 7000 Series NX-OS Software

The entire Cisco Nexus 7000 Series NX-OS documentation set is available at the following URL:

http://www.cisco.com/en/us/products/ps9402/tsd_products_support_series_home.html

Release Notes

The release notes are available at the following URL:

http://www.cisco.com/en/US/products/ps9402/prod_release_notes_list.html

Configuration Guides

These guides are available at the following URL:

http://www.cisco.com/en/US/products/ps9402/products_installation_and_configuration_guides_list.html

The documents in this category include:

- *Cisco Nexus 7000 Series NX-OS Configuration Examples*
- *Cisco Nexus 7000 Series NX-OS FabricPath Configuration Guide*
- *Cisco Nexus 7000 Series NX-OS Fundamentals Configuration Guide*
- *Cisco Nexus 7000 Series NX-OS Interfaces Configuration Guide*
- *Cisco Nexus 7000 Series NX-OS IP SLAs Configuration Guide*
- *Cisco Nexus 7000 Series NX-OS Layer 2 Switching Configuration Guide*
- *Cisco Nexus 7000 Series NX-OS LISP Configuration Guide*
- *Cisco Nexus 7000 Series NX-OS MPLS Configuration Guide*
- *Cisco Nexus 7000 Series NX-OS Multicast Routing Configuration Guide*
- *Cisco Nexus 7000 Series NX-OS OTV Configuration Guide*
- *Cisco Nexus 7000 Series NX-OS Quality of Service Configuration Guide*
- *Cisco Nexus 7000 Series NX-OS SAN Switching Guide*
- *Cisco Nexus 7000 Series NX-OS Security Configuration Guide*
- *Cisco Nexus 7000 Series NX-OS System Management Configuration Guide*
- *Cisco Nexus 7000 Series NX-OS Unicast Routing Configuration Guide*
- *Cisco Nexus 7000 Series NX-OS Verified Scalability Guide*
- *Cisco Nexus 7000 Series NX-OS Virtual Device Context Configuration Guide*
- *Cisco Nexus 7000 Series NX-OS Virtual Device Context Quick Start*
- *Cisco Nexus 7000 Series NX-OS OTV Quick Start Guide*
- *Cisco NX-OS FCoE Configuration Guide for Cisco Nexus 7000 and Cisco MDS 9500*

- *Cisco Nexus 2000 Series Fabric Extender Software Configuration Guide*

Command References

These guides are available at the following URL:

http://www.cisco.com/en/US/products/ps9402/prod_command_reference_list.html

The documents in this category include:

- *Cisco Nexus 7000 Series NX-OS Command Reference Master Index*
- *Cisco Nexus 7000 Series NX-OS FabricPath Command Reference*
- *Cisco Nexus 7000 Series NX-OS Fundamentals Command Reference*
- *Cisco Nexus 7000 Series NX-OS High Availability Command Reference*
- *Cisco Nexus 7000 Series NX-OS Interfaces Command Reference*
- *Cisco Nexus 7000 Series NX-OS Layer 2 Switching Command Reference*
- *Cisco Nexus 7000 Series NX-OS LISP Command Reference*
- *Cisco Nexus 7000 Series NX-OS MPLS Configuration Guide*
- *Cisco Nexus 7000 Series NX-OS Multicast Routing Command Reference*
- *Cisco Nexus 7000 Series NX-OS OTV Command Reference*
- *Cisco Nexus 7000 Series NX-OS Quality of Service Command Reference*
- *Cisco Nexus 7000 Series NX-OS SAN Switching Command Reference*
- *Cisco Nexus 7000 Series NX-OS Security Command Reference*
- *Cisco Nexus 7000 Series NX-OS System Management Command Reference*
- *Cisco Nexus 7000 Series NX-OS Unicast Routing Command Reference*
- *Cisco Nexus 7000 Series NX-OS Virtual Device Context Command Reference*
- *Cisco NX-OS FCoE Command Reference for Cisco Nexus 7000 and Cisco MDS 9500*

Other Software Documents

You can locate these documents starting at the following landing page:

http://www.cisco.com/en/us/products/ps9402/tsd_products_support_series_home.html

- *Cisco Nexus 7000 Series NX-OS MIB Quick Reference*
- *Cisco Nexus 7000 Series NX-OS Software Upgrade and Downgrade Guide*
- *Cisco Nexus 7000 Series NX-OS Troubleshooting Guide*
- *Cisco NX-OS Licensing Guide*
- *Cisco NX-OS System Messages Reference*
- *Cisco NX-OS XML Interface User Guide*

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To provide technical feedback on this document, or to report an error or omission, please send your comments to: ciscodfa-docfeedback@cisco.com.

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Obtaining Documentation and Submitting a Service Request

For information on obtaining documentation, using the Cisco Bug Search Tool (BST), submitting a service request, and gathering additional information, see *What's New in Cisco Product Documentation*, at: <http://www.cisco.com/c/en/us/td/docs/general/whatsnew/whatsnew.html>.

Subscribe to *What's New in Cisco Product Documentation*, which lists all new and revised Cisco technical documentation as an RSS feed and delivers content directly to your desktop using a reader application. The RSS feeds are a free service.



CHAPTER

1

Overview

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

- [Information About the Cisco Nexus 2000 Series Fabric Extender, page 2](#)
- [Fabric Extender Terminology, page 2](#)
- [Fabric Interface Features , page 3](#)
- [Host Interfaces, page 3](#)
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Information About the Cisco Nexus 2000 Series Fabric Extender

The Cisco Nexus 2000 Series Fabric Extender, also known as FEX, is a highly scalable and flexible server networking solution that works with Cisco Nexus Series devices 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, which is a Cisco Nexus Series device, to allow automatic provisioning and configuration taken from the settings on the parent device. This integration allows large numbers of servers and hosts to be supported by using the same feature set as the parent device, including security and quality-of-service (QoS) configuration parameters, with a single management domain. The Fabric Extender and its parent switch enable a large multipath, loop-free, active-active data center topology without the use of the Spanning Tree Protocol (STP).

The Cisco Nexus 2000 Series Fabric Extender forwards all traffic to its parent Cisco Nexus Series device over 10-Gigabit Ethernet fabric uplinks, which allows all traffic to be inspected by policies established on the Cisco Nexus Series device.



Note

You must connect the Fabric Extender to its parent Cisco Nexus 7000 Series device with a 32-port, 10-Gigabit M1 module (N7K-M132XP-12), a 32-port 10-Gigabit M1-XL module (N7K-M132XP-12L), an M2 module, or an F2 module.

No software is included with the Fabric Extender. The software is automatically downloaded and upgraded from its parent device.

Fabric Extender Terminology

Some terms used in this document are as follows:

- Fabric interface—A 10-Gigabit Ethernet uplink port that is 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.

- Port channel fabric interface—A port channel uplink connection from the Fabric Extender to its parent switch. This connection consists of fabric interfaces that are bundled into a single logical channel.
- Host interface—An Ethernet host interface for connection to a server or host system.



Note

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

- Port channel host interface—A port channel host interface for connection to a server or host system.

Fabric Interface Features

The FEX fabric interfaces support static port channels. During the initial discovery and association process, SFP+ validation and digital optical monitoring (DOM) are performed as follows:

- The FEX 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 FEX local check is bypassed if it is running its backup image.
- The parent switch performs SFP validation again when the fabric interface is brought up. It keeps the fabric interface down if SFP validation fails.

After 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.

For more information about PFC, see the *Cisco Nexus 7000 Series NX-OS Quality of Service Configuration Guide*.

Host Interfaces

Layer 3 Host Interfaces

Beginning with Cisco NX-OS Release 5.2, by default, all host interfaces on a Fabric Extender that are connected to a Cisco Nexus 7000 Series parent switch run in Layer 3 mode.

**Note**

If you have updated the parent switch to Cisco Nexus Release 5.2, previously configured fabric Extender host interfaces retain their default port mode, Layer 2. You can change these ports to Layer 3 mode with the **no switchport** command.

The host interfaces also support subinterfaces. You can create up to 32 subinterfaces on a Fabric Extender host interface.

Beginning with Cisco NX-OS Release 6.2, port profiles are supported on the host interfaces of a Fabric Extender.

For information about interfaces, see the *Cisco Nexus 7000 Series NX-OS Interfaces Configuration Guide*.

Layer 2 Host Interfaces

In Cisco NX-OS Release 5.1 and earlier releases, the default port mode is Layer 2.

To run a host interface in Layer 2 mode, use the **switchport** command. For Cisco NX-OS Release 5.2 and later releases, to change the port mode to Layer 3, use the **no switchport** command.

The Fabric Extender provides connectivity for computer hosts and other edge devices in the network fabric. Follow these guidelines when connecting devices to Fabric Extender host interfaces:

- All Fabric Extender host interfaces run as spanning tree edge ports with BPDU Guard enabled and you cannot configure them as spanning tree network ports.
- You can connect servers that use active/standby teaming, 802.3ad port channels, or other host-based link redundancy mechanisms to Fabric Extender host interfaces.
- Any device that is running spanning tree connected to a Fabric Extender host interface results in that host interface being placed in an error-disabled state when a BPDU is received.
- You can connect only virtual switches that leverages a link redundancy mechanism not dependent on spanning tree such as Cisco FlexLink or vPC (with the BPDU Filter enabled) to a Fabric Extender host interface. Because spanning tree is not used to eliminate loops, you should ensure a loop-free topology below the Fabric Extender host interfaces.

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

For more information about BPDU Guard, see the *Cisco Nexus 7000 Series NX-OS Layer 2 Switching Configuration Guide*.

Host Interface Port Channels

Layer 3 Host Interface Port Channels

The Fabric Extender (FEX) supports host interface port channel configurations. You can combine up to 8 interfaces in a standard mode port channel and 16 interfaces when configured with the Link Aggregation Control Protocol (LACP).

**Note**

Port channel resources are allocated when the port channel has one or more members.

All members of the port channel must be FEX host interfaces and all host interfaces must be from the same FEX. You cannot mix interfaces from the FEX and the parent switch.

Layer 3 mode is supported on host interface port channels.

A host interface port channel also supports subinterfaces. You can create up to 1000 subinterfaces on a FEX host interface port channel.

For more information about port channels, see the *Cisco Nexus 7000 Series NX-OS Interfaces Configuration Guide*.

Layer 2 Host Interface Port Channels

The Fabric Extender supports host interface port channel configurations. You can combine up to 8 interfaces in a standard mode port channel and 16 interfaces when configured with the Link Aggregation Control Protocol (LACP).

**Note**

Port channel resources are allocated when the port channel has one or more members.

All members of the port channel must be Fabric Extender host interfaces and all host interfaces must be from the same Fabric Extender. You cannot mix interfaces from the Fabric Extender and the parent switch.

Layer 2 mode is supported on host interface port channels.

You can configure Layer 2 port channels as access or trunk ports.

Beginning with Cisco NX-OS Release 5.2(1), Fabric Extenders support the host vPC feature where a server can be dual-attached to two different FEXs through a port channel. You must configure parent switches that connect each Fabric Extender (one parent switch per FEX) in a vPC domain.

Minimum Number of Links on a Fabric Port Channel

In a network configuration of dual-homed hosts (active/standby), you can configure the Fabric Extender to support a minimum number of links for fabric port channels (FPCs) with the **port-channel min-links** command.

When the number of FPC links falls below the specified threshold, the host-facing Cisco Nexus 2000 interfaces are brought down. This process allows for a NIC switchover on the connection between the host and the FEX.

The automatic recovery of Cisco Nexus 2000 Series interfaces to the standby FEX is triggered when the number of FPC links reaches the specified threshold.

Load Balancing Using Host Interface Port Channels

The Cisco NX-OS software allows for load balancing traffic across all operational interfaces on a FEX host interface port-channel by hashing the addresses in the frame to a numerical value that selects one of the links in the channel. Port-channels provide load balancing by default.

You can configure the type of load-balancing algorithm used. You can choose the load-balancing algorithm that determines which member port to select for egress traffic by looking at the fields in the frame.

You can configure the load-balancing mode to apply to all Fabric Extenders or to specified ones. If load-balancing mode is not configured, Fabric Extenders use the default system configuration. The per-FEX configuration takes precedence over the load-balancing configuration for the entire system. You cannot configure the load-balancing method per port channel.



Note

The default load-balancing mode for Layer 3 interfaces is the source and destination IP address, and the default load-balancing mode for non-IP interfaces is the source and destination MAC address. For more details, see the *Cisco Nexus 7000 Series NX-OS Interfaces Configuration Guide, Release 6.x*.

You can configure the device to use one of the following methods to load balance across the port channel:

- Destination MAC address
- Source MAC address
- Source and destination MAC address
- Destination IP address
- Source IP address
- Source and destination IP address
- Source TCP/UDP port number

- Destination TCP/UDP port number
- Source and destination TCP/UDP port number
- Dot1Q VLAN number

**Note**

You must be in the default virtual device context (VDC) to configure load-balancing method for FEX; if you attempt to configure this feature from another VDC, the system displays an error.

VLANs

The Fabric Extender supports Layer 2 VLAN trunks and IEEE 802.1Q VLAN encapsulation.

For more information about VLANs, see the *Cisco Nexus 7000 Series NX-OS Layer 2 Switching Configuration Guide*.

**Note**

The Fabric Extender does not support private VLANs (PVLANS).

Protocol Offload

To reduce the load on the control plane of the Cisco Nexus Series device, Cisco NX-OS allows you to offload link-level protocol processing to the Fabric Extender CPU. The following protocols are supported:

- Link Layer Discovery Protocol (LLDP)
- Cisco Discovery Protocol (CDP)
- Link Aggregation Control Protocol (LACP)

Quality of Service

The Fabric Extender uses IEEE 802.1p class of service (CoS) values to associate traffic with the appropriate class. Per-port quality of service (QoS) configuration is also supported.

Host interfaces support pause frames, which are 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.

For more information about LLC and quality-of-service, see the *Cisco Nexus 7000 Series NX-OS Quality of Service Configuration Guide*.

Access Control Lists

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

For more information about ACLs, see the *Cisco Nexus 7000 Series NX-OS Security Configuration Guide*.

IGMP Snooping

IGMP snooping is supported on all host interfaces of the Fabric Extender.

The Fabric Extender and its parent switch support IGMPv2 and IGMPv3 snooping based only on the destination multicast MAC address. It does not support snooping that is based on the source MAC address or on proxy reports.

**Note**

For more information about IGMP snooping, see <http://tools.ietf.org/wg/magma/draft-ietf-magma-snoop/rfc4541.txt>. Also, see the *Cisco Nexus 7000 Series NX-OS Multicast Routing Configuration Guide*.

Switched Port Analyzer

You can configure the host interfaces on the Fabric Extender as Switched Port Analyzer (SPAN) source ports. You cannot configure Fabric Extender ports 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 ingress and egress monitoring are supported.

**Note**

All IP multicast traffic on the VLANs that a Fabric Extender host interface belongs to is captured in the SPAN session. You cannot separate the traffic by IP multicast group membership.

If you configure ingress monitoring and egress monitoring for host interfaces on the same Fabric Extender, you might 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.

For more information about SPAN, see the *Cisco Nexus 7000 Series NX-OS System Management Configuration Guide*.

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. Because most interfaces do not run at their maximum speeds, you can take advantage of unused bandwidth by sharing ports. 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 2248TP Fabric Extender has 4 10-Gigabit Ethernet fabric interfaces and 48 100/1000BASE-T (100-Mb/1-Gigabit) Ethernet host interfaces. When its host interfaces are running in Gigabit Ethernet mode, it offers the following configurations:

- 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)

The Cisco Nexus 2248TP can be run with no oversubscription when its host interfaces are running in 100-Mb mode.

The Cisco Nexus 2248TP-E Fabric Extender has 4 10-Gigabit Ethernet fabric interfaces and 48 100/1000BASE-T (100-Mb/1-Gigabit) Ethernet host interfaces. When its host interfaces are running in Gigabit Ethernet mode, it offers 1.2 to 1 oversubscription (48 host interfaces for four fabric interfaces).

The Cisco Nexus 2248PQ Fabric Extender has 16 10-Gigabit Ethernet fabric interfaces and 48 10-Gigabit Ethernet host interfaces. All host interfaces use all of the available fabric interfaces. When all host interfaces are sending traffic to all fabric interfaces, the maximum oversubscription ratio for the Cisco Nexus 2248PQ is 3:1.

The Cisco Nexus 2232PP Fabric Extender has 8 10-Gigabit Ethernet fabric interfaces and 32 10-Gigabit Ethernet host interfaces. All host interfaces use all of the available fabric interfaces. (Static pinning is not supported. Port-channel mode is supported only on fabric interfaces.) When all host interfaces are sending traffic to all fabric interfaces, the maximum oversubscription ratio for the Cisco Nexus 2232PP is 4:1.

The Cisco Nexus 2232TM and Cisco Nexus 2232TM-E Fabric Extenders have 8 10-Gigabit Ethernet fabric interfaces and 32 Gigabit and 10-Gigabit Ethernet host interfaces. All host interfaces use all of the available fabric interfaces. When all host interfaces are sending traffic to all fabric interfaces, the maximum oversubscription ratio for the Cisco Nexus 2232TM and Cisco Nexus 2232TM-E is 4:1.

The Cisco Nexus 2224TP Fabric Extender has 2 10-Gigabit Ethernet fabric interfaces and 24 100/1000BASE-T (100-Mb/1-Gigabit) Ethernet host interfaces. With this system, you can configure a 1.2 to 1 oversubscription (24 host interfaces for 2 fabric interfaces) or higher.

The Cisco Nexus B22 Fabric Extender for HP (NB22HP) has 8 10-Gigabit Ethernet fabric interfaces and 16 1G/10-Gigabit Ethernet host interfaces. All host interfaces use all of the available fabric interfaces. When all host interfaces are sending traffic to all fabric interfaces, the maximum oversubscription ratio for the Cisco Nexus B22 Fabric Extender for HP (N2K-B22HP-P) is 2:1.

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 switch discovers the Fabric Extender 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 operations 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.

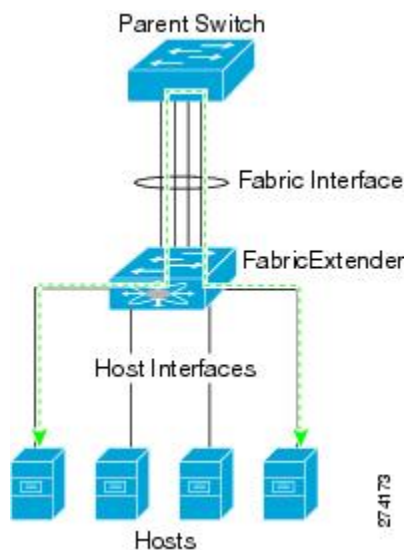
The switch assigns an IP address in the range of loopback addresses (127.15.1.0/24) to the Fabric Extender to avoid conflicts with IP addresses that might be in use on the network.

- 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.

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 that are connected to the same Fabric Extender as shown in the following figure.

Figure 1: Forwarding Model



The forwarding model facilitates feature consistency between the Fabric Extender and its parent Cisco Nexus Series device.



Note

The Fabric Extender provides end-host connectivity into the network fabric. As a result, 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.

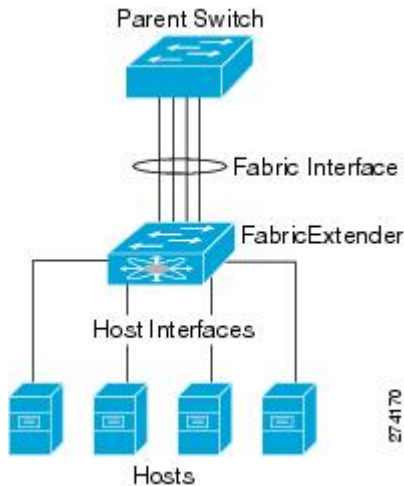
You cannot disable BPDU Guard on the host interfaces of the Fabric Extender.

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

Port Channel Fabric Interface Connection

To provide load balancing between the host interfaces and the parent switch, you can configure the Fabric Extender to use a port channel fabric interface connection. This connection bundles 10-Gigabit Ethernet fabric interfaces into a single logical channel as shown in the following figure.

Figure 2: Port Channel Fabric Interface Connection



When you configure the Fabric Extender to use a port channel 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.
- 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 port channel does not trigger a change to the host interfaces. Traffic is automatically redistributed across the remaining links in the port channel fabric interface. If all links in the fabric port channel go down, all host interfaces on the FEX are set to the down state.

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 Cisco Nexus Series device via a port channel fabric interface. You configure a chassis ID on a port channel on the switch to identify the Fabric Extender that is discovered through those interfaces.

The chassis ID ranges from 101 to 199.



Note The chassis ID is required only to access a host interface on the Fabric Extender. A value of less than 101 indicates a slot on the parent switch. The following port numbering convention is used for the interfaces on the switch:

```
interface ethernet slot/port
```

- *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 updated (if required) during the association process between the parent switch and the Fabric Extender.

When you enter the **install all** command, it upgrades the software on the parent Cisco Nexus 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 parent switch and the Fabric Extender.

Licensing Requirements for the Fabric Extender

The following table shows the licensing requirements for the Cisco Nexus 2000 Series Fabric Extender:

Product	License Requirement
Cisco NX-OS	The Cisco Nexus 2000 Series Fabric Extender requires no license. Any feature not included in a license package is bundled with the Cisco NX-OS system images and is provided at no extra charge to you. For an explanation of the licensing scheme, see the <i>Cisco NX-OS Licensing Configuration Guide</i> .

Guidelines and Limitations for the Fabric Extender

The Cisco Nexus 2000 Series Fabric Extender (FEX) has the following configuration guidelines and limitations:

- Beginning with Cisco NX-OS Release 5.2(1), the default port mode is Layer 3. Before Cisco NX-OS Release 5.2(1), the default port mode was Layer 2.

- You must enable the Fabric Extender feature set in the default virtual device context (VDC). After you enable the feature set in the default VDC, the FEX can belong to any VDC and can be configured from those VDCs.
- Each Fabric Extender that is connected to a chassis must have a unique FEX ID. The same FEX ID cannot be configured for two or more Fabric Extenders even if the Fabric Extenders are in separate VDCs.
- The FEX ID for a Fabric Extender is persistent across a chassis. The FEX ID is not reset when used in a VDC.
- All the uplinks and host ports of a Fabric Extender belong to a single VDC. The ports cannot be allocated or split among multiple VDCs.
- You must connect the Fabric Extender to its parent Cisco Nexus 7000 Series device with a 32-port 10-Gigabit M1 module (N7K-M132XP-12), a 32-port, 10-Gigabit M1-XL module (N7K-M132XP-12L), an M2-Series module, or an F2-Series module.
- The Fabric Extender feature set operation might cause the standby supervisor to reload if it is in an unstable state, such as following a service failure or powering up. You can check whether the standby supervisor is stable by using the **show modules** command. When the standby supervisor is stable, it is indicated as ha-standby.
- You can configure the Fabric Extender host interfaces as edge ports only. The interface is placed in an error-disabled state if a downstream switch is detected.
- The Fabric Extender does not support PVLANS.
- For Cisco NX-OS Release 6.2(2) and later releases, the FEX supports queuing, which allows a router to be connected to a Layer 3 FEX interface or a router to be connected to a Layer 2 FEX interface (using SVI).

Follow these guidelines for a router that is connected to a Layer 2 FEX interface (using SVI):

- You can configure routing adjacency with Layer 3 on the peer router.
- You can configure routing adjacency with SVI on the router using access/trunk interfaces.



Note FEX interfaces do not support the spanning tree protocol.

You must configure the network without the possibility of any loops.

- For Cisco NX-OS Release 6.2(2) and later releases, the Cisco Fabric Extender supports routing protocol adjacency. Before Cisco NX-OS Release 6.2(2), the Fabric Extender cannot participate in a routing protocol adjacency with a device attached to its port. Only a static direct route is supported. This restriction applies to both of the following supported connectivity cases:
 - An SVI with a FEX single port or portchannel in Layer 2 mode.
 - A FEX port or portchannel in Layer 3 mode.
- For Cisco NX-OS Release 6.2(2) and later releases, the Cisco Fabric Extender supports the following:
 - Queuing for Ethernet frames on a FEX-based CoS and DSCP values and support for queuing Fibre Channel over Ethernet (FCoE) frames on a FEX.

- FEX HIF (FEX Host Interface) port to connect to a Protocol Independent Multicast (PIM) router.
- For Cisco NX-OS Release 6.2(2) and later releases, the Cisco Fabric Extender supports optimized multicast flooding (OMF) is available on FEX ports.
- The Cisco Fabric Extender does not support policy based routing (PBR).

Associating with F2-Series Modules

- The following FEX devices support F2 modules:
 - 2248TP
 - 2248TP-E
 - 2248PQ
 - 2232TP
 - 2232PP
 - 2232TM
 - 2224TP
- Each port in the ASIC has an index. Allow only ports with similar indices across ASICs to be added to a port channel.

For example, if port 1 has an index of 1 and port 2 has an index of 2, the following ports are supported and not supported:

 - Supported: Port 1 of ASIC 1 and port 1 of ASIC 2 are added to a port channel.
 - Not supported: Port 1 of ASIC 1 and port 2 of ASIC 2 to form a port channel.

A set of ports from an ASIC that has an index sub-set S , such as $\{1,2,4\}$, is allowed to be added to a port channel only if the port channel has an equivalent or an empty set.

FEX Queuing Support

- **FEX QoS Queuing Support**

Fabric Extenders (FEXs) follow the network quality of service (QoS) queuing model for supporting queuing on FEX host interfaces, regardless of whether the FEX is connected to M-series or F-series fabric uplinks.

 - Depending on the network-QoS template that is attached to the system QoS, the following parameters are inherited for queuing support on a FEX:
 - Number of queues
 - Class of service (CoS2q) mapping
 - Differentiated services code point (DSCP2q) mapping
 - Maximum transmission unit (MTU)

- For both ingress and egress queuing on the FEX host interfaces, all of the preceding parameters are derived from the ingress queuing parameters that are defined in the active network-QoS policy. The egress queuing parameters of the active network-QoS policy do not affect the FEX host-port queuing.
- Such parameters as the bandwidth, queue limit, priority, and set CoS in the network-QoS type queuing-policy maps are not supported for a FEX.

• Hardware Queue-limit Support

The following example shows how to configure the queue limit for a FEX by using the **hardware fex-type queue-limit** command in the FEX configuration mode:

```
switch(config)# fex 101
switch(config-fex)# hardware ?
  B22HP Fabric Extender 16x10G SFP+ 8x10G SFP+ Module
  N2224TP Fabric Extender 24x1G 2x10G SFP+ Module
  N2232P Fabric Extender 32x10G SFP+ 8x10G SFP+ Module
  N2232TM Fabric Extender 32x10GBase-T 8x10G SFP+ Module
  N2232TM-E Fabric Extender 32x10GBase-T 8x10G SFP+ Module
  N2248T Fabric Extender 48x1G 4x10G SFP+ Module
  N2248TP-E Fabric Extender 48x1G 4x10G SFP+ Module
switch(config-fex)# hardware N2248T ?
  queue-limit Set queue-limit
switch(config-fex)# hardware N2248T queue-limit ?
  <5120-652800> Queue limit in bytes =====> Allowed range of values varies dependent
  on the FEX type for which it is configured
switch(config-fex)# hardware N2248T queue-limit =====> Default configuration that sets
  queue-limit to default value of 66560 bytes
switch(config-fex)# hardware N2248T queue-limit 5120 =====> Set user defined queue-limit
  for FEX type N2248T associated on fex id 101
switch(config-fex)# no hardware N2248T queue-limit =====> Disable queue-limit for FEX
  type N2248T associated on fex id 101
switch(config-fex)# hardware N2248TP-E queue-limit ?
  <32768-33538048> Queue limit in Bytes
  rx Ingress direction
  tx Egress direction
switch(config-fex)# hardware N2248TP-E queue-limit 40000 rx
switch(config-fex)# hardware N2248TP-E queue-limit 80000 tx =====> For some FEX types,
  different queue-limit can be configured on ingress & egress directions
```

The value of the queue limit that is displayed for a FEX interface is 0 bytes until after the first time the FEX interface is brought up. After the interface comes up, the output includes the default queue limit or the user-defined queue limit based on the hardware queue-limit configuration. If the hardware queue limit is unconfigured, "Queue limit: Disabled" is displayed in the command output. The following partial output of the **show queuing interface interface** command shows the queue limit that is enforced on a FEX:

```
switch# show queuing interface ethernet 101/1/48

<snippet>
Queue limit: 66560 bytes
<snippet>
```

• Global Enable/Disable Control of DSCP2Q

In the following example, the **all** or the **f-series** keyword enables DSCP2q mapping for the FEX host interfaces, regardless of the module type to which the FEX is connected:

```
switch(config)# hardware QoS dscp-to-queue ingress module-type ?
  all          Enable dscp based queuing for all cards
  f-series     Enable dscp based queuing for f-series cards
  m-series     Enable dscp based queuing for m-series cards
```

• Show Command Support for FEX Host Interfaces

The **show queuing interface *interface*** command is supported for FEX host interfaces. The following sample output of this command for FEX host interfaces includes the number of queues used, the mapping for each queue, the corresponding queue MTU, the enforced hardware queue limit, and the ingress and egress queue statistics.



Note There is no support to clear the queuing statistics shown in this output.

```
switch# show queuing interface ethernet 199/1/2

slot 1
=====

Interface is not in this module.

slot 2
=====

Interface is not in this module.

slot 4
=====

Interface is not in this module.

slot 6
=====

Interface is not in this module.

slot 9
=====

Ethernet199/1/2 queuing information:
  Input buffer allocation:
  Qos-group: ctrl
  frh: 0
  drop-type: drop
  cos: 7
  xon      xoff      buffer-size
  -----+-----+-----
  2560     7680     10240

  Qos-group: 0 2 (shared)
  frh: 2
  drop-type: drop
  cos: 0 1 2 3 4 5 6
  xon      xoff      buffer-size
  -----+-----+-----
  34560    39680    48640

  Queueing:
  queue   qos-group   cos           priority  bandwidth  mtu
  -----+-----+-----+-----+-----+-----
  ctrl-hi n/a           7             PRI       0          2400
  ctrl-lo n/a           7             PRI       0          2400
  2       0           0 1 2 3 4    WRR       80         1600
  4       2           5 6          WRR       20         1600

  Queue limit: 66560 bytes

  Queue Statistics:
  queue   rx           tx           flags
  -----+-----+-----+-----
  0       0           0           ctrl
  1       0           0           ctrl
  2       0           0           data
  4       0           0           data
```

```

Port Statistics:
rx drop          rx mcast drop    rx error          tx drop          mux ovflow
-----+-----+-----+-----+-----
0                0                0                0                InActive

Priority-flow-control enabled: no
Flow-control status: rx 0x0, tx 0x0, rx_mask 0x0
cos      qos-group  rx pause  tx pause  masked rx pause
-----+-----+-----+-----+-----
0        0        xon       xon       xon
1        0        xon       xon       xon
2        0        xon       xon       xon
3        0        xon       xon       xon
4        0        xon       xon       xon
5        2        xon       xon       xon
6        2        xon       xon       xon
7        n/a      xon       xon       xon

DSCP to Queue mapping on FEX
-----+-----+-----+-----+-----
FEX TCAM programmed successfully

  queue      DSCPs
  ----      -
02          0-39,
04          40-63,
03          **EMPTY**
05          **EMPTY**

slot 10
=====

slot 11
=====

Interface is not in this module.

slot 15
=====

Interface is not in this module.

slot 16
=====

Interface is not in this module.

slot 17
=====

Interface is not in this module.

slot 18
=====

Interface is not in this module.

```

• ISSU Behavior

In Cisco NX-OS Release 6.2(2) and later releases, FEX queuing is disabled by default on all existing FEXs after an in-service software upgrade (ISSU). FEX queuing is enabled upon flapping the FEX. You can reload the FEX to enable queuing on any FEX after an ISSU. A message is displayed in the output of the **show queuing interface interface** command for the FEX host interface after an ISSU.

```

switch# show queuing interface ethernet 133/1/32 module 9

Ethernet133/1/32 queuing information:
  Input buffer allocation:

```

```

Qos-group: ctrl
frh: 0
drop-type: drop
cos: 7
xon      xoff      buffer-size
-----+-----+-----
2560     7680     10240

```

```

Qos-group: 0
frh: 8
drop-type: drop
cos: 0 1 2 3 4 5 6
xon      xoff      buffer-size
-----+-----+-----
0         126720    151040

```

```

Queueing:
queue   qos-group   cos           priority  bandwidth  mtu
-----+-----+-----+-----+-----+-----
ctrl-hi n/a             7             PRI        0          2400
ctrl-lo n/a             7             PRI        0          2400
2       0           0 1 2 3 4 5 6 WRR        100       9440

```

Queue limit: 66560 bytes

```

Queue Statistics:
queue  rx           tx           flags
-----+-----+-----+-----
0      0             0           ctrl
1      0             0           ctrl
2      0             0           data

```

```

Port Statistics:
rx drop      rx mcast drop  rx error      tx drop      mux overflow
-----+-----+-----+-----+-----
0             0              0              0             InActive

```

```

Priority-flow-control enabled: no
Flow-control status: rx 0x0, tx 0x0, rx_mask 0x0
cos   qos-group  rx pause  tx pause  masked rx pause
-----+-----+-----+-----+-----
0     0         xon       xon       xon
1     0         xon       xon       xon
2     0         xon       xon       xon
3     0         xon       xon       xon
4     0         xon       xon       xon
5     0         xon       xon       xon
6     0         xon       xon       xon
7     n/a       xon       xon       xon

```

***FEX queuing disabled on fex 133. Reload the fex to enable queuing.<=====

For any new FEXs brought online after an ISSU, queuing is enabled by default.

The queue limit is enabled by default for all FEXs, regardless of whether queuing is enabled or disabled for the FEX. In Cisco NX-OS Release 6.2(2), all FEXs come up with the default hardware queue-limit value. Any user-defined queue limit that is configured after an ISSU by using the **hardware queue-limit** command takes effect even if queuing is not enabled for the FEX.

- **No Support on the Cisco Nexus 2248PQ 10-Gigabit Ethernet Fabric Extender**

The following sample output shows that FEX queuing is not supported for the Cisco Nexus 2248PQ 10-Gigabit Ethernet Fabric Extender (FEX2248PQ):

```

switch# show queuing interface ethernet 143/1/1 module 5

Ethernet143/1/1 queuing information:
Network-QOS is disabled for N2248PQ <=====
Displaying the default configurations
Input buffer allocation:
Qos-group: ctrl

```

```

frh: 0
drop-type: drop
cos: 7
xon      xoff      buffer-size
-----+-----+-----
2560     7680     10240

Qos-group: 0
frh: 8
drop-type: drop
cos: 0 1 2 3 4 5 6
xon      xoff      buffer-size
-----+-----+-----
0         126720    151040

Queueing:
queue    qos-group    cos                priority  bandwidth  mtu
-----+-----+-----+-----+-----+-----
ctrl-hi  n/a              7                PRI       0          2400
ctrl-lo  n/a              7                PRI       0          2400
2        0                0 1 2 3 4 5 6    WRR       100       9440

Queue limit: 0 bytes

Queue Statistics:
queue    rx                tx                flags
-----+-----+-----+-----
0        0                0                ctrl
1        0                0                ctrl
2        0                0                data

Port Statistics:
rx drop    rx mcast drop    rx error    tx drop    mux ovflow
-----+-----+-----+-----+-----
0          0                0            0          InActive

Priority-flow-control enabled: no
Flow-control status: rx 0x0, tx 0x0, rx_mask 0x0
cos      qos-group    rx pause    tx pause    masked rx pause
-----+-----+-----+-----+-----
0        0          xon         xon         xon
1        0          xon         xon         xon
2        0          xon         xon         xon
3        0          xon         xon         xon
4        0          xon         xon         xon
5        0          xon         xon         xon
6        0          xon         xon         xon
7        n/a        xon         xon         xon

```

• Fabric Port Queuing Restrictions

- For FEXs that are connected to M-series uplinks, the queuing structure is different on FEX host interfaces and FEX fabric interfaces. The M series queuing policies must be consistent with the FEX queuing policies.
- DSCP-based queuing is not supported on M1 FEX fabric uplinks.
- You cannot modify the CoS 0-4 mappings in the default queue on M1 FEX fabric uplinks.

• MTU

- FEX queue MTU configurations are derived from type network-QoS policy-map templates. MTU changes are applied on cloned network-QoS policy maps. The MTU that is configured on a FEX port must match the MTU in the network-QoS policy map so that the FEX MTU can be applied to the FEX host interfaces. For more information, see the *Cisco Nexus 7000 Series NX-OS Quality of Service Configuration Guide*.

Configuration Limits

The configuration limits are documented in the *Cisco Nexus 7000 Series NX-OS Verified Scalability Guide*.

Default Settings

This table lists the default settings for the Fabric Extender parameters.

Table 1: Default Cisco Nexus 2000 Series Fabric Extender Parameter Settings

Parameters	Default
feature-set fex command	Disabled
Port mode	Layer 3 (Cisco NX-OS Release 5.2 and later releases). Layer 2 (Cisco NX-OS Release 5.1 and earlier releases).



Configuring the Fabric Extender

This chapter describes how to configure a Cisco Nexus 2000 Series Fabric Extender using a parent Cisco Nexus 7000 Series device and includes the following sections:

- [Configuring the Cisco Nexus 2000 Series Fabric Extender, page 21](#)
- [Verifying the Configuration, page 38](#)
- [Additional References, page 45](#)

Configuring the Cisco Nexus 2000 Series Fabric Extender

This section describes how to configure the Fabric Extender.

Information About Cisco Nexus 2000 Series Fabric Extender

FEX in Active-Active Mode

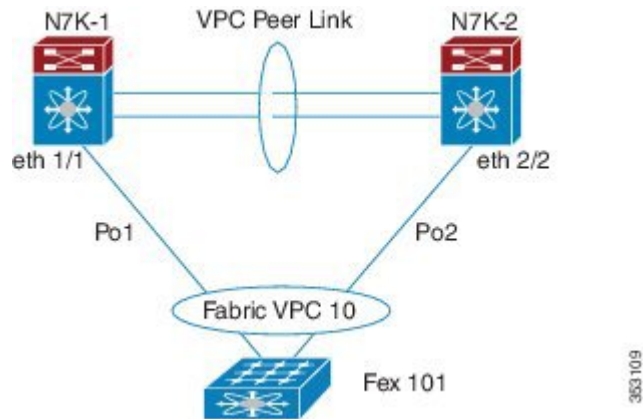
Beginning with Cisco NX-OS Release 7.2(0)D1(1), a Fabric Extender can support connections to two Cisco Nexus 7000 Series switches in active-active mode using a vPC.

A Fabric Extender in active-active (FEX-AA) mode:

- Uses a vPC to provide a seamless fail-over and fast convergence when one of the switches fail.

- Supports traffic across both switches to maintain efficiency.

Figure 3: FEX Active-Active



Configuration Synchronization and FEX-AA

The vPC configuration synchronization feature can be used for FEX-AA. Configuration synchronization allows you to synchronize the configuration between a pair of switches in a network. You use a switch profile to create a configuration file that is applied locally and used to synchronize the configuration to the peer.

Guidelines and Limitations for FEX-AA

The following are guidelines and limitations for FEX-AA:

- FEX-AA is not supported on vPC+ deployments.
- Only F-Series (except F1 series) modules support FEX-AA. M1/M2 Series modules do not support FEX-AA.
- Configuring FEX-AA across two VDCs on the same chassis is not supported.
- FEXs configured in AA mode cannot have host interfaces configured in L3 mode .
- Both Cisco Nexus 7000 Series switches can configure the FEX.
- Both Cisco Nexus 7000 Series switches must configure the FEX in the same way so that the fex-id is the same for each.
- The configuration of host ports and host port-channels behind the FEX in AA mode must be the same on both the Cisco Nexus 7000 switches .
- The FEX image can be downloaded from either Cisco Nexus 7000 Series switch.

Managing the Fabric Extender Feature Set

You can install and manage the Fabric Extender feature set.

SUMMARY STEPS

1. [Installing the Fabric Extender Feature Set, on page 23](#)
2. [Enabling the Fabric Extender Feature Set, on page 24](#)
3. (Optional) [Disallowing the Fabric Extender Feature Set, on page 25](#)

DETAILED STEPS

-
- Step 1** [Installing the Fabric Extender Feature Set, on page 23](#)
- Step 2** [Enabling the Fabric Extender Feature Set, on page 24](#)
- Step 3** (Optional) [Disallowing the Fabric Extender Feature Set, on page 25](#)
-

Installing the Fabric Extender Feature Set**Note**

You must enable the Fabric Extender feature set in the default virtual device context (VDC). Once enabled in the default VDC, the FEX can belong to any VDC and can be configured from those VDCs. A single Fabric Extender belongs exclusively to a single VDC.

Before You Begin

Ensure that you are in the default VDC.

Ensure that you have disabled the Intrusion Detection System (IDS) reserved addresses check (it is disabled by default). Use the **show hardware ip verify** command and look for the string "address reserved" in the output. If the IDS reserved addresses check is enabled, disable it with the **no hardware ip verify address reserved** command.

SUMMARY STEPS

1. **configure terminal**
2. **install feature-set fex**
3. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	configure terminal Example: switch# configure terminal switch(config)#	Enters global configuration mode.
Step 2	install feature-set fex	Installs the Fabric Extender feature set in the default VDC.

	Command or Action	Purpose
	Example: <pre>switch(config)# install feature-set fex</pre>	To uninstall the Fabric Extender feature set, use the no install feature-set fex command. Before you can uninstall the feature set, you must ensure the following: <ul style="list-style-type: none"> • The feature set must be installed in the default VDC. • The feature set must not be enabled in any VDC.
Step 3	exit Example: <pre>switch(config)# exit switch#</pre>	Exits global configuration mode.

Enabling the Fabric Extender Feature Set

You can enable the installed Fabric Extender feature set in any VDC on the device.

Before You Begin

Ensure that you have installed the Fabric Extender feature set in the default VDC.

Ensure that you are in the correct VDC or use the **switchto vdc** command.

SUMMARY STEPS

1. **configure terminal**
2. **feature-set fex**
3. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	configure terminal Example: <pre>switch# configure terminal switch(config)#</pre>	Enters global configuration mode.
Step 2	feature-set fex Example: <pre>switch(config)# feature-set fex</pre>	Enables the Fabric Extender feature set. The feature set must be installed before it shows as an option to this command. To disable the Fabric Extender feature set, use the no feature-set fex command. Before you can disable a feature set, you must install the feature set in the default VDC.

	Command or Action	Purpose
		Note The no feature-set fex command might take some time to complete if the size of the configuration is very large. The command cleans up all of the configurations associated with the Fabric Extender feature set.
Step 3	exit Example: <pre>switch(config)# exit switch#</pre>	Exits global configuration mode.

Disallowing the Fabric Extender Feature Set

By default, when you install the Fabric Extender feature set, it is allowed in all VDCs. You can disallow the installed Fabric Extender feature set in a specific VDC on the device.

Before You Begin

Ensure that you have installed the feature set in the default VDC.

Ensure that you have not enabled the feature set in the specified VDC.

SUMMARY STEPS

1. **configure terminal**
2. **vdc vdc_ID**
3. **no allow feature-set fex**
4. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	configure terminal Example: <pre>switch# configure terminal switch(config)#</pre>	Enters global configuration mode.
Step 2	vdc vdc_ID Example: <pre>switch(config)# vdc 1</pre>	Specifies a VDC and enters VDC configuration mode.

	Command or Action	Purpose
Step 3	no allow feature-set fex Example: <pre>switch(config-vdc)# no allow feature-set fex</pre>	Disallows the feature set in the VDC. You cannot disallow a feature set that is enabled in the specified VDC. By default, the installed Fabric Extender feature set is allowed in all VDCs on the device. You can disallow a feature set in a specific VDC. Subsequently, you can change the status back to allowed with the allow feature-set fex command.
Step 4	end Example: <pre>switch(config-vdc)# end switch#</pre>	Exits VDC configuration mode and returns to EXEC mode.

Associating a Fabric Extender to a Fabric Interface

A FEX is connected to its parent device through a port channel. By default, the parent device does not allow the attached Fabric Extender to connect until it has been assigned a FEX number and is associated with the connected interface.



Note You must have installed and enabled the Fabric Extender features with the **install feature-set fex** and **feature-set fex** commands before you can configure and use a Fabric Extender that is connected to the parent switch.



Note Nexus 7000 doesn't support static pinning configuration on FEX.



Note Associating a Fabric Extender to a fabric interface enables the specified port to operate only in shared rate-mode. The port does not support dedicated rate-mode when associated with a Fabric Extender.

Associating a Fabric Extender to a Port Channel

Before You Begin

Ensure that you have installed and enabled the Fabric Extender feature set.

SUMMARY STEPS

1. **configure terminal**
2. **interface port-channel** *channel*
3. **switchport**
4. **switchport mode fex-fabric**
5. **fex associate** *FEX-number*
6. (Optional) **show interface port-channel** *channel fex-intf*

DETAILED STEPS

	Command or Action	Purpose
Step 1	configure terminal Example: switch# configure terminal switch(config)#	Enters global configuration mode.
Step 2	interface port-channel <i>channel</i> Example: switch(config)# interface port-channel 4 switch(config-if)#	Specifies a port channel to configure.
Step 3	switchport Example: switch(config-if)# switchport	Sets the interface as a Layer 2 switching port.
Step 4	switchport mode fex-fabric Example: switch(config-if)# switchport mode fex-fabric	Sets the port channel to support an external Fabric Extender.
Step 5	fex associate <i>FEX-number</i> Example: switch(config-if)# fex associate 101	Associates a FEX number to the Fabric Extender unit attached to the interface. The range is from 101 to 199.
Step 6	show interface port-channel <i>channel fex-intf</i> Example: switch# show interface port-channel 4 fex-intf	(Optional) Displays the association of a Fabric Extender to a port channel interface.

This example shows how to associate the Fabric Extender to a port channel interface on the parent device:

```
switch# configure terminal
switch(config)# interface ethernet 1/28
switch(config-if)# channel-group 4
switch(config-if)# no shutdown
switch(config-if)# exit
switch(config)# interface ethernet 1/29
```

```

switch(config-if)# channel-group 4
switch(config-if)# no shutdown
switch(config-if)# exit
switch(config)# interface ethernet 1/30
switch(config-if)# channel-group 4
switch(config-if)# no shutdown
switch(config-if)# exit
switch(config)# interface ethernet 1/31
switch(config-if)# channel-group 4
switch(config-if)# no shutdown
switch(config-if)# exit
switch(config)# interface port-channel 4
switch(config-if)# switchport
switch(config-if)# switchport mode fex-fabric
switch(config-if)# fex associate 101

```

**Tip**

As a best practice, only enter the **fex associate** command from the port channel interface, not from the physical interface.

**Note**

When adding physical interfaces to port channels, all configurations on the port channel and physical interface must match.

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

```

switch# show interface port-channel 4 fex-intf
Fabric          FEX
Interface       Interfaces
-----
Po4             Eth101/1/48   Eth101/1/47   Eth101/1/46   Eth101/1/45
                Eth101/1/44   Eth101/1/43   Eth101/1/42   Eth101/1/41
                Eth101/1/40   Eth101/1/39   Eth101/1/38   Eth101/1/37
                Eth101/1/36   Eth101/1/35   Eth101/1/34   Eth101/1/33
                Eth101/1/32   Eth101/1/31   Eth101/1/30   Eth101/1/29
                Eth101/1/28   Eth101/1/27   Eth101/1/26   Eth101/1/25
                Eth101/1/24   Eth101/1/23   Eth101/1/22   Eth101/1/21
                Eth101/1/20   Eth101/1/19   Eth101/1/18   Eth101/1/17
                Eth101/1/16   Eth101/1/15   Eth101/1/14   Eth101/1/13
                Eth101/1/12   Eth101/1/11   Eth101/1/10   Eth101/1/9
                Eth101/1/8    Eth101/1/7    Eth101/1/6    Eth101/1/5
                Eth101/1/4    Eth101/1/3    Eth101/1/2    Eth101/1/1

```

Disassociating a Fabric Extender from an Interface

Before You Begin

Ensure that you have installed and enabled the Fabric Extender feature set.

Ensure that you are in the correct VDC (or use the **switchto vdc** command).

SUMMARY STEPS

1. **configure terminal**
2. **interface {ethernet slot/port | port-channel channel}**
3. **no fex associate**

DETAILED STEPS

	Command or Action	Purpose
Step 1	configure terminal Example: switch# configure terminal switch(config)#	Enters global configuration mode.
Step 2	interface {ethernet slot/port port-channel channel} Example: switch(config)# interface port-channel 4 switch(config-if)#	Specifies the interface to configure. The interface can be an Ethernet interface or a port channel.
Step 3	no fex associate Example: switch(config-if)# no fex associate	Disassociates the Fabric Extender unit attached to the interface.

Associating a Fabric Extender to an F-Series Module

Before You Begin

Ensure that you have installed and enabled the Fabric Extender feature set.

- switch# **configure terminal**
- switch(config)# **install feature-set fex**
- switch(config)# **feature-set fex**

**Note**

F-Series modules (except F1 Series) are supported only by the following FEX devices:

- 2248TP
 - 2248TP-E
 - 2248PQ
 - 2348UPQ
 - 2348TQ
 - 2232TP
 - 2232PP
 - 2232TM
 - 2224TP
 - B22-IBM
 - B22-HP
-

**Note**

Restriction for F2-Series Linecards in an F2 VDC:

Each port in the ASIC has an index. Allow only ports with similar indices across ASICs to be added to a port channel.

For example, if port 1 has an index of 1 and port 2 has an index of 2, the following ports are supported and not supported:

- Supported: Port 1 of ASIC 1 and port 1 of ASIC 2 are added to a port channel.
- Not supported (For F2-series): Port 1 of ASIC 1 and port 2 of ASIC 2 to form a port channel.

A set of ports from an ASIC that has an index sub-set S, such as {1,2,4}, is allowed to be added to a port channel only if the port channel has an equivalent or an empty set.

SUMMARY STEPS

1. **vdc switch**
2. **limit-resource module-type** [f2e | f3]
3. **interface ethernet** *mod-number port-range*
4. **allocate interface ethernet** *slot-port*
5. **switchport mode fex -fabric**
6. **fex associate** *FEX chassis number*
7. **channel-group** *port-channel number*
8. **no shutdown**
9. **int port** *port-channel number*
10. **no shutdown**

DETAILED STEPS

	Command or Action	Purpose
Step 1	vdc switch Example: switch(config)# vdc switch	Specifies the VDC.
Step 2	limit-resource module-type [f2e f3] Example: switch(config)# limit-resource module-type f2e	Specifies the module type.
Step 3	interface ethernet <i>mod-number port-range</i> Example: switch(config)# interface ethernet 1/1	Specifies the interface.
Step 4	allocate interface ethernet <i>slot-port</i> Example: switch(config)# allocate interface ethernet 1	Allocates the F2-Series interfaces to VDC.
Step 5	switchport mode fex -fabric Example: switch(config-if)# switchport mode fex -fabric	Specifies the FEX.
Step 6	fex associate <i>FEX chassis number</i> Example: switch(config-if)# fex associate 101	Specifies the chassis.
Step 7	channel-group <i>port-channel number</i> Example: switch(config-if)# channel-group 1	Specifies the port channel number.
Step 8	no shutdown Example: switch(config-if)# no shutdown	Brings up the port.
Step 9	int port <i>port-channel number</i> Example: switch(config-if)# int port 1	Specifies the port channel.
Step 10	no shutdown Example: switch(config-if)# no shutdown	Brings up the port channel.

Configuring Fabric Extender Global Features

You can configure global features on the Fabric Extender.

Before You Begin

Ensure that you have enabled the Fabric Extender feature set.

SUMMARY STEPS

1. **configure terminal**
2. **fex** *FEX-number*
3. (Optional) **description** *desc*
4. (Optional) **no description**
5. (Optional) **type** *FEX-type*
6. (Optional) **no type**
7. (Optional) **serial** *serial*
8. (Optional) **no serial**

DETAILED STEPS

	Command or Action	Purpose
Step 1	configure terminal Example: <pre>switch# configure terminal switch(config)#</pre>	Enters global configuration mode.
Step 2	fex <i>FEX-number</i> Example: <pre>switch(config)# fex 101 switch(config-fex)#</pre>	Enters FEX configuration mode for the specified Fabric Extender. The range of the <i>FEX-number</i> is from 101 to 199.
Step 3	description <i>desc</i> Example: <pre>switch(config-fex)# description Rack7A-N2K</pre>	(Optional) Specifies the description. The default is the string FEXxxxx where <i>xxxx</i> is the FEX number. If the FEX number is 123, the description is FEX0123.
Step 4	no description Example: <pre>switch(config-fex)# no description</pre>	(Optional) Deletes the description.
Step 5	type <i>FEX-type</i> Example: <pre>switch(config-fex)# type N2248T</pre>	(Optional) Specifies the type of Fabric Extender. The <i>FEX-type</i> is one of the following: <ul style="list-style-type: none"> • N2224TP—24 100 Base-T/1000 Base-T Ethernet host interfaces and 2 10-Gigabit SFP+ Ethernet fabric interfaces module

	Command or Action	Purpose
		<ul style="list-style-type: none"> • N2232P and N2232TM—32 10-Gigabit SFP+ Ethernet host interfaces and 8 10-Gigabit SFP+ Ethernet fabric interfaces module • N2248T and N2248TP-E—48 100 Base-T/1000 Base-T Ethernet host interfaces and 4 10-Gigabit SFP+ Ethernet fabric interfaces module. • N2248PQ—48 10-Gigabit SFP+ Ethernet host interfaces and 16 10-Gigabit SFP+ Ethernet fabric interfaces module. • NB22HP—16 1G/10-Gigabit SFP+ Ethernet host interfaces and 8 10-Gigabit SFP+ Ethernet fabric interfaces module <p>The parent Cisco Nexus Series device remembers the type of the Fabric Extender in its binary configuration. When this feature is configured, the Fabric Extender is allowed only to come online if its type matches the configured FEX type.</p>
Step 6	no type Example: <pre>switch(config-fex)# no type</pre>	(Optional) Deletes the FEX type. When a Fabric Extender is connected to the fabric interfaces and does not match the configured type that is saved in the binary configuration on the parent switch, all configurations for all interfaces on the Fabric Extender are deleted.
Step 7	serial serial Example: <pre>switch(config-fex)# serial JAF1339BDSK</pre>	(Optional) Defines a serial number string. If this command is configured, a switch allows the corresponding chassis ID to associate (using the fex associate command) only if the Fabric Extender reports a matching serial number string. Caution Configuring a serial number that does not match the specified Fabric Extender forces the Fabric Extender offline.
Step 8	no serial Example: <pre>switch(config-fex)# no serial</pre>	(Optional) Deletes the serial number string.

Enabling DSCP to Queue Mapping

For Cisco NX-OS Release 6.2(2) and later releases, the Cisco Fabric Extenders support Layer 3 protocol adjacencies on host interfaces (HIFs) and DSCP to queue mapping. Before Cisco NX-OS Release 6.2(2), you can configure a Fabric Extender (FEX) port as a Layer 3 interface for host connectivity, but not for routing. See the Configuring the Cisco Nexus 2000 Series Fabric Extender for more information about fabric extenders.

Before Cisco NX-OS 6.2(2), the Fabric Extender cannot participate in a routing protocol adjacency with a device attached to its port. Only a static direct route is supported. This restriction applies to both of the following supported connectivity cases:

- Switch virtual interfaces (SVI) with Fabric Extender single port or portchannel in Layer 2 mode.
- Fabric Extender port or portchannel in Layer 3 mode.

SUMMARY STEPS

1. **configure terminal**
2. **hardware qos dscp-to-queue ingress module type {all | f-series | m-series}**
3. (Optional) **show hardware qos dscp-to-queue ingress**
4. (Optional) **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	configure terminal Example: switch(config)# configure terminal	Enters global configuration mode.
Step 2	hardware qos dscp-to-queue ingress module type {all f-series m-series} Example: switch(config)# hardware qos dscp-to-queue ingress module type m-series	Enables the dscp-to-queue mapping on the specified module(s).
Step 3	show hardware qos dscp-to-queue ingress Example: switch(config)# show hardware qos dscp-to-queue ingress	(Optional) Displays information about the status of dscp-to-queue mapping in ingress direction.
Step 4	copy running-config startup-config Example: switch(config)# copy running-config startup-config	(Optional) Saves the running configuration to the startup configuration.

Configuration Examples

This section contains examples of FEX configurations.

Configuring a FEX with a Layer 3 Host Interface

This example shows how to configure a Fabric Extender with a Layer 3 host interface (at the interface level, subinterface level, port channel level, and port channel subinterface level):

Layer 3 Configuration	Layer 3 Subinterface Configuration
<pre> config t interface ethernet 101/1/1 no switchport ip address 192.0.1.1/24 Mtu 9000 no shutdown </pre>	<pre> config t interface ethernet 101/1/1.12 ip address 192.0.2.1/24 encapsulation dot1Q 12 mtu 850 no shutdown </pre>

Layer 3 Host Interface Port Channel Configuration	Layer 3 Host Interface Port Channel Subinterface Configuration
<pre> config t interface ethernet 101/1/1-2 no switchport channel-group 12 no shutdown interface port-channel 12 ip address 192.0.3.1/24 mtu 2000 no shutdown </pre>	<pre> config t interface ethernet 101/1/1-2 no switchport channel-group 12 no shutdown interface port-channel 12.14 ip address 192.0.4.1/24 encapsulation dot1Q 14 mtu 1700 no shutdown </pre>



Note The VLAN used in the Layer 3 host interface (HIF) or host interface port channel (HIFPC) subinterface has only local significance to its parent interface. The same VLAN ID can be reused between Layer 3 subinterfaces in the same switch or VDC.

Configuring a Host Interface in a vPC Topology Connected to Two FEXs

This example shows how to configure a host vPC with a FEX (host vPC attached to two different FEXs):



Note The `switchport trunk allowed vlan vlan-list` command is not supported on FEX fabric interfaces.

Switch 1 Configuration	Switch 2 Configuration
<pre> config t feature lacp int e101/1/1-2 channel-group 12 mode active no shutdown int port-channel10 switchport switchport mode trunk switchport trunk allowed vlan 1-20 vpc 10 </pre>	<pre> config t feature lacp int e101/1/1-2 channel-group 12 mode active no shutdown int port-channel10 switchport switchport mode trunk switchport trunk allowed vlan 1-20 vpc 10 </pre>

Configuring a Host Interface in a vPC Topology Connected to Two FEXs

This example shows how to configure a host vPC with a FEX (host vPC attached to two different FEXs):



Note The `switchport trunk allowed vlan vlan-list` command is not supported on FEX fabric interfaces.

Switch 1 Configuration	Switch 2 Configuration
<pre> config t feature lacp int e101/1/1-2 channel-group 12 mode active no shutdown int port-channel10 switchport switchport mode trunk switchport trunk allowed vlan 1-20 vpc 10 </pre>	<pre> config t feature lacp int e101/1/1-2 channel-group 12 mode active no shutdown int port-channel10 switchport switchport mode trunk switchport trunk allowed vlan 1-20 vpc 10 </pre>

Dual-Homing of a Server to a FEX with FabricPath



Note Cisco Nexus 7000 Series switches do not support dual-homing.

To configure FabricPath interfaces for two switches that are connected with FabricPath, perform the following tasks on each switch:

- Enable FabricPath on each switch.
- Configure the interfaces that you want to designate as FabricPath interfaces.
- Set the STP priority device to 8192 on all FabricPath Layer 2 gateway devices.
- (Optional) Set the STP domain ID for each of the separate STP domains that are connected to the FabricPath network.

- (Optional) Configure a FEX switch ID.

To configure FabricPath interfaces, follow these steps:

- 1 (Optional) Enable FabricPath on each switch.

```
switch# config terminal
switch(config)# feature fabricpath
switch(config-lldp)# exit
switch(config)#
```

- 2 After you enable FabricPath on the switch, configure the specified interface as FabricPath interfaces.

```
switch(config)# interface ethernet 1/2
switch(config-if)# switchport mode fabricpath
switch(config-if)# exit
switch(config)#
```

- 3 Configure the STP priority for all Rapid PVST+ VLANs as 8192.

```
switch# config terminal
switch(config)# spanning-tree vlan 11-20 priority 8192
switch(config)#
```

- 4 Configure the STP priority for all MST instances as 8192.

```
switch# config terminal
switch(config)# spanning-tree mst 1-5 priority 8192
switch(config)#
```

- 5 (Optional) Configure the STP domain ID on each FabricPath Layer 2 gateway switch attached to the FabricPath network.

```
switch# config terminal
switch(config)# spanning-tree domain 5
switch(config)
```

- 6 (Optional) Configure the FEX switch ID.



Note

See the *Cisco Nexus 7000 Series NX-OS Interfaces Configuration Guide* for information on configuring FEX.



Note

FEX VPC+ configurations are supported only on F2-Series modules.

If you are setting up an initial FEX VPC+ configuration on an F2-Series module, follow these steps:

- a In the VPC domain configuration mode, enable partial DF mode with the **fabricpath multicast load-balance** command.
- b If disabled, enable TRILL style mac-address learning with the **mac address-table core-port-learning** command.
- c In the VPC domain configuration mode, configure the emulated switch ID with the **fabricpath switchid switchid#** command.
- d On each of the VPC/VPC+ peer link interfaces in interface configuration mode, enter the **switchport mode fabricpath** command.
- e On each VPC/VPC+ peer link port channel, enter the **VPC peer-link** command.
- f Configure the VPC ID with the **vpc vpcid** command.

If you are changing an existing FEX VPC configuration to a FEX VPC+ configuration on an F2-Series module, follow these steps:

- a In the VPC domain configuration mode, enable partial DF mode with the **fabricpath multicast load-balance** command.
- b If disabled, enable trill style mac-address learning with the **mac address-table core-port-learning** command.
- c In the VPC domain configuration mode, configure the emulated switch ID with the **fabricpath switchid switchid#** command.

7 Copy the configuration.

```
switch(config)# copy running-config startup-config
switch(config)#
```

Configuring a FEX in Active-Active Mode

This example shows how to configure a FEX in active-active (FEX-AA) mode:

Switch 1 Configuration	Switch 2 Configuration
<pre>int eth 1/1 channel-group 1 int po1 switchport switchport mode fex-fabric fex associate 101 vpc 10</pre>	<pre>int eth 2/2 channel-group 2 int po2 switchport switchport mode fex-fabric fex associate 101 vpc 10</pre>



Note

- The chassis number (fex-id) for both switches must be the same.
- Configuring FEX-AA across two VDCs on the same chassis is not supported.
- FEX-AA does not support Layer 3 interfaces.

Verifying the Status of DSCP-to-queue Mapping

The following sample output from the **show hardware qos dscp-to-queue ingress** command displays the status of DSCP-to-queue mapping enabled in ingress direction on F-series modules:

```
Switch# show hardware qos dscp-to-queue ingress

status: Enabled
module_type : f-series
```

Verifying the Configuration

This section describes how to display the configuration of the Fabric Extender and verify the chassis hardware status.

Verifying the Fabric Extender Configuration

Use the following commands to display configuration information about the defined interfaces on a Fabric Extender:

Command or Action	Purpose
<code>show fex [FEX-number] [detail]</code>	Displays information about a specific Fabric Extender or all attached units.
<code>show interface type number fex-intf</code>	Displays the Fabric Extender ports that are pinned to a specific switch interface.
<code>show interface fex-fabric</code>	Displays the switch interfaces that have detected a Fabric Extender uplink.
<code>show interface ethernet number transceiver [fex-fabric]</code>	Displays the SFP+ transceiver and diagnostic optical monitoring (DOM) information for the Fabric Extender uplinks.
<code>show feature-set</code>	Displays the status of the feature sets on the device.

Configuration Examples for the Fabric Extender

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

```
switch# show fex
      FEX          FEX          FEX          FEX
Number  Description      State      Model          Serial
-----
101     FEX0101             Online     N2K-C2248TP-1GE  JAF1418AARL
```

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

```
switch# show fex 101 detail
FEX: 101 Description: FEX0101 state: Online
  FEX version: 5.1(1) [Switch version: 5.1(1)]
  FEX Interim version: 5.1(0.159.6)
  Switch Interim version: 5.1(1)
  Extender Model: N2K-C2248TP-1GE, Extender Serial: JAF1418AARL
  Part No: 73-12748-05
  Card Id: 99, Mac Addr: 54:75:d0:a9:49:42, Num Macs: 64
  Module Sw Gen: 21 [Switch Sw Gen: 21]
  pinning-mode: static Max-links: 1
  Fabric port for control traffic: Po101
  Fabric interface state:
    Po101 - Interface Up. State: Active
    Eth2/1 - Interface Up. State: Active
    Eth2/2 - Interface Up. State: Active
    Eth4/1 - Interface Up. State: Active
    Eth4/2 - Interface Up. State: Active
  Fex Port      State  Fabric Port  Primary Fabric
    Eth101/1/1  Up    Po101        Po101
    Eth101/1/2  Up    Po101        Po101
    Eth101/1/3  Down  Po101        Po101
    Eth101/1/4  Down  Po101        Po101
    Eth101/1/5  Down  Po101        Po101
    Eth101/1/6  Down  Po101        Po101
    Eth101/1/7  Down  Po101        Po101
    Eth101/1/8  Down  Po101        Po101
```

```

Eth101/1/9   Down   Po101   Po101
Eth101/1/10 Down   Po101   Po101
Eth101/1/11 Down   Po101   Po101
Eth101/1/12 Down   Po101   Po101
Eth101/1/13 Down   Po101   Po101
Eth101/1/14 Down   Po101   Po101
Eth101/1/15 Down   Po101   Po101
Eth101/1/16 Down   Po101   Po101
Eth101/1/17 Down   Po101   Po101
Eth101/1/18 Down   Po101   Po101
Eth101/1/19 Down   Po101   Po101
Eth101/1/20 Down   Po101   Po101
Eth101/1/21 Down   Po101   Po101
Eth101/1/22 Down   Po101   Po101
Eth101/1/23 Down   Po101   Po101
Eth101/1/24 Down   Po101   Po101
Eth101/1/25 Down   Po101   Po101
Eth101/1/26 Down   Po101   Po101
Eth101/1/27 Down   Po101   Po101
Eth101/1/28 Down   Po101   Po101
Eth101/1/29 Down   Po101   Po101
Eth101/1/30 Down   Po101   Po101
Eth101/1/31 Down   Po101   Po101
Eth101/1/32 Down   Po101   Po101
Eth101/1/33 Down   Po101   Po101
Eth101/1/34 Down   Po101   Po101
Eth101/1/35 Down   Po101   Po101
Eth101/1/36 Down   Po101   Po101
Eth101/1/37 Down   Po101   Po101
Eth101/1/38 Down   Po101   Po101
Eth101/1/39 Down   Po101   Po101
Eth101/1/40 Down   Po101   Po101
Eth101/1/41 Down   Po101   Po101
Eth101/1/42 Down   Po101   Po101
Eth101/1/43 Down   Po101   Po101
Eth101/1/44 Down   Po101   Po101
Eth101/1/45 Down   Po101   Po101
Eth101/1/46 Down   Po101   Po101
Eth101/1/47 Down   Po101   Po101
Eth101/1/48 Down   Po101   Po101

```

Logs:

```

09/21/2010 21:14:26.843850: Module register received
09/21/2010 21:14:26.845778: Registration response sent
09/21/2010 21:14:27.663073: Module Online Sequence
09/21/2010 21:14:30.191121: Module Online

```

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

```

switch# show interface port-channel 101 fex-intf
Fabric          FEX
Interface       Interfaces
-----
Po101           Eth101/1/2   Eth101/1/1

```

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
-----
101  Eth2/1        Active       1           N2K-C2248TP-1GE  JAF1418AARL
101  Eth2/2        Active       2           N2K-C2248TP-1GE  JAF1418AARL
101  Eth4/1        Active       3           N2K-C2248TP-1GE  JAF1418AARL
101  Eth4/2        Active       4           N2K-C2248TP-1GE  JAF1418AARL

```

This example shows how to display the SFP+ transceiver and diagnostic optical monitoring (DOM) information for Fabric Extender uplinks for an SFP+ transceiver that is plugged into the parent switch interface:

```

switch# show interface ethernet 1/40 transceiver
Ethernet1/40
  sfp is present
  name is CISCO-MOLEX INC

```

```

part number is 74752-9026
revision is A0
serial number is MOC13321057
nominal bitrate is 12000 Mbits/sec
Link length supported for copper is 3 m(s)
cisco id is --
cisco extended id number is 4
    
```

This example shows how to display the SFP+ transceiver and DOM information for Fabric Extender uplinks for an SFP+ transceiver that is plugged into the uplink port on the Fabric Extender:

```

switch# show interface ethernet 1/40 transceiver fex-fabric
Ethernet1/40
  sfp is present
  name is CISCO-MOLEX INC
  part number is 74752-9026
  revision is A0
  serial number is MOC13321057
  nominal bitrate is 12000 Mbits/sec
  Link length supported for 50/125mm fiber is 0 m(s)
  Link length supported for 62.5/125mm fiber is 0 m(s)
  cisco id is --
  cisco extended id number is 4
    
```

This example shows how to display the status of the feature sets on the device:

```

switch# show feature-set
Feature Set Name      ID      State
-----
fcoe                  1      installed
fabricpath           2      enabled
fex                   3      enabled
switch#
    
```

This example shows how to display the services used by the Fabric Extender feature set:

```

switch# show feature-set services fex
vntag_mgr
fex
2 services in feature set fex
switch#
    
```

Verifying the Chassis Management Information

Use the following to display configuration information used on the switch supervisor to manage the Fabric Extender.

Command or Action	Purpose
show environment fex {all <i>FEX-number</i> } [temperature power fan]	Displays the environmental sensor status.
show inventory fex <i>FEX-number</i>	Displays inventory information for a Fabric Extender.
show module fex [<i>FEX-number</i>]	Displays module information about a Fabric Extender.
show sprom fex <i>FEX-number</i> {all backplane powersupply <i>ps-num</i> } all	Displays the contents of the serial PROM (SPROM) on the Fabric Extender.

Configuration Examples for Chassis Management

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.
-----
101  1  48    Fabric Extender 48x1GE + 4x10G M  N2K-C2248TP-1GE  ok

FEX Mod Sw                Hw                World-Wide-Name(s) (WWN)
-----
101  1  5.1(1)             3.5              --
FEX Mod  MAC-Address(es)                               Serial-Num
-----
101  1  5475.d0a9.4940 to 5475.d0a9.496f  JAF1418AARL
```

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

```
switch# show inventory fex 101
NAME: "FEX 101 CHASSIS", DESCR: "N2K-C2248TP-1GE CHASSIS"
PID: N2K-C2248TP-1GE , VID: V00 , SN: SSI13380FSM

NAME: "FEX 101 Module 1", DESCR: "Fabric Extender Module: 48x1GE, 4x10GE Supervisor"
PID: N2K-C2248TP-1GE , VID: V00 , SN: JAF1339BDSK

NAME: "FEX 101 Fan 1", DESCR: "Fabric Extender Fan module"
PID: N2K-C2248-FAN , VID: N/A , SN: N/A

NAME: "FEX 101 Power Supply 2", DESCR: "Fabric Extender AC power supply"
PID: NXK-PAC-400W , VID: 000, SN: LIT13370QD6
```

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

```
switch# show environment fex 101

Temperature Fex 101:
-----
Module  Sensor      MajorThresh  MinorThres  CurTemp  Status
(Celsius) (Celsius)   (Celsius)
-----
1        Outlet-1    60           50          33       ok
1        Outlet-2    60           50          38       ok
1        Inlet-1     50           40          35       ok
1        Die-1      100          90          44       ok

Fan Fex: 101:
-----
Fan      Model              Hw      Status
-----
Chassis  N2K-C2148-FAN     --      ok
PS-1     --                 --      absent
PS-2     NXK-PAC-400W      --      ok

Power Supply Fex 101:
-----
Voltage: 12 Volts
-----
PS  Model              Power      Power      Status
(Watts)   (Amp)
-----
1   --                 --         --         --
2   NXK-PAC-400W      4.32      0.36      ok

Mod Model              Power      Power      Power      Power      Status
Requested Requested Allocated Allocated
(Watts)   (Amp)     (Watts)   (Amp)
-----
1   N2K-C2248TP-1GE  0.00      0.00      0.00      0.00      powered-up
```

```

Power Usage Summary:
-----
Power Supply redundancy mode:                redundant

Total Power Capacity                        4.32 W

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

-----
Total Power Available                       4.32 W
-----

```

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

```

switch# show sprom fex 101 all
DISPLAY FEX 101 SUP sprom contents
Common block:
Block Signature : 0xabab
Block Version   : 3
Block Length    : 160
Block Checksum  : 0x1a1e
EEPROM Size     : 65535
Block Count     : 3
FRU Major Type  : 0x6002
FRU Minor Type  : 0x0
OEM String      : Cisco Systems, Inc.
Product Number  : N2K-C2248TP-1GE
Serial Number   : JAF1339BDSK
Part Number     : 73-12748-01
Part Revision   : 11
Mfg Deviation   : 0
H/W Version     : 0.103
Mfg Bits        : 0
Engineer Use    : 0
snmpOID        : 9.12.3.1.9.78.3.0
Power Consump   : 1666
RMA Code        : 0-0-0-0
CLEI Code       : XXXXXXXXXTBDV00
VID             : V00
Supervisor Module specific block:
Block Signature : 0x6002
Block Version   : 2
Block Length    : 103
Block Checksum  : 0x2686
Feature Bits    : 0x0
HW Changes Bits : 0x0
Card Index      : 11016
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       : -128,-128
Sensor #4       : -128,-128
Sensor #5       : 50,40
Sensor #6       : -128,-128
Sensor #7       : -128,-128
Sensor #8       : -128,-128
Max Connector Power: 4000
Cooling Requirement: 65
Ambient Temperature: 40

DISPLAY FEX 101 backplane sprom contents:
Common block:
Block Signature : 0xabab
Block Version   : 3
Block Length    : 160
Block Checksum  : 0x1947
EEPROM Size     : 65535

```

Verifying the Chassis Management Information

```

Block Count      : 5
FRU Major Type   : 0x6001
FRU Minor Type   : 0x0
OEM String       : Cisco Systems, Inc.
Product Number   : N2K-C2248TP-1GE
Serial Number    : SSI13380FSM
Part Number      : 68-3601-01
Part Revision    : 03
Mfg Deviation    : 0
H/W Version     : 1.0
Mfg Bits        : 0
Engineer Use     : 0
snmpOID         : 9.12.3.1.3.914.0.0
Power Consump    : 0
RMA Code        : 0-0-0-0
CLEI Code       : XXXXXXXXTDBV00
VID             : V00
Chassis specific block:
Block Signature  : 0x6001
Block Version    : 3
Block Length    : 39
Block Checksum  : 0x2cf
Feature Bits    : 0x0
HW Changes Bits : 0x0
Stackmib OID    : 0
MAC Addresses   : 00-0d-ec-e3-28-00
Number of MACs  : 64
OEM Enterprise  : 0
OEM MIB Offset  : 0
MAX Connector Power: 0
WNN software-module specific block:
Block Signature  : 0x6005
Block Version    : 1
Block Length    : 0
Block Checksum  : 0x66
wnn usage bits:
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 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  : 0x86f

```



```

lic usage bits:
ff ff ff ff ff ff ff ff

DISPLAY FEX 101 power-supply 2 srom contents:
Common block:
Block Signature : 0xabab
Block Version   : 3
Block Length    : 160
Block Checksum  : 0x1673
EEPROM Size     : 65535
Block Count     : 2
FRU Major Type  : 0xab01
FRU Minor Type  : 0x0
OEM String      : Cisco Systems Inc   NXK-PAC-400W
Product Number  : NXK-PAC-400W
Serial Number   : LIT13370QD6
Part Number     : 341
Part Revision   : -037
CLEI Code       : 5-01 01 000
VID             : 000
snmpOID         : 12336.12336.12336.12336.12336.12336.12374.12336
H/W Version     : 43777.2
Current         : 36
RMA Code        : 200-32-32-32
Power supply specific block:
Block Signature : 0x0
Block Version   : 0
Block Length    : 0
Block Checksum  : 0x0
Feature Bits    : 0x0
Current 110v   : 36
Current 220v   : 36
Stackmib OID    : 0

```

Additional References

This section includes additional information that is related to configuring the Cisco Nexus 2000 Series Fabric Extender.

Related Documents

Related Topic	Document Title
Cisco NX-OS Licensing	<i>Cisco NX-OS Licensing Guide</i>
Virtual device contexts (VDC)	<i>Cisco Nexus 7000 Series NX-OS Virtual Device Context Configuration Guide</i>
Interface configuration	<i>Cisco Nexus 7000 Series NX-OS Interfaces Configuration Guide</i>
Command reference	<i>Cisco Nexus 7000 Series Command References</i> available at the following URL: http://www.cisco.com/en/US/products/ps9402/prod_command_reference_list.html

Feature History

This table lists the release history for this feature.

Table 2: Feature History for the Cisco Nexus 2000 Series Fabric Extender

Feature Name	Releases	Feature Information
vPC configuration synchronization	7.2(0)D1(1)	Added support for vPC configuration synchronization for FEX
Cisco Nexus 7000 Series FEX Fabric Active-Active	7.2(0)D1(1)	Added support for FEX Active-Active.
Feature set commands	5.1(1)	The Fabric Extender is enabled on the Cisco Nexus 7000 Series device with the install feature-set and feature-set commands.
Port channel and vPC support	5.2(1)	Support was added for port channels and the integration of vPC on the host interfaces.
Layer 3 support	5.2(1)	Layer 3 capability was added to the Fabric Extender host interface ports including IPv4 and IPv6 and IGMP snooping.

This table lists the supported line cards and FEXs.

Table 3: Supported Line cards and FEXs History

FEX and Line card	Releases
Cisco Nexus B22 Fabric Extender for IBM Cisco Nexus 2348UPQ Fabric Extender Cisco Nexus 2348TQ Fabric Extender	7.2(0)D1(1)
Cisco Nexus B22 Fabric Extender for HP Cisco Nexus 2248PQ Fabric Extender	6.2(2)

FEX and Line card	Releases
48-port, 100/1000 BASE-T (100-Mb/1-Gigabit) N2248TP-E 32-port 10-Gigabit SFP+ N2248TP-E Support for M2 series modules Cisco Nexus 2224TP Fabric Extender Cisco Nexus 2232TM Fabric Extender	6.1(1)
48-port, 1/10-Gigabit F2-Series module (N7K-F248XP-25).	6.0(1)
Cisco Nexus 2248TP Fabric Extender Cisco Nexus 2232PP Fabric Extender	5.2(1)
32-port, 10-Gigabit M1 module (N7K-M132XP-12) 32-port, 10-Gigabit M1 XL module (N7K-M132XP-12L).	5.1(1)



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