



Cisco Nexus B22 Blade Fabric Extender for IBM

Design and Deployment Guide



Contents

Introduction	3
Network Diagram.....	3
Hardware Installation.....	5
Fabric Extender Management Model	6
Fabric Connectivity Options	7
Statically Pinned Fabric Interface Connection	7
Port Channel Fabric Interface Connection	9
Configuring a Fabric Port Channel	10
Virtual Port Channel Connection.....	13
Configuring a vPC.....	14
Server Network Teaming.....	16
Creating Host-Side vPC for Server Links with LACP	17
Fibre Channel over Ethernet.....	21
Configuring FCoE	21
Configuring the Cisco Nexus 5000 Series and B22 for IBM for FCoE	22
iSCSI Configuration	27
Virtual Network Adapter Partitioning	30
Debug Commands	35
show fex.....	35
show fex detail	36
show interface brief.....	37
show interface ethernet 191/1/1	42
show vlan	43
show interface fex-fabric.....	44
Cisco Nexus Configurations	45
Cisco Nexus 5000 Series Switch 1 Configuration	45
Cisco Nexus 5000 Series Switch 2 Configuration	56
Conclusion.....	70
For More Information	70

Introduction

The Cisco Nexus[®] B22 Blade Fabric Extender for IBM[®] extends the Cisco Nexus switch fabric to the server edge. Logically, it behaves like a remote line card to a parent Cisco Nexus 5000 or 6000 Series Switch. The fabric extender and the parent Cisco Nexus 5000 or 6000 Series Switch together form a distributed modular system. The Cisco Nexus B22 for IBM forwards all traffic to the parent Cisco Nexus 5000 or 6000 Series Switch over eight 10 Gigabit Ethernet uplinks. Low-cost uplink connections of up to 10 meters can be made with copper Twinax cable, and longer connections of up to 100 meters can use the Cisco[®] 10-Gbps fabric extender transceiver (FET-10G). Standard 10-Gbps optics such as short reach (SR), long reach (LR), and extended reach (ER) are also supported. Downlinks to each server are 10 Gigabit Ethernet and work with all Ethernet and converged network adapter (CNA) mezzanine cards, allowing customers a choice of Ethernet, Fibre Channel over Ethernet (FCoE), or Small Computer System Interface over IP (iSCSI) connections. Because the Cisco Nexus B22 for IBM is a transparent extension of a Cisco Nexus switch, traffic can be switched according to policies established by the Cisco Nexus switch using a single point of management.

The Cisco Nexus B22 for IBM provides the following benefits:

Highly scalable, consistent server access: This distributed modular system creates a scalable server access environment with no reliance on Spanning Tree Protocol and with consistent features and architecture between blade and rack servers.

Simplified operations: The availability of one single point of management and policy enforcement using upstream Cisco Nexus 5000 Series Switches eases the commissioning and decommissioning of blades through zero-touch installation and automatic configuration of fabric extenders.

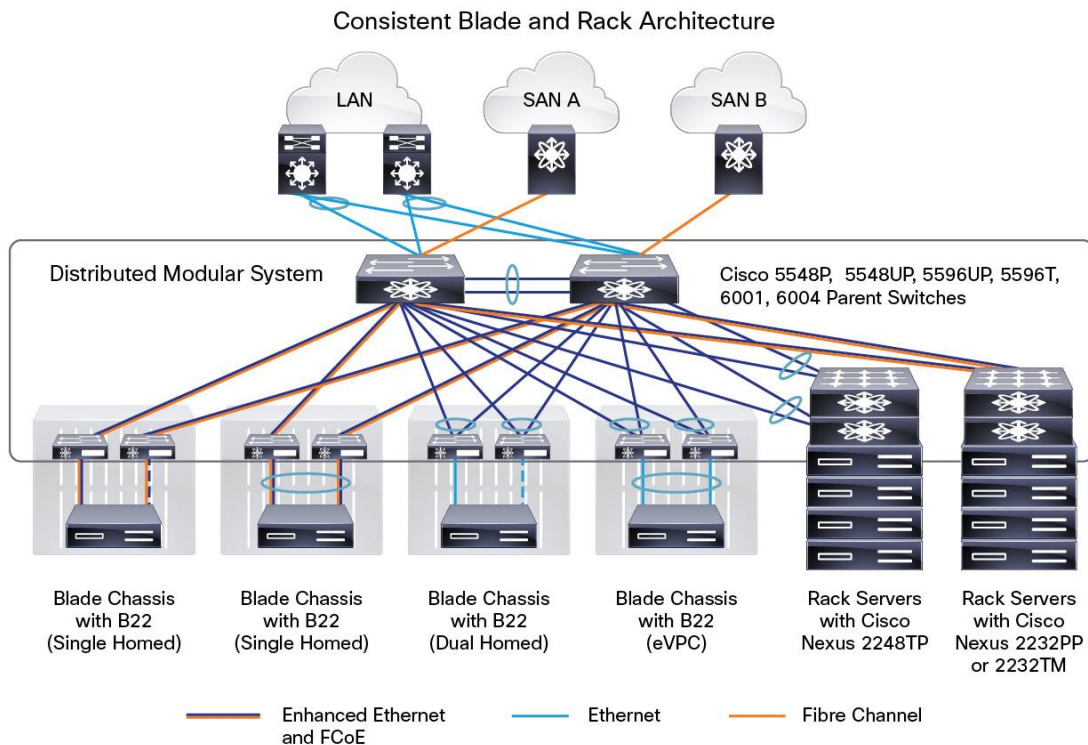
Increased business benefits: Consolidation, reduced cabling, investment protection through feature inheritance from the parent switch, and the capability to add functions without the need for a major equipment upgrade of server-attached infrastructure all contribute to reduced operating expenses (OpEx) and capital expenditures (CapEx).

The Cisco Nexus B22 for IBM integrates into the I/O module slot of a third-party blade chassis, drawing both power and cooling from the blade chassis itself.

Network Diagram

Figure 1 presents a sample network topology that can be built using the Cisco Nexus B22 for IBM, 2000 Series Fabric Extenders, and 5000 or 6000 Series Switches. In this topology, the Cisco Nexus 5000 or 6000 Series Switch serves as the parent switch, performing all packet switching and policy enforcement for the entire distributed modular system. The Cisco Nexus switch also serves as the only point of management for both configuration and monitoring within the domain, making it simple to manage blade server and rack server connections together.

Figure 1: Cisco Nexus Virtual Chassis Topology



The Cisco Nexus switches, along with the Cisco Nexus 2000 Series and B22 for IBM, create a distributed modular system that unifies the data center architecture. Within this distributed modular system, both IBM Flex System[®] computing nodes and rack servers are managed identically. This approach allows the use of the same business and technical processes and procedures.

The left-most blade chassis in Figure 1 contains dual Cisco Nexus B22 for IBM fabric extenders. Each Cisco Nexus B22 for IBM is singly attached to a parent Cisco Nexus 5500 platform switch, a connection mode referred to as straight-through mode. The fabric links can be either statically pinned or put into a Port Channel. This connection mode helps ensure that all data packets from a particular Cisco Nexus B22 for IBM enter the same parent Cisco Nexus switch. This approach may be necessary when certain types of traffic must be restricted to either the left or right Cisco Nexus 5500 platform switch: for instance, to maintain SAN A and SAN B separation. Also, in this example the connections to individual computing nodes are in active-standby mode, which helps ensure traffic flow consistency but does not make full use of the server network interface card (NIC) bandwidth.

The second IBM Flex System chassis from the left in Figure 1 improves on the first with the creation of an Ethernet virtual Port Channel (vPC) from the computing node to the Cisco Nexus parent switch. This vPC places the Ethernet portion of the NICs in an active-active configuration, giving increased bandwidth to each host. The FCoE portion of the CNA is also configured as active-active but maintains SAN A and SAN B separation because each virtual Fibre Channel (vFC) interface is bound to a particular link at the server. This configuration also achieves high availability through redundancy, and it can withstand a failure of a Cisco Nexus 5500 platform switch, a Cisco Nexus B22 for IBM, or any connecting cable. This topology is widely used in FCoE deployments.

The third blade chassis from the left in Figure 1 contains Cisco Nexus B22 for IBM fabric extenders that connect to both Cisco Nexus 5500 platform switches through vPC for redundancy. In this configuration, active-active load balancing using vPC from the blade server to the Cisco Nexus 5500 platform switch cannot be enabled. However, the servers can still be dual-homed with active-standby or active-active transmit-load-balancing (TLB) teaming. This topology is only for Ethernet traffic because SAN A and SAN B separation between the fabric extender and the parent switch is necessary.



The fourth blade chassis from the left in Figure 1 contains Cisco Nexus B22 for IBM fabric extenders that connect to both Cisco Nexus 5500 platform switches with enhanced vPC (EvPC) technology. This configuration allows active-active load balancing from the fabric extenders and the computing nodes.

The last two configurations show how rack-mount servers can connect to the same Cisco Nexus parent switch using rack-mount Cisco Nexus 2000 Series Fabric Extenders. The topology for blade servers and rack-mount servers can be identical if desired.

Hardware Installation

Installation of the Cisco Nexus B22 for IBM in the rear of the blade server chassis is similar to the installation of other connection blades. The layout of the blade server chassis, as well as the server types and mezzanine cards used, determines the slots that should be populated with the Cisco Nexus B22 for IBM for 10 Gigabit Ethernet connectivity. Tables 1 through 3 summarize the typical options for servers using dual-port 10 Gigabit Ethernet devices.

Table 1 Mapping of Third-Party Half-Wide Server Dual-Port Mezzanine Card to I/O Module

Card	Connection Blades
LAN on motherboard (LoM) plus mezzanine card in slot 1	I/O module bays 1 and 2
Mezzanine card in slot 2	I/O module bays 3 and 4

Table 2 Mapping of Third-Party Half-Wide Server Quad-Port Mezzanine Card to I/O Module

Card	Connection Blades
Mezzanine 1 ports 1 to 4	I/O module bays 1 and 2
Mezzanine 2 ports 1 to 4	I/O module bays 3 and 4

Table 3 Mapping of Third-Party Full-Wide Server Quad-Port Mezzanine Card to I/O Module

Card	Connection Blades
Mezzanine 1 ports 1 to 4	I/O module bays 1 and 2
Mezzanine 2 ports 1 to 4	I/O module bays 3 and 4
Mezzanine 3 ports 1 to 4	I/O module bays 1 and 2
Mezzanine 4 ports 1 to 4	I/O module bays 3 and 4

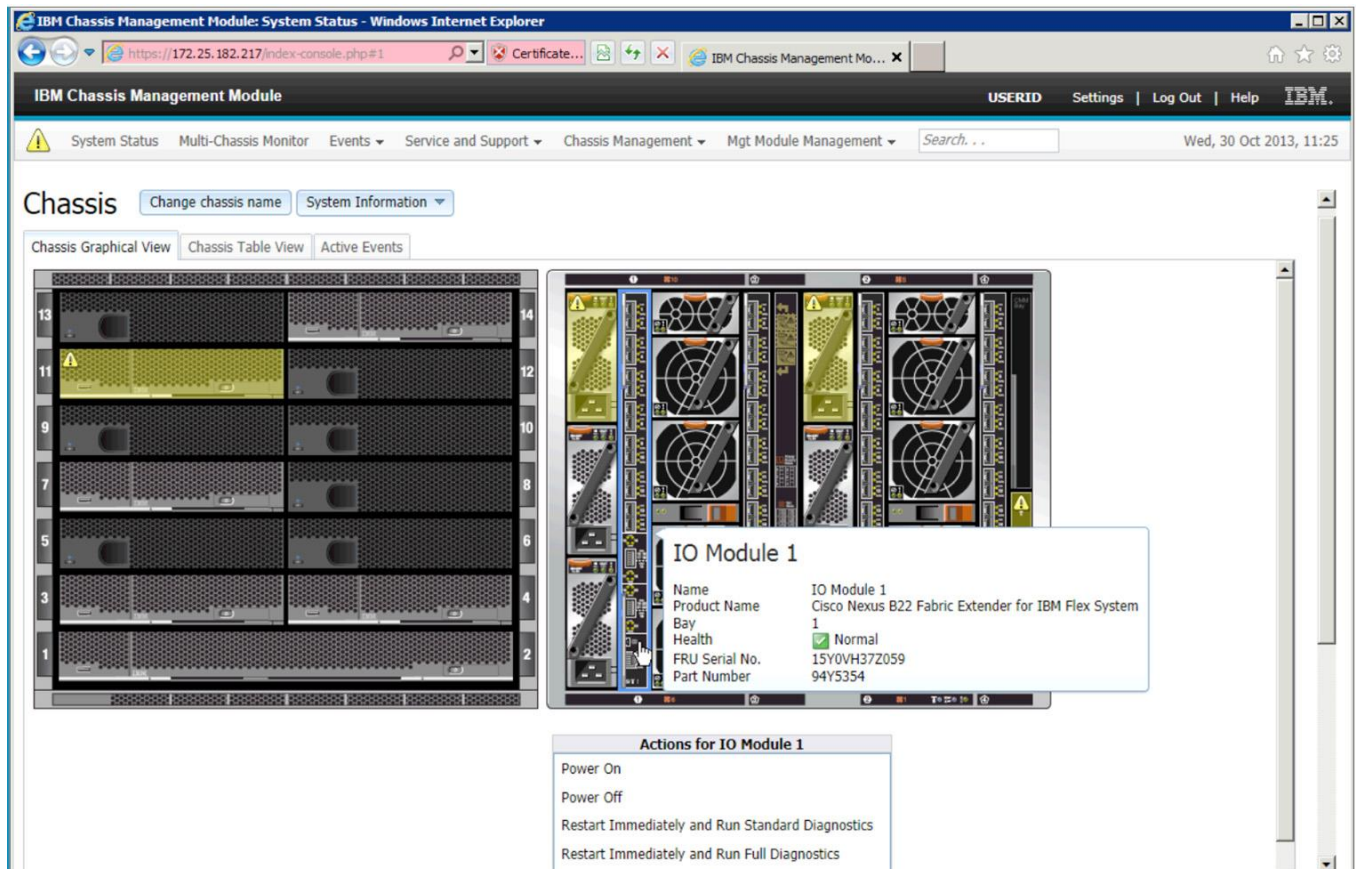
After the Cisco Nexus B22 for IBM fabric extenders are installed, the chassis management module (CMM) should be updated to at least the minimum version shown in Table 4.

Table 4 Management Blade Minimum Firmware Versions

Blade Chassis	Server Manager Firmware
IBM PureFlex™ System Model 8721HC1	DSA:9.41, IMM2:2.6, UEFI:1.31, and CMM: 2PET12E

No configuration is required from the chassis MMB. Only the minimum CMM firmware is required to properly detect and enable the Cisco Nexus B22 for IBM in the blade chassis (Figure 2).

Figure 2: Cisco Nexus B22 for IBM Fabric Extenders as Seen in the CMM



Fabric Extender Management Model

The Cisco Nexus fabric extenders are managed by a parent switch through the fabric interfaces using a zero-touch configuration model. The switch discovers the fabric extender by using a detection protocol.

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 operating status. All fabric extender information is displayed using the switch commands for monitoring and troubleshooting.

This management model allows fabric extender modules to be added without adding management points or complexity. Software image and configuration management is also handled automatically, without the need for user intervention.



Fabric Connectivity Options

The Cisco Nexus B22 for IBM creates a distributed, modular chassis with the Cisco Nexus parent switch after a fabric connection has been made over standard 10-Gbps cabling. This connection can be accomplished using any of the following types of interconnects:

- Cisco passive direct-attach cables (1m, 3m, or 5m)
- Cisco active direct-attach cables (7m or 10m)
- Cisco standard Enhanced Small Form-Factor Pluggable (SFP+) optics (SR, LR, and ER)
- Cisco Fabric Extender Transceivers (FET modules)

After the fabric links have been physically established, the logical configuration of the links must be established. The fabric links to the Cisco Nexus B22 for IBM can use either of two connection methods:

- Statically pinned fabric interface connection
- Port Channel fabric interface connection

Statically Pinned Fabric Interface Connection

Static pinning is the default method of connection between the fabric extender and the Cisco Nexus parent switch. In this mode of operation, a deterministic relationship exists between the host interfaces and the upstream parent; up to eight fabric interfaces can be connected. These fabric interfaces are equally divided among the 16 server-side host ports. If fewer fabric ports are allocated, more server ports are assigned to a single fabric link. The advantage of this configuration is that the traffic path and the amount of allocated bandwidth are always known for a particular set of servers.

Since static pinning will group host-side ports into individual fabric links, you should understand how ports are grouped. The size of the port groups is determined by the number of host ports divided by the **max link** parameter value. For example, if the **max link** parameter is set to 2, eight host ports would be assigned to each link. The interfaces will be grouped in ascending order starting from interface 1. Thus, interfaces 1 to 8 will be pinned to one fabric link, and interfaces 9 to 16 will be pinned to a different interface (Table 5).

Table 5 Interface Assignment with Two Fabric Links

Interface	Fabric Link
1, 2, 3, 4, 5, 6, and 7	Fabric link 1
8, 9, 10, 11, 12, 13, and 14	Fabric link 2

Table 6 summarizes the assignment with four fabric links: With the **max link** parameter set to 4, the interfaces are divided into four groups.

Table 6 Interface Assignment with Four Fabric Links

Interface	Fabric Link
1, 2, 3, and 4	Fabric link 1
5, 6, 7, and 8	Fabric link 2
9, 10, and 11	Fabric link 3
12, 13, and 14	Fabric link 4

Table 7 summarizes the assignment of eight fabric links: With the **max link** parameter set to 8, the interfaces are divided into eight groups.

Table 7 Interface Assignment with Eight Fabric Links

Interface	Fabric Link
1 and 2	Fabric link 1
3 and 4	Fabric link 2
5 and 6	Fabric link 3
7 and 8	Fabric link 4
9 and 10	Fabric link 5
11 and 12	Fabric link 6
13	Fabric link 7
14	Fabric link 8

Note: The assignment of the host-side ports is always based on the configured **max link** parameter and not the actual physical number of fabric ports connected. Be sure to match the **max link** parameter with the actual number of physical links used.

The relationship of host-side ports to parent switch fabric ports is static. If a fabric interface fails, all its associated host interfaces are brought down and will remain down until the fabric interface is restored. Figure 3 shows static port mappings.

Figure 3: Static Port Mapping Based on **Max Link** Parameter

Port	Max-Links							
	1	2	3	4	5	6	7	8
1	Eth1/25	Eth1/25	Eth1/25	Eth1/25	Eth1/25	Eth1/25	Eth1/25	Eth1/25
2	Eth1/25	Eth1/25	Eth1/25	Eth1/25	Eth1/25	Eth1/25	Eth1/25	Eth1/25
3	Eth1/25	Eth1/25	Eth1/25	Eth1/25	Eth1/25	Eth1/25	Eth1/26	Eth1/26
4	Eth1/25	Eth1/25	Eth1/25	Eth1/25	Eth1/26	Eth1/26	Eth1/26	Eth1/26
5	Eth1/25	Eth1/25	Eth1/25	Eth1/26	Eth1/26	Eth1/26	Eth1/27	Eth1/27
6	Eth1/25	Eth1/25	Eth1/26	Eth1/26	Eth1/26	Eth1/26	Eth1/27	Eth1/27
7	Eth1/25	Eth1/25	Eth1/26	Eth1/26	Eth1/27	Eth1/27	Eth1/28	Eth1/28
8	Eth1/25	Eth1/26	Eth1/26	Eth1/26	Eth1/27	Eth1/27	Eth1/28	Eth1/28
9	Eth1/25	Eth1/26	Eth1/26	Eth1/27	Eth1/27	Eth1/28	Eth1/29	Eth1/29
10	Eth1/25	Eth1/26	Eth1/26	Eth1/27	Eth1/28	Eth1/28	Eth1/29	Eth1/29
11	Eth1/25	Eth1/26	Eth1/27	Eth1/27	Eth1/28	Eth1/29	Eth1/30	Eth1/30
12	Eth1/25	Eth1/26	Eth1/27	Eth1/28	Eth1/28	Eth1/29	Eth1/30	Eth1/30
13	Eth1/25	Eth1/26	Eth1/27	Eth1/28	Eth1/29	Eth1/30	Eth1/31	Eth1/31
14	Eth1/25	Eth1/26	Eth1/27	Eth1/28	Eth1/29	Eth1/30	Eth1/31	Eth1/32

Port Channel Fabric Interface Connection

The Port Channel fabric interface provides an alternative way of connecting the parent switch and the Cisco Nexus B22 for IBM fabric extender. In this mode of operation, the physical fabric links are bundled into a single logical channel. This approach prevents a single fabric interconnect link loss from disrupting traffic to any one server. The total bandwidth of the logical channel is shared by all the servers, and traffic is spread across the members through the use of a hash algorithm.

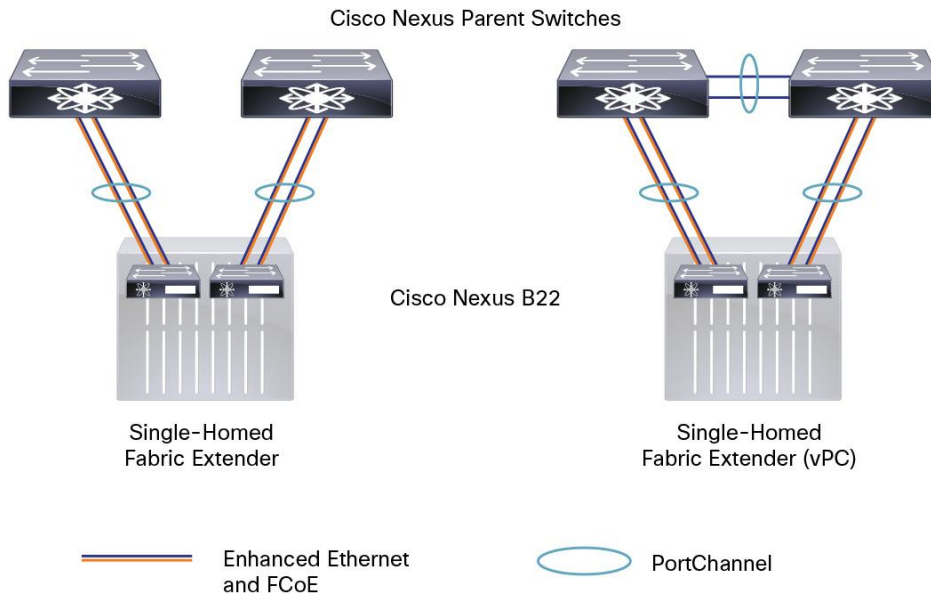
- For a Layer 2 frame, the switch uses the source and destination MAC addresses.
- For a Layer 3 frame, the switch uses the source and destination MAC addresses and the source and destination IP addresses.

Since both redundancy and increased bandwidth are possible, configuration of the fabric links on a Port Channel is the most popular connection option.

Figure 4 shows Port Channel designs.

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.

Figure 4: Port Channel Designs



Configuring a Fabric Port Channel

Follow these steps to configure a fabric Port Channel.

1. Log into the first parent switch and enter configuration mode:

```
Nexus 5000 Switch
login: admin
Password:
```

```
Cisco Nexus Operating System (NX-OS) Software
TAC support: http://www.cisco.com/tac
Copyright (c) 2002-2011, Cisco Systems, Inc. All rights reserved.
The copyrights to certain works contained in this software are
owned by other third parties and used and distributed under
license. Certain components of this software are licensed under
the GNU General Public License (GPL) version 2.0 or the GNU
Lesser General Public License (LGPL) Version 2.1. A copy of each
such license is available at
http://www.opensource.org/licenses/gpl-2.0.php and
http://www.opensource.org/licenses/lgpl-2.1.php
```

```
N5548-Bottom# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
```

```
N5548-Bottom(config)#
```

2. Enable the fabric extender feature:

```
N5548-Bottom(config)#  
N5548-Bottom(config)# feature flex  
N5548-Bottom(config)#
```

3. Logically create the fabric extender:

```
N5548-Bottom(config)#  
N5548-Bottom(config)# flex 191  
N5548-Bottom(config-flex)#
```

4. Create the Port Channel, change the port mode, and associate the fabric extender with the Port Channel:

```
N5548-Bottom(config-if)# interface port-channel 191  
N5548-Bottom(config-if)# switchport mode fex-fabric  
N5548-Bottom(config-if)# fex associate 191  
N5548-Bottom(config-if)#
```

5. Assign the Cisco Nexus parent switch ports to the Port Channel:

```
N5548-Bottom(config-if)# interface ethernet 1/17  
N5548-Bottom(config-if)# switchport mode fex-fabric  
N5548-Bottom(config-if)# fex associate 191  
N5548-Bottom(config-if)# channel-group 191  
N5548-Bottom(config-if)# interface ethernet 1/18  
N5548-Bottom(config-if)# switchport mode fex-fabric  
N5548-Bottom(config-if)# fex associate 191  
N5548-Bottom(config-if)# channel-group 191
```



6. Repeat the steps on the second Cisco Nexus 5000 Series Switch connected to the fabric extender in interconnect bay 4:

```
N5548-Top# configure terminal
N5548-Top(config)# feature fex
N5548-Top(config)# fex 192
N5548-Top(config-if)# interface port-channel 192
N5548-Top(config-if)# switchport mode fex-fabric
N5548-Top(config-if)# fex associate 192
N5548-Top(config-if)# interface ethernet 1/17
N5548-Top(config-if)# switchport mode fex-fabric
N5548-Top(config-if)# fex associate 192
N5548-Top(config-if)# channel-group 192
N5548-Top(config-if)# interface ethernet 1/18
N5548-Top(config-if)# switchport mode fex-fabric
N5548-Top(config-if)# fex associate 192
N5548-Top(config-if)# channel-group 192
```

7. Verify that the Cisco Nexus B22 for IBM is up and running:

```
switch(config-if)# show fex
```

FEX Number	FEX Description	FEX State	FEX Model	Serial
192	FEX0192	Online	N2K-B22IBM-P	FOC1730R0XQ

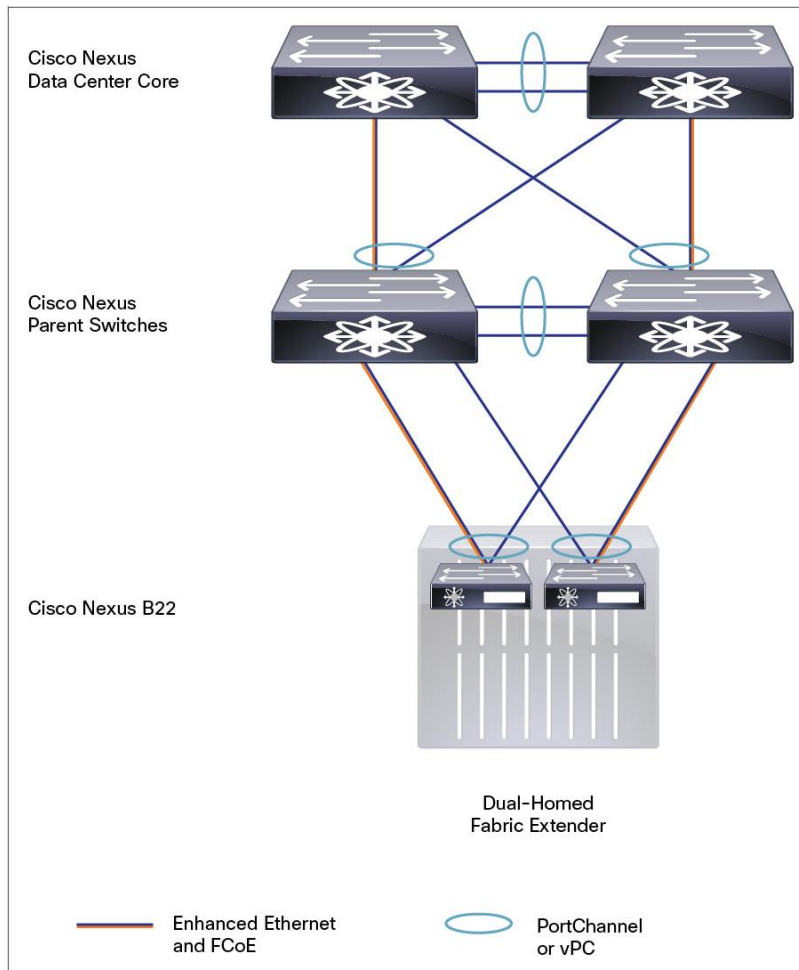
A pair of fabric extenders now is configured in straight-through mode, also known as a single-attached configuration, and each is communicating with its respective Cisco Nexus switch. The links between the two Cisco Nexus switches and the Cisco Nexus B22 fabric extenders use Port Channels for connectivity.

Virtual Port Channel Connection

vPCs allow links that are physically connected to two different Cisco Nexus switches to form a Port Channel to a downstream device. The downstream device can be a switch, a server, or any other networking device that supports IEEE 802.3ad Port Channels. vPC technology enables networks to be designed with multiple links for redundancy while also allowing those links to connect to different endpoints for added resiliency (Figure 5).

More information about vPC technology can be found at http://www.cisco.com/en/US/products/ps9670/products_implementation_design_guides_list.html.

Figure 5: Blade Server Configuration Options



Configuring a vPC

The high-level steps for enabling vPC are listed here. This configuration should be implemented on both switches in parallel.

1. Enable the vPC feature.
2. Create the vPC domain.
3. Configure the peer keepalive link.
4. Configure the vPC peer link Port Channel.
5. Check the status of the vPC.

1. Enable the vPC feature:

```
N5548-Bottom# configure terminal
N5548-Bottom(config)# feature vpc
```

```
N5548-Top# configure terminal
N5548-Top(config)# feature vpc
```

2. Create the vPC domain (the domain should be unique within network):

```
N5548-Bottom(config)# vpc domain 5
N5548-Bottom(config)# role priority 1
N5548-Bottom(config)# system-priority 1
```

```
N5548-Top(config)# vpc domain 5
N5548-Top(config)# role priority 2
N5548-Top(config)# system-priority 1
```

3. Configure the peer keepalive link over the management network:

```
N5548-Bottom(config-vpc-domain)# peer-keepalive destination 172.25.182. 109 source
172.25.182. 108
```

Note:

```
-----:: Management VRF will be used as the default VRF ::-----
```

```
N5548-Top(config-vpc-domain)# peer-keepalive destination 172.25.182. 108 source
172.25.182. 109
```

Note:

```
-----:: Management VRF will be used as the default VRF ::-----
```

4. Configure the vPC peer link:

```
N5548-Bottom# interface port-channel 20
N5548-Bottom(config-if)# interface ethernet 1/9
N5548-Bottom(config-if)# channel-group 20
N5548-Bottom(config-if)# interface ethernet 1/10
N5548-Bottom(config-if)# channel-group 20
```

```
N5548-Bottom(config-if)# interface port-channel 20
N5548-Bottom(config-if)# vpc peer-link
```

Please note that spanning tree port type is changed to "network" port type on vPC peer-link.

This will enable spanning tree Bridge Assurance on vPC peer-link provided the STP Bridge Assurance(which is enabled by default) is not disabled.

```
N5548-Bottom(config-if)#
```

```
N5548-Top# interface port-channel 20
N5548-Top (config-if)# interface ethernet 1/9
N5548-Top(config-if)# channel-group 20
N5548-Top(config-if)# interface ethernet 1/10
N5548-Top(config-if)# channel-group 20
```

```
N5548-Top(config-if)# interface port-channel 20
N5548-Top(config-if)# vpc peer-link
```

Please note that spanning tree port type is changed to "network" port type on vPC peer-link.

This will enable spanning tree Bridge Assurance on vPC peer-link provided the STP Bridge Assurance(which is enabled by default) is not disabled.

```
N5548-Bottom(config-if)#
```

5. Check the vPC status:

```
N5548-Bottom(config-if)# show vpc
```

Legend:

(*) - local vPC is down, forwarding via vPC peer-link

```
vPC domain id                : 5
Peer status                   : peer adjacency formed ok
vPC keep-alive status        : peer is alive
Configuration consistency status: success
Per-vlan consistency status   : success
Type-2 consistency status     : success
```



```

vPC role                : primary
Number of vPCs configured : 0
Peer Gateway             : Disabled
Dual-active excluded VLANs : -
Graceful Consistency Check : Enabled
  
```

```

vPC Peer-link status
-----
  
```

```

id   Port   Status Active vlans
--   ---   -
1    Po20   up     1,182
N5548-Bottom(config-if) #
  
```

Now the two switches have been configured to support vPC links to other devices. These connections can be used for upstream links to the data center core. These vPC links can be used for connections to hosts in the data center, allowing additional bandwidth and redundant links.

Server Network Teaming

Server NIC teaming provides an additional layer of redundancy to servers. It makes it possible for multiple links to be available, for redundancy. In the blade server environment, server network teaming typically is limited to active-standby configurations and cannot provide active-active links, because active-active links require an EtherChannel or Link Aggregation Control Protocol (LACP) connection to a single switch. However, because the Cisco Nexus B22 for IBM fabric extender is an extension of the parent switch, EtherChannel or LACP connections can be created between the blade server and the virtual chassis. Dual Cisco Nexus switches can be used with vPC for additional switch redundancy while providing active-active links to servers, thus enabling aggregate 40-Gbps bandwidth with dual links (Figure 6).

Figure 6: Fabric Link and Server Topologies

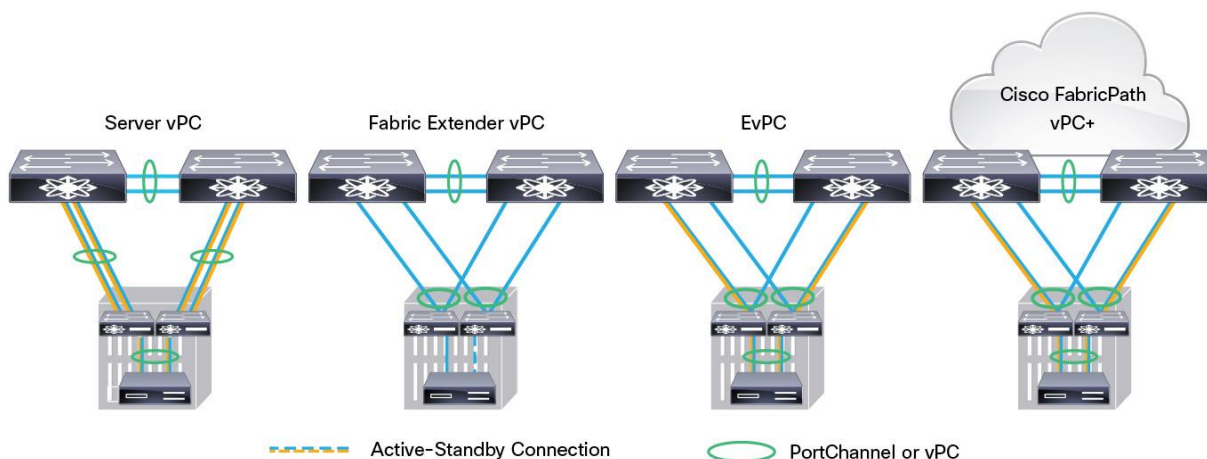
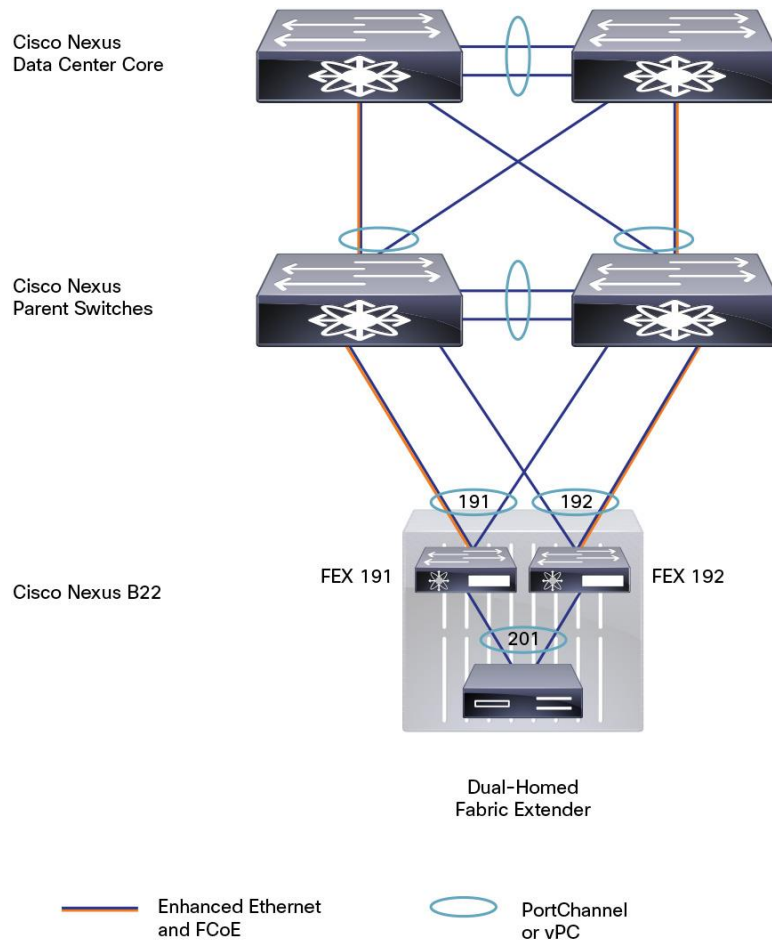


Figure 7: Enhanced vPC Configuration



Creating Host-Side vPC for Server Links with LACP

1. Enable LACP on both parent switches.

```
5548-Bottom(config)# feature lacp
5548-Top(config)# feature lacp
```

2. Define and configure the left diagram FEX 191 for enhanced vPC on the left Nexus parent

```
5548-Bottom(config)# fex 191
5548-Bottom(config-fex)# interface ethernet 1/21-22
5548-Bottom(config-if)# channel-group 191
5548-Bottom(config-if)# no shutdown
5548-Bottom(config-if)# interface port-channel 191
5548-Bottom(config-if)# switchport mode fex-fabric
5548-Bottom(config-if)# fex associate 191
5548-Bottom(config-if)# vpc 191
5548-Bottom(config-if)# no shutdown
```

3. Define and configure the right diagram FEX 192 for enhanced vPC on the left Nexus parent

```
5548-Bottom(config)# fex 192
5548-Bottom(config-fex)# interface ethernet 1/23-24
5548-Bottom(config-if)# channel-group 192
5548-Bottom(config-if)# no shutdown
5548-Bottom(config-if)# interface port-channel 192
5548-Bottom(config-if)# switchport mode fex-fabric
5548-Bottom(config-if)# fex associate 192
5548-Bottom(config-if)# vpc 192
5548-Bottom(config-if)# no shutdown
```

4. Define and configure the left diagram FEX 191 for enhanced vPC on the right Nexus parent

```
5548-Top(config)# fex 191
5548-Top(config-fex)# interface ethernet 1/21-22
5548-Top(config-if)# channel-group 191
5548-Top(config-if)# no shutdown
5548-Top(config-if)# interface port-channel 191
5548-Top(config-if)# switchport mode fex-fabric
5548-Top(config-if)# fex associate 191
5548-Top(config-if)# vpc 191
5548-Top(config-if)# no shutdown
```

5. Define and configure the right diagram FEX 192 for enhanced vPC on the right Nexus parent

```
5548-Top(config)# fex 192
5548-Top(config-fex)# interface ethernet 1/23-24
5548-Top(config-if)# channel-group 192
5548-Top(config-if)# no shutdown
5548-Top(config-if)# interface port-channel 192
5548-Top(config-if)# switchport mode fex-fabric
5548-Top(config-if)# fex associate 192
5548-Top(config-if)# vpc 192
5548-Top(config-if)# no shutdown
```

6. Create the port channel between the blade server and the FEX

```
5548-Bottom# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
5548-Bottom#(config)# interface port-channel 201
5548-Bottom#(config-if)# switchport mode trunk
5548-Bottom#(config-if)# switchport trunk native vlan 182
5548-Bottom#(config-if)# switchport trunk allowed vlan 182-184,200
```



```
5548-Bottom#(config-if)# no shutdown
```

```
5548-Top# configure terminal
5548-Top#(config)# interface port-channel 201
5548-Top#(config)# switchport mode trunk
5548-Top#(config)# switchport trunk native vlan 182
5548-Top#(config)# switchport trunk allowed vlan 182-182,201
5548-Top#(config)# no shutdown
```

7. Add the member interfaces to the vPC port channel and permit VLAN or desired VLANs for L2 Trunk links.

Note: If a Native VLAN besides 1 is desired ensure it is correctly defined before use.

```
5548-Bottom(config-if)# interface ethernet 191/1/7
5548-Bottom(config-if)# switchport mode trunk
5548-Bottom(config-if)# switchport trunk native vlan 182
5548-Bottom(config-if)# switchport trunk allowed vlan 182-184,200
5548-Bottom(config-if)# channel-group 201 mode active
5548-Bottom(config-if)# no shutdown
5548-Bottom(config-if)# interface ethernet 192/1/7
5548-Bottom(config-if)# switchport mode trunk
5548-Bottom(config-if)# switchport trunk native vlan 182
5548-Bottom(config-if)# switchport trunk allowed vlan 182-184,200
5548-Bottom(config-if)# channel-group 201 mode active
5548-Bottom(config-if)# no shutdown
```

8. Repeat the vlan configuration on the second Nexus parent switch for the vPC port channel and permit VLAN or desired VLANs for L2 Trunk links.

```
5548-Top(config-if)# interface ethernet 191/1/7
5548-Top(config-if)# switchport mode trunk
5548-Top(config-if)# switchport trunk native vlan 182
5548-Top(config-if)# switchport trunk allowed vlan 182-184,201
5548-Top(config-if)# channel-group 201 mode active
5548-Top(config-if)# no shutdown
5548-Top(config-if)# interface ethernet 192/1/7
5548-Top(config-if)# switchport mode trunk
5548-Top(config-if)# switchport trunk native vlan 182
5548-Top(config-if)# switchport trunk allowed vlan 182-184,201
5548-Top(config-if)# channel-group 201 mode active
5548-Top(config-if)# no shutdown
```



Note: With EvPC when you configure a Port Channel from the Cisco Nexus 2000 Series to the server, do not include the vpc x configuration under the Port Channel. vPC should be assigned automatically by the Cisco NX-OS Software. For more information, see http://www.cisco.com/en/US/docs/switches/datacenter/nexus5500/sw/layer2/6x/b_5500_Layer2_Config_602N12_chapter_0101.html.

To verify that the vPC is formed, go to one of the Cisco Nexus switches to check the status of the server Port Channel interface. The pair of Cisco Nexus switches is in a vPC configuration, so each has a single port in the Port Channel. A check of the status of the Port Channel on each parent switch shows that channel group 201 is in the "P - Up in port-channel" state on each switch. A check from the OneCommand utility will show that the status is "Active" for each link that is up in the Port Channel.

```
5548-Bottom# show port-channel summary
```

```
Flags:  D - Down          P - Up in port-channel (members)
        I - Individual    H - Hot-standby (LACP only)
        s - Suspended     r - Module-removed
        S - Switched      R - Routed
        U - Up (port-channel)
        M - Not in use. Min-links not met
```

Group	Port-Channel	Type	Protocol	Member Ports
20	Po20(SU)	Eth	NONE	Eth1/9(P) Eth1/10(D)
191	Po191(SU)	Eth	NONE	Eth1/17(P)
192	Po192(SU)	Eth	NONE	Eth1/18(P)
193	Po193(SU)	Eth	NONE	Eth1/19(P)
194	Po194(SD)	Eth	NONE	Eth1/20(D)
201	Po201(SU)	Eth	NONE	Eth191/1/1(P)
202	Po202(SU)	Eth	NONE	Eth192/1/1(P)

```
5548-Bottom #
```

```
N5548-Top# show port-channel summary
```

```
show port-channel summary
```

```
Flags:  D - Down          P - Up in port-channel (members)
        I - Individual    H - Hot-standby (LACP only)
        s - Suspended     r - Module-removed
        S - Switched      R - Routed
        U - Up (port-channel)
        M - Not in use. Min-links not met
```

Group	Port-Channel	Type	Protocol	Member Ports
10	Po10 (SD)	Eth	NONE	--
20	Po20 (SU)	Eth	NONE	Eth1/9 (P) Eth1/10 (D)
61	Po61 (SU)	Eth	NONE	Eth1/5 (P) Eth1/6 (P)
191	Po191 (SU)	Eth	NONE	Eth1/17 (P)
192	Po192 (SU)	Eth	NONE	Eth1/18 (P)
193	Po193 (SU)	Eth	NONE	Eth1/19 (P)
194	Po194 (SD)	Eth	NONE	Eth1/20 (D)
201	Po201 (SU)	Eth	NONE	Eth191/1/1 (P)
202	Po202 (SU)	Eth	NONE	Eth192/1/1 (P)

N5548-Top#

Fibre Channel over Ethernet

FCoE combines LAN and storage traffic on a single link, eliminating the need for dedicated adapters, cables, and devices for each type of network, resulting in savings that can extend the life of the data center. The Cisco Nexus B22 for IBM is the building block that enables FCoE traffic to travel outside the blade chassis.

Best practices for unified fabric are listed in the Cisco NX-OS operations guide for the Cisco Nexus 5000 Series at http://www.cisco.com/en/US/docs/switches/datacenter/nexus5000/sw/operations/n5k_ops_guide.html.

Configuring FCoE

Follow these steps to configure FCoE:

1. Enable the FCoE personality on the CNA.
2. Verify and, if necessary, install the FCoE drivers in the server OS.
3. Enable FCoE on the parent switches.
4. Configure quality of service (QoS) to support FCoE on the Cisco Nexus parent switch.
5. Enable the FCoE feature on the Cisco Nexus switch.
6. Create the SAN A and SAN B VLANs.
7. Create vFC interfaces.

1. Enable FCoE on the CNA.

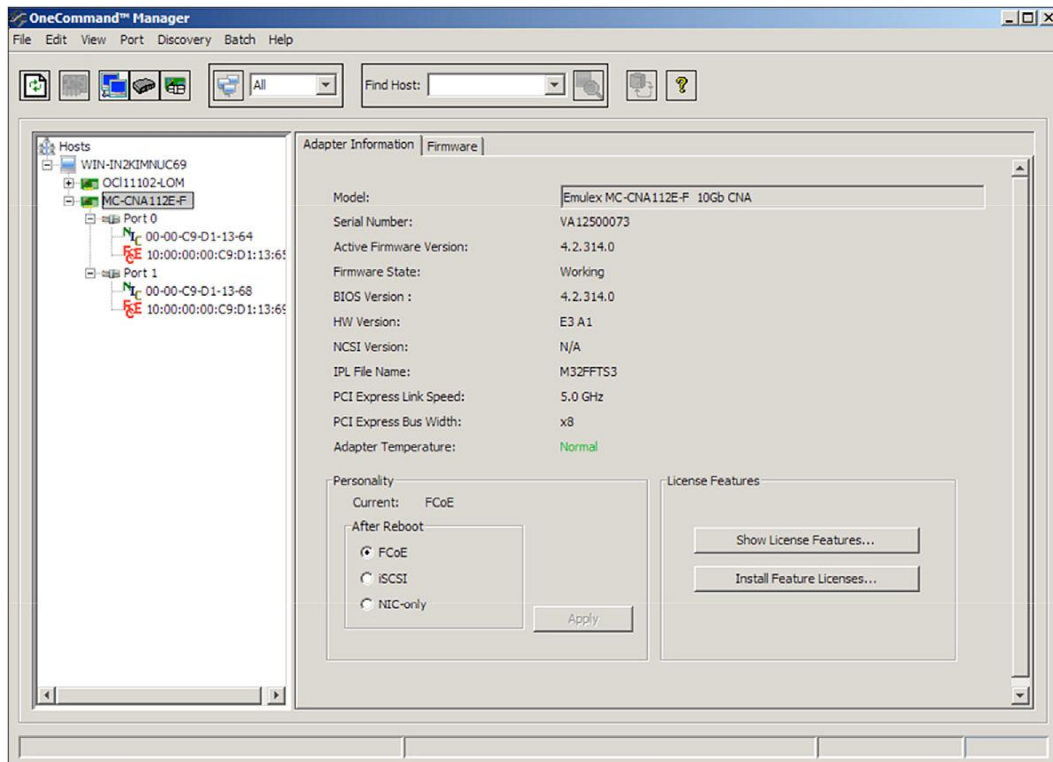
The CNA personality should be set to FCoE according to the CNA documentation.

2. Verify and, if necessary, install the FCoE drivers in the server OS.

Verify that the latest FCoE drivers and firmware are loaded for the operating system. The latest versions can be obtained from the third-party support website. The FCoE drivers are separate from the Ethernet NIC drivers. Generally, the latest versions of the CNA drivers and the CNA firmware should be used.

Figure 8 shows the ports configured for FCoE and the drivers loaded.

Figure 8: OneCommand FCoE Utility Showing Ports Configured for FCoE with Drivers Loaded



Configuring the Cisco Nexus 5000 Series and B22 for IBM for FCoE

This example assumes that a server in bay 2 is using connection blade bays 3 and 4 for FCoE connectivity.

1. Enable the FCoE feature on the Cisco Nexus switches:

```
N5548-Bottom # config terminal
```

Enter configuration commands, one per line. End with CNTL/Z.

```
switch(config)# feature fcoe
```

```
FC license checked out successfully
```

```
fc_plugin extracted successfully
```

```
FC plugin loaded successfully
```

```
FCoE manager enabled successfully
```

```
FC enabled on all modules successfully
```

```
Warning: Ensure class-fcoe is included in qos policy-maps of all types
```

```
N5548-Bottom (config)#
```

```
N5548-Top # config terminal
```

Enter configuration commands, one per line. End with CNTL/Z.

```
switch(config)# feature fcoe
```

```
FC license checked out successfully
```

```
fc_plugin extracted successfully
```



```
FC plugin loaded successfully
FCoE manager enabled successfully
FC enabled on all modules successfully
Warning: Ensure class-fcoe is included in qos policy-maps of all types
N5548-Top (config)#
```

2. Configure QoS to support FCoE on both switches:

```
N5548-Bottom(config)# system qos
N5548-Bottom(config-sys-qos)# service-policy type qos input fcoe-default-in-policy
N5548-Bottom(config-sys-qos)# service-policy type queuing input fcoe-default-in-policy
N5548-Bottom(config-sys-qos)# service-policy type queuing output fcoe-default-out-policy
N5548-Bottom(config-sys-qos)# service-policy type network-qos fcoe-default-nq-policy
N5548-Bottom(config-sys-qos)#
```

```
N5548-Top(config)# system qos
N5548-Top(config-sys-qos)# service-policy type qos input fcoe-default-in-policy
N5548-Top(config-sys-qos)# service-policy type queuing input fcoe-default-in-policy
N5548-Top(config-sys-qos)# service-policy type queuing output fcoe-default-out-policy
N5548-Top(config-sys-qos)# service-policy type network-qos fcoe-default-nq-policy
N5548-Top(config-sys-qos)#
```

3. Create the virtual Fibre Channel interface (physical port) on both switches:

```
N5548-Bottom(config)#
N5548-Bottom(config)# interface vfc 1032
N5548-Bottom(config-if)# switchport mode F
N5548-Bottom(config-if)# bind interface ethernet 191/1/7
N5548-Bottom(config-if)# switchport trunk allowed vsan 200
N5548-Bottom(config-if)# no shut
N5548-Bottom(config-if)#
```

```
N5548-Top(config)#
N5548-Top(config)# interface vfc 1032
N5548-Top(config-if)# switchport mode F
N5548-Top(config-if)# bind interface ethernet 192/1/7
N5548-Top(config-if)# switchport trunk allowed vsan 201
N5548-Top(config-if)# no shut
N5548-Top(config-if)#
```

Create the virtual Fibre Channel interface (Port Channel) on both switches:

```
N5548-Bottom(config)#  
N5548-Bottom(config)# interface vfc 1032  
N5548-Bottom(config-if)# switchport mode F  
N5548-Bottom(config-if)# bind interface port-channel 201  
N5548-Bottom(config-if)# no shut  
N5548-Bottom(config-if)#
```

```
N5548-Top(config)#  
N5548-Top(config)# interface vfc 1032  
N5548-Top(config-if)# switchport mode F  
N5548-Top(config-if)# bind interface port-channel 201  
N5548-Top(config-if)# no shut  
N5548-Top(config-if)#
```

4. Create the FCoE VSAN and map it to the VLAN on the switches:

```
N5548-Bottom(config)# vlan 200  
N5548-Bottom(config-vlan)# fcoe vsan 200  
N5548-Bottom(config-vlan)#
```

```
N5548-Top(config)# vlan 201  
N5548-Top(config-vlan)# fcoe vsan 201  
N5548-Top(config-vlan)#
```

5. Configure the VLANs allowed to transverse the vPC links:

```
N5548-Bottom(config)# interface port-channel 20  
N5548-Bottom(config-if)# switchport trunk allowed vlan 1, 200  
N5548-Bottom(config-vsan-db)#
```

```
N5548-Top(config)# interface port-channel 20  
N5548-Top(config-vsan-db)# switchport trunk allowed vlan 1, 201  
N5548-Top(config-vsan-db)#
```

6. Bind the entry in the VSAN database on the switches:

```
N5548-Bottom(config)#  
N5548-Bottom(config)# vsan database  
N5548-Bottom(config-vsan-db)# vsan 200  
N5548-Bottom(config-vsan-db)# vsan 200 interface vfc1032  
N5548-Bottom(config-vsan-db)#
```

```
N5548-Top(config)#
N5548-Top(config)# vsan database
N5548-Top(config-vsan-db)# vsan 201
N5548-Top(config-vsan-db)# vsan 201 interface vfc1032
N5548-Top(config-vsan-db)#
```

Note: The VLAN and VSAN numbers do not have to be the same.

```
Configure the native fibre channel slot/module
N5548-Bottom(config)# slot 2
N5548-Bottom(config-slot)# port 1-16 type fc
N5548-Bottom(config-slot)# poweroff module 2
N5548-Bottom(config)# no poweroff module 2
```

```
Configure the native fibre channel slot/module
N5548-Top(config)# slot 2
N5548-Top(config-slot)# port 1-16 type fc
N5548-Top(config-slot)# poweroff module 2
N5548-Top(config)# no poweroff module 2
```

7. Configure the Fibre Channel interface port type:

```
N5548-Bottom(config)# interface fc 1/48
N5548-Bottom(config-if)# switchport mode F
N5548-Bottom(config-if)#
```

```
N5548-Top(config)# interface fc 1/48
N5548-Top(config-if)# switchport mode F
N5548-Top(config-if)#
```

8. Bind the VSAN to the Fibre Channel interface:

```
N5548-Bottom(config)# vsan database
N5548-Bottom(config-vsan-db)# vsan 200 interface fc 1/48
N5548-Bottom(config-vsan-db)#
```

```
N5548-Top(config)# vsan database
N5548-Top(config-vsan-db)# vsan 201 interface fc 1/48
N5548-Top(config-vsan-db)#
```



9. Create the necessary zone and zone sets with appropriate members:

```
N5548-Bottom(config)# zoneset name zoneset1 vsan 200
N5548-Bottom(config-zoneset)#zone name zone1
N5548-Bottom(config-zoneset-zone)# member pwnn 50:00:40:20:05:df:43:2c
N5548-Bottom(config-zoneset-zone)# member pwnn 10:00:6c:ae:8b:2c:cb:c1
```

```
N5548-Top(config)# zoneset name zoneset1 vsan 201
N5548-Top(config-zoneset)#zone name zone1
N5548-Top(config-zoneset-zone)# member pwnn 50:00:40:21:05:df:43:2c
N5548-Top(config-zoneset-zone)# member pwnn 10:00:6c:ae:8b:2c:cb:c5
```

Note: Use a relevant display command (for example, **show interface** or **show flogi database**) to obtain the required value in hexadecimal format.

10. Activate the zone sets:

```
N5548-Bottom(config-zoneset)# zoneset activate name zoneset1 vsan 200
```

```
N5548-Top(config-zoneset)# zoneset activate name zoneset2 vsan 201
```

You can now use the following commands to check the connectivity between the blade server and the Cisco Nexus B22 for IBM:

```
N5548-Bottom# show flogi database
```

```
-----
INTERFACE          VSAN    FCID          PORT NAME          NODE NAME
-----
fc1/48              200     0x300000     50:00:40:20:05:df:43:2c  20:05:00:04:02:df:43:2c
vfc1032             200     0x300020     10:00:6c:ae:8b:2c:cb:c1  20:00:6c:ae:8b:2c:cb:c1
vfc1033             200     0x300040     10:00:6c:ae:8b:2c:d8:41  20:00:6c:ae:8b:2c:d8:41
```

```
N5548-Bottom#
```

```
N5548-Bottom# show fcns database
```

```
VSAN 200:
```

```
-----
FCID      TYPE  PWWN          (VENDOR)          FC4-TYPE:FEATURE
-----
0x300000  N     50:00:40:20:05:df:43:2c          scsi-fcp:target
0x300020  N     10:00:6c:ae:8b:2c:cb:c1
0x300040  N     10:00:6c:ae:8b:2c:d8:41
```

```
N5548-Bottom#
```


1. **Define a class map of QoS policies on the first switch to identify the iSCSI traffic (here, iSCSI traffic is matched to class-of-service [CoS] 5):**

```
N5548-Bottom(config)# class-map type qos match-all iSCSI-C1
N5548-Bottom(config-cmap-qos)# match protocol iscsi
N5548-Bottom(config-cmap-qos)# match cos 5
```

2. **Configure the type of QoS policies used to classify the traffic of a specific system class (here, the QoS-group value 2 is used):**

```
N5548-Bottom(config)# policy-map type qos iSCSI-C1
N5548-Bottom(config-pmap-qos) class iSCSI-C1
N5548-Bottom(config-pmap-c-qos)# set qos-group 2
N5548-Bottom(config-pmap-c-qos)# exit
N5548-Bottom(config-pmap-c-qos)# class class-default
```

3. **Configure the no-drop policy maps:**

```
N5548-Bottom(config)# class-map type network-qos iSCSI-C1
N5548-Bottom(config-cmap-nq)# match qos-group 2
N5548-Bottom(config-cmap-nq)# exit
N5548-Bottom(config)# policy-map type network-qos iSCSI-C1
N5548-Bottom(config-pmap-nq)# class type network-qos iSCSI-C1
N5548-Bottom(config-pmap-nq-c)# pause no-drop
N5548-Bottom(config-pmap-nq-c)# class type network-qos class-default
N5548-Bottom(config-pmap-nq-c)# mtu 9216
```

4. **Apply the system service policies:**

```
N5548-Bottom(config-sys-qos)# service-policy type qos input iSCSI-C1
N5548-Bottom(config-sys-qos)# service-policy type network-qos iSCSI-C1
```

5. **Identify the iSCSI traffic on the other Cisco Nexus switch using the same process as for the first switch by defining a class map for each class of traffic to be used in the QoS policies:**

```
N5548-Top(config)# class-map type qos match-all iSCSI-C1
N5548-Top(config-cmap-qos)# match protocol iscsi
N5548-Top(config-cmap-qos)# match cos 5
```

6. **Configure the QoS policy type:**

```
N5548-Top(config)# policy-map type qos iSCSI-C1
N5548-Top(config-pmap-qos) class iSCSI-C1
N5548-Top(config-pmap-c-qos)# set qos-group 2
N5548-Top(config-pmap-c-qos)# exit
N5548-Top(config-pmap-c-qos)# class class-default
```

7. Configure the no-drop policy maps:

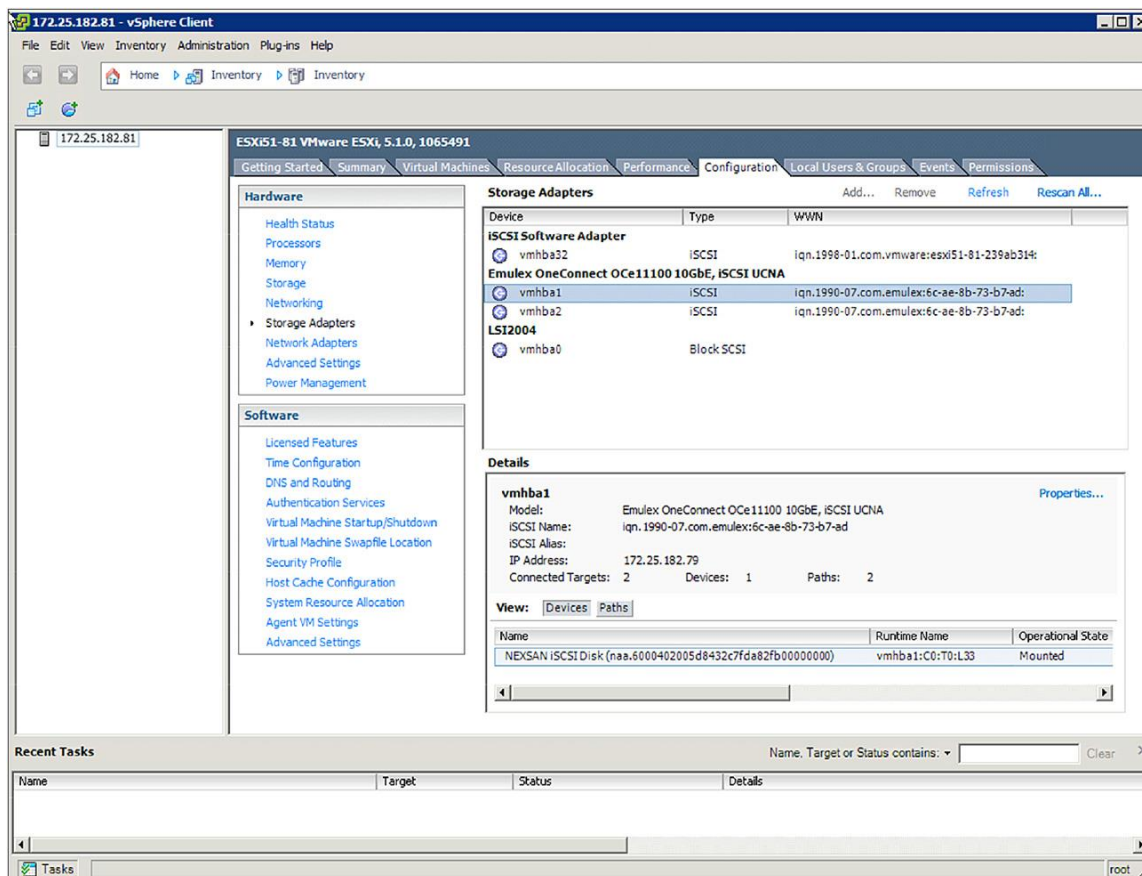
```
N5548-Top(config)# class-map type network-qos iSCSI-C1
N5548-Top(config-cmap-nq)# match qos-group 2
N5548-Top(config-cmap-nq)# exit
N5548-Top(config)# policy-map type network-qos iSCSI-C1
N5548-Top(config-pmap-nq)# class type network-qos iSCSI-C1
N5548-Top(config-pmap-nq-c)# pause no-drop
N5548-Top(config-pmap-nq-c)# class type network-qos class-default
N5548-Top(config-pmap-nq-c)# mtu 9216
```

8. Apply the system service policies:

```
N5548-Top(config-sys-qos)# service-policy type qos input iSCSI-C1
N5548-Top(config-sys-qos)# service-policy type network-qos iSCSI-C1
```

Figure 10 shows how the iSCSI ports appear in VMware ESXi. Two additional storage adapters are created in VMware ESXi.

Figure 10: IBM Flex System X440+10GB Fabric Blade Running VMware ESXi 5.1.0,1065491



The screenshot displays the VMware ESXi configuration interface for storage adapters. The 'Storage Adapters' table lists several adapters, with 'vmhba1' selected. The details for 'vmhba1' are as follows:

Device	Type	WWN
vmhba32	iSCSI	iqn.1998-01.com.vmware:esxi51-81-239ab314
vmhba1	iSCSI	iqn.1990-07.com.emulex:6c-ae-8b-73-b7-ad
vmhba2	iSCSI	iqn.1990-07.com.emulex:6c-ae-8b-73-b7-ad
vmhba0	Block SCSI	

Details for vmhba1:

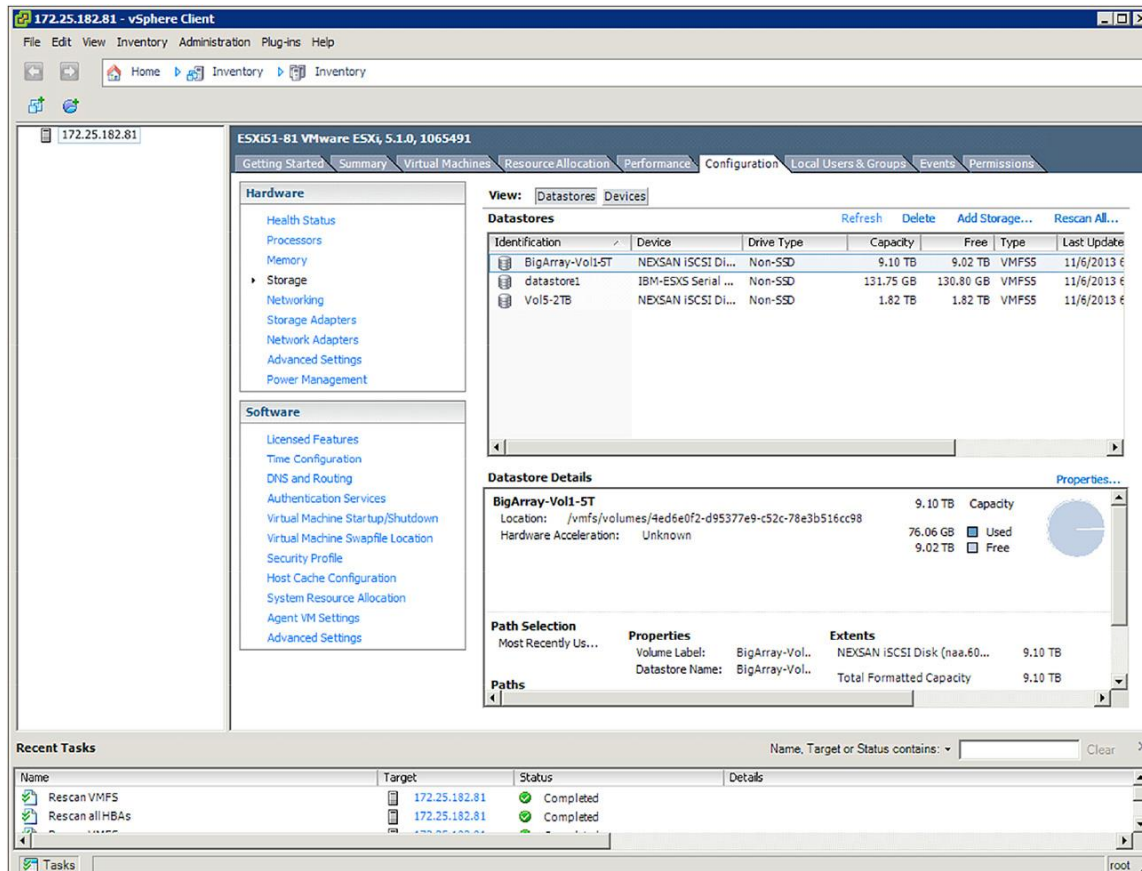
- Model: Emulex OneConnect OCE11100 10GbE, iSCSI UCNA
- iSCSI Name: iqn.1990-07.com.emulex:6c-ae-8b-73-b7-ad
- iSCSI Alias:
- IP Address: 172.25.182.79
- Connected Targets: 2 Devices: 1 Paths: 2

View: Devices | Paths

Name	Runtime Name	Operational State
NEXSAN iSCSI Disk (naa.6000402005d8432c7fda82fb00000000)	vmhba1:C0:T0:L33	Mounted

The storage array should then be visible as shown in Figure 11.

Figure 11: IBM Flex System X440+10GB Fabric Blade Running VMware ESXi 5.1.0,1065491



Virtual Network Adapter Partitioning

Various IBM adapters can present a single Ethernet link to the server operating system as if it were different physical adapters. This capability allows bare-metal servers and hypervisors to offer multiple NICs and adapters while physically having a pair of high-bandwidth links. This feature provides the flexibility to limit the bandwidth allocated to each virtual adapter without the need for a server administrator to know the network QoS configuration parameters.

To configure the virtual adapter function, follow this procedure:

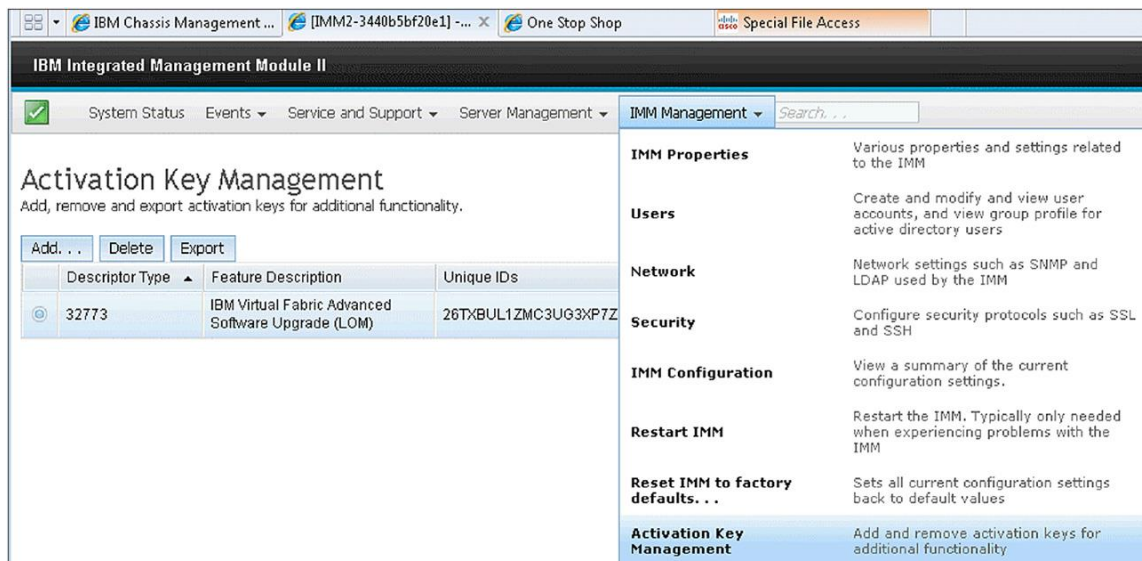
1. Install the license.
2. Configure the virtual network adapters.
3. Configure the switch interface for the correct VLANs.

1. Install the license:

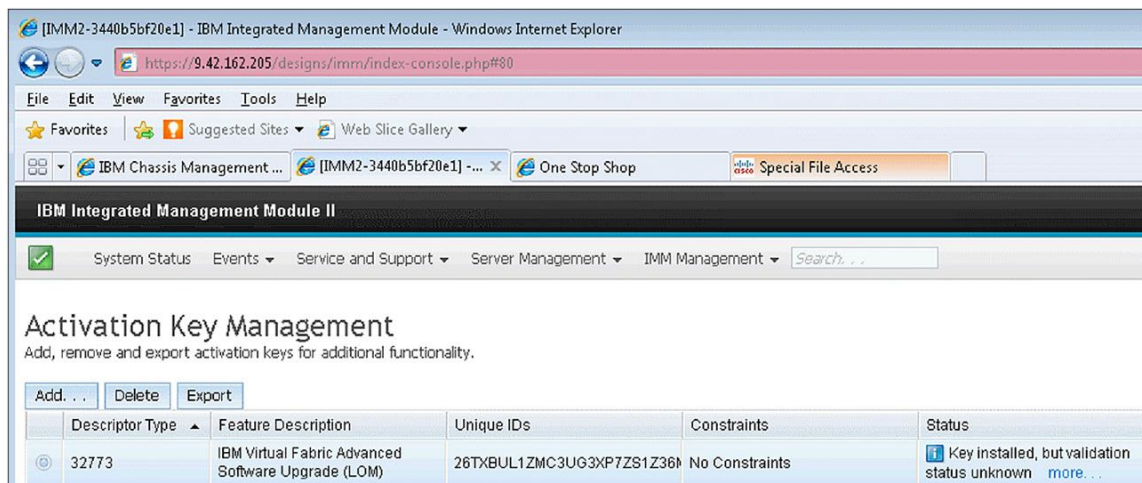
- a. Capture the application-specific integrated circuit (ASIC) ID from the LoM by opening the unified extensible firmware interface (UEFI) menu and choosing System Settings > Network > Feature on Demand (FoD).

Feature On Demand		
FoD Type	8005	Feature Descriptor Type
FUI	26TXBUL1ZMC3UG3XP7ZS1Z3	
	6M3CD17RU	
FoD Status	Valid FoD license key found	

- b. Generate the FoD key for the advanced software function.
- c. Install the key using the IBM Integrated Management Module (IMM) web interface.



- d. Verify that the key was successfully installed.

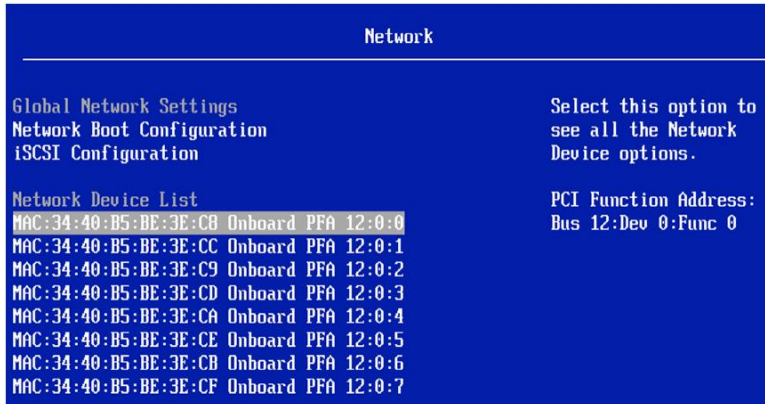


Descriptor Type	Feature Description	Unique IDs	Constraints	Status
32773	IBM Virtual Fabric Advanced Software Upgrade (LOM)	26TXBUL1ZMC3UG3XP7ZS1Z36	No Constraints	Key installed, but validation status unknown more...

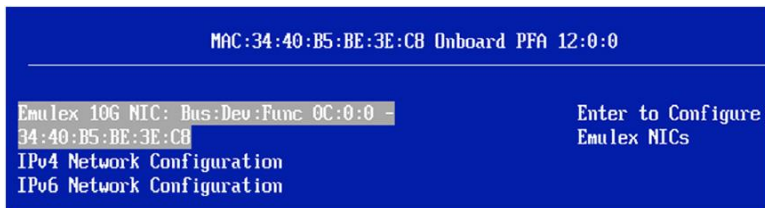
- e. Reboot the system.

2. Configure the virtual network adapter:

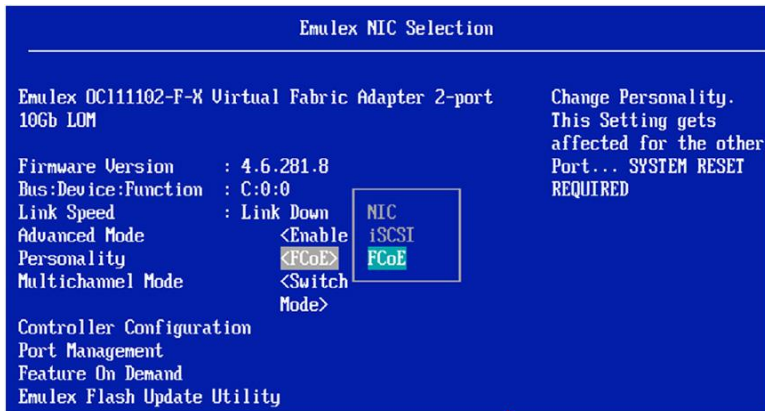
- a. During the boot cycle, press F1 to open the UEFI menu.
- b. Select the adapter port by opening the UEFI menu and choosing System Settings > Network and selecting the adapter port.



- c. Select the Emulex NIC.



- d. Select Advanced Mode option: NIC, iSCSI, or FCoE.



- e. Make sure that the multichannel mode is set to Switch Independent and select Controller Configuration.

```

Emulex NIC Selection
-----
Emulex OC111102-F-K Virtual Fabric Adapter 2-port 10Gb LOM      Enter to View or
                                                                    Configure Function
                                                                    Parameters
Firmware Version       : 4.6.281.8
Bus:Device:Function    : C:0:0
Link Speed             : Link Down
Advanced Mode          : <Enable>
Personality            : <FCoE>
Multichannel Mode     : <Switch Independent
Mode>
Controller Configuration
Port Management
Feature On Demand
Emulex Flash Update Utility
                                                                    ↓
F4=Move Highlight      <Enter>=Select Entry    Esc=Exit
  
```

- f. Select the Configure Bandwidth option.

```

Controller Configuration
-----
View Configuration      Configure Bandwidth
Configure Bandwidth
Configure LPVID
Save Current Configurations
  
```

- g. Allocate the minimum and maximum bandwidth.

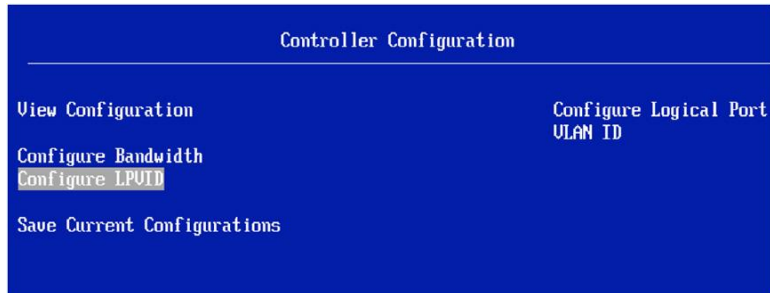
Note: Function 2 on both physical NICs corresponds to the second vNIC, which can be the iSCSI or FCoE initiator. In this example, it is the FCoE initiator with 4-Gbps of bandwidth allocated.

```

Configure Bandwidth
-----
Configure Minimum Bandwidth
Function 0      [10]
Function 2      [40]
Function 4      [25]
Function 6      [25]

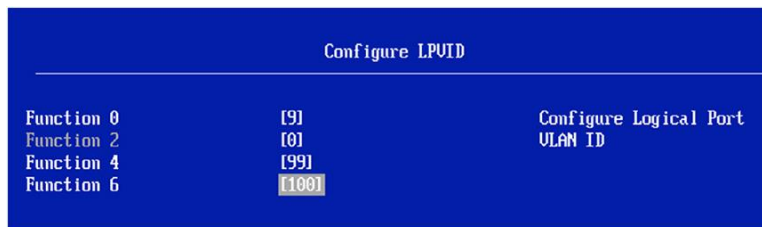
Configure Maximum Bandwidth
Function 0      [10]
Function 2      [40]
Function 4      [25]
Function 6      [25]
  
```

- h. Select the Configure LPVID option.



3. Configure unique VLANs as necessary for each Ethernet vNIC.

- a. This feature works by applying VLAN tags to the traffic egressing the adapter and entering the network. Thus, for correct operation, the VLAN tags on the physical network port to the adapter must match. Note that a VLAN ID cannot be assigned for the FCoE vNIC.



- b. Make sure that the VLANs are configured and allowed on the internal and external switch ports as needed.
- c. Configure the network port attached to the server. Use the following configuration as a reference.

```
interface Ethernet191/1/7
  switchport mode trunk
  switchport trunk native vlan 182
  switchport trunk allowed vlan 182,200
  spanning-tree port type edge trunk
  channel-group 207
```

```
interface port-channel207
  switchport mode trunk
  switchport trunk native vlan 182
  switchport trunk allowed vlan 182,200
  spanning-tree port type edge trunk
```

Debug Commands

show fex

This command displays the status of the fabric extenders that are powered on and connected.

Cisco Nexus B22 for IBM installed but parent switch not configured:

```
N5548-Bottom# show fex
  FEX          FEX          FEX          FEX
  Number      Description      State          Model          Serial
  -----
  ---          -
                   Discovered      N2K-B22IBM-P  FOC1515ZZU4
N5548-Bottom#
```

Cisco Nexus B22 for IBM loading after parent switch is configured:

```
N5548-Bottom(config-if) # show fex
  FEX          FEX          FEX          FEX
  Number      Description      State          Model          Serial
  -----
  103         FEX0103         Connected      N2K-B22IBM-P  FOC1515ZZU4
N5548-Bottom(config-if) #
```

```
N5548-Bottom#
show fex
  FEX          FEX          FEX          FEX          Fex
  Number      Description      State          Model          Serial
  -----
  191         FEX0191         Online         N2K-B22IBM-P  FOC1730R0XQ
  192         FEX0192         Online         N2K-B22IBM-P  FOC1730R0XM
```

Cisco Nexus B22 for IBM online and ready for use:

```
N5548-Top# show fex
  FEX          FEX          FEX          FEX
  Number      Description      State          Model          Serial
  -----
  104         FEX0104         Online         N2K-B22IBM-P  FOC1515ZZUU
N5548-Top#
N5548-Top#

N5548-Top#
show fex
```




FEX Number	FEX Description	FEX State	FEX Model	Fex Serial
191	FEX0191	Online	N2K-B22IBM-P	FOC1730R0XQ
192	FEX0192	Online	N2K-B22IBM-P	FOC1730R0XM

show fex detail

This command displays the details of the fabric extender module, including the connection blade bay number, rack name, and enclosure information for the blade server chassis.

```
N5548-Top#
show fex 191 detail
FEX: 191 Description: FEX0191 state: Online
  FEX version: 6.0(2)N2(1a) [Switch version: 6.0(2)N2(1a)]
  FEX Interim version: 6.0(2)N2(1a.19)
  Switch Interim version: 6.0(2)N2(1a.19)
  Extender Serial: FOC1730R0XQ
  Extender Model: N2K-B22IBM-P, Part No: 73-15000-03
  Bay: 1
  Machine Type/Model: 8721HC1
  Machine Serial Number: 06MVGY8
  UUID: 100E 4829 C606 45B1 A8E1 D697 BCCD 2884
  Card Id: 211, Mac Addr: f8:4f:57:ce:36:42, Num Macs: 64
  Module Sw Gen: 21 [Switch Sw Gen: 21]
  post level: complete
  Pinning-mode: static Max-links: 1
  Fabric port for control traffic: Eth1/17
  FCoE Admin: false
  FCoE Oper: false
  FCoE FEX AA Configured: true
  Fabric interface state:
    Po191 - Interface Up. State: Active
    Eth1/17 - Interface Up. State: Active
  Fex Port      State Fabric Port
    Eth191/1/1  Up    Po191
    Eth191/1/2  Down  Po191
    Eth191/1/3  Up    Po191
    Eth191/1/4  Up    Po191
    Eth191/1/5  Down  Po191
    Eth191/1/6  Down  Po191
    Eth191/1/7  Up    Po191
    Eth191/1/8  Down  Po191
    Eth191/1/9  Down  Po191
    Eth191/1/10 Down  Po191
    Eth191/1/11 Down  Po191
    Eth191/1/12 Down  Po191
```




```

Eth191/1/13 Down Po191
Eth191/1/14 Up Po191

```

Logs:

```

09/25/2013 11:09:20.990637: Module register received
09/25/2013 11:09:20.993278: Registration response sent
09/25/2013 11:09:21.98103: create module inserted event.
09/25/2013 11:09:21.99012: Module Online Sequence
09/25/2013 11:09:22.829803: Module Online

```

show interface brief

This command displays a summary of the interfaces with information including the VLAN, link status, and speed.

```
N5548-Top# show interface brief
```

```

-----
Interface  Vsan   Admin  Admin  Status      SFP   Oper  Oper  Port
          Mode   Trunk  Mode
          Mode
          (Gbps)
-----
fc1/41    1      auto   on     sfpAbsent   --    --    --
fc1/42    1      auto   on     sfpAbsent   --    --    --
fc1/43    1      auto   on     sfpAbsent   --    --    --
fc1/44    1      auto   on     sfpAbsent   --    --    --
fc1/45    1      auto   on     sfpAbsent   --    --    --
fc1/46    1      auto   on     sfpAbsent   --    --    --
fc1/47    1      auto   on     down        swl   --    --
fc1/48    201    F      on     up          swl   F     8    --
-----

```

```

-----
Ethernet  VLAN   Type Mode  Status  Reason      Speed  Port
Interface
-----
Eth1/1    1      eth  fabric up    none    10G(D)  --
Eth1/2    1      eth  fabric up    none    10G(D)  --
Eth1/3    1      eth  access down  SFP not inserted  10G(D)  --
Eth1/4    1      eth  access down  SFP not inserted  10G(D)  --
Eth1/5    1      eth  fabric up    none    10G(D)  61
Eth1/6    1      eth  fabric up    none    10G(D)  61
Eth1/7    182    eth  access up    none    1000(D)  --
Eth1/8    182    eth  access up    none    1000(D)  --
Eth1/9    1      eth  trunk up     none    10G(D)  20
Eth1/10   1      eth  trunk down   SFP not inserted  10G(D)  20
Eth1/11   1      eth  access down  SFP not inserted  10G(D)  --
-----

```



Eth1/12	1	eth	access	down	SFP not inserted	10G(D)	--
Eth1/13	1	eth	access	down	SFP not inserted	10G(D)	--
Eth1/14	1	eth	access	down	SFP not inserted	10G(D)	--
Eth1/15	1	eth	access	down	SFP not inserted	10G(D)	--
Eth1/16	1	eth	access	down	SFP not inserted	10G(D)	--
Eth1/17	1	eth	fabric	up	none	10G(D)	191
Eth1/18	1	eth	fabric	up	none	10G(D)	192
Eth1/19	1	eth	fabric	up	none	10G(D)	193
Eth1/20	1	eth	fabric	up	none	10G(D)	194
Eth1/21	1	eth	access	down	SFP not inserted	10G(D)	--
Eth1/22	1	eth	access	down	SFP not inserted	10G(D)	--
Eth1/23	1	eth	access	down	SFP not inserted	10G(D)	--
Eth1/24	1	eth	access	down	SFP not inserted	10G(D)	--
Eth1/25	1	eth	access	down	SFP not inserted	10G(D)	--
Eth1/26	1	eth	access	down	SFP not inserted	10G(D)	--
Eth1/27	1	eth	access	down	SFP not inserted	10G(D)	--
Eth1/28	1	eth	access	down	SFP not inserted	10G(D)	--
Eth1/29	1	eth	access	down	SFP not inserted	10G(D)	--
Eth1/30	1	eth	access	down	SFP not inserted	10G(D)	--
Eth1/31	1	eth	access	down	SFP not inserted	10G(D)	--
Eth1/32	1	eth	access	down	SFP not inserted	10G(D)	--
Eth1/33	1	eth	access	down	SFP not inserted	10G(D)	--
Eth1/34	1	eth	access	down	SFP not inserted	10G(D)	--
Eth1/35	1	eth	access	down	SFP not inserted	10G(D)	--
Eth1/36	1	eth	access	down	SFP not inserted	10G(D)	--
Eth1/37	1	eth	access	down	SFP not inserted	10G(D)	--
Eth1/38	1	eth	access	down	SFP not inserted	10G(D)	--
Eth1/39	1	eth	access	down	SFP not inserted	10G(D)	--
Eth1/40	1	eth	access	down	SFP not inserted	10G(D)	--
Eth2/1	1	eth	access	down	SFP not inserted	10G(D)	--
Eth2/2	1	eth	access	down	SFP not inserted	10G(D)	--
Eth2/3	1	eth	access	down	SFP not inserted	10G(D)	--
Eth2/4	1	eth	access	down	SFP not inserted	10G(D)	--
Eth2/5	1	eth	access	down	SFP not inserted	10G(D)	--
Eth2/6	1	eth	access	down	SFP not inserted	10G(D)	--
Eth2/7	1	eth	access	down	SFP not inserted	10G(D)	--
Eth2/8	1	eth	access	down	SFP not inserted	10G(D)	--
Eth2/9	1	eth	access	down	SFP not inserted	10G(D)	--
Eth2/10	1	eth	access	down	SFP not inserted	10G(D)	--
Eth2/11	1	eth	access	down	SFP not inserted	10G(D)	--
Eth2/12	1	eth	access	down	SFP not inserted	10G(D)	--
Eth2/13	1	eth	access	down	SFP not inserted	10G(D)	--
Eth2/14	1	eth	access	down	SFP not inserted	10G(D)	--
Eth2/15	1	eth	access	down	SFP not inserted	10G(D)	--
Eth2/16	1	eth	access	down	SFP not inserted	10G(D)	--



```

-----
Port-channel VLAN      Type Mode   Status Reason                               Speed  Protocol
Interface
-----
Po10             1      eth trunk down   No operational members              auto(I) lacp
Po20             1      eth trunk up    none                                 a-10G(D) none
Po61             1      eth fabric up   none                                 a-10G(D) none
Po191            1      eth fabric up   none                                 a-10G(D) none
Po192            1      eth fabric up   none                                 a-10G(D) none
Po193            1      eth fabric up   none                                 a-10G(D) none
Po194            1      eth fabric up   none                                 a-10G(D) none
Po201            182    eth access up   none                                 a-10G(D) none
Po202            182    eth access up   none                                 a-10G(D) none
Po203            182    eth access up   none                                 a-10G(D) none
Po207            182    eth trunk up    none                                 a-10G(D) none
Po214            182    eth access up   none                                 a-10G(D) none
Po215            182    eth trunk up    none                                 a-10G(D) none
-----

```

```

-----
Port   VRF      Status IP Address                               Speed  MTU
-----
mgmt0  --      up    172.25.182.109                          1000  1500
-----

```

```

-----
Interface Vsan  Admin Admin  Status  Bind      Oper  Oper
          Mode Trunk Info      Mode      Speed
          Mode
-----
vfc1032  201   F     on     trunking Eth192/1/7  TF   auto
vfc1033  201   F     on     trunking Eth192/1/14 TF   auto
-----

```

```

-----
Interface Secondary VLAN (Type)              Status Reason
-----
Vlan1    --              down  Administratively down
Vlan50   --              up    --
-----

```

```

-----
Ethernet VLAN  Type Mode   Status Reason                               Speed  Port
Interface
-----
Eth160/1/1  1      eth access up    none                                 10G(D) --
Eth160/1/2  1      eth access down  Link not connected                 auto(D) --
Eth160/1/3  1      eth access down  Link not connected                 auto(D) --
Eth160/1/4  1      eth access down  Link not connected                 auto(D) --
Eth160/1/5  1      eth access down  Link not connected                 auto(D) --
-----

```



Eth160/1/6	1	eth	access	down	Link not connected	auto(D)	--
Eth160/1/7	1	eth	access	down	Link not connected	auto(D)	--
Eth160/1/8	1	eth	access	down	Link not connected	auto(D)	--
Eth160/1/9	1	eth	access	down	Link not connected	auto(D)	--
Eth160/1/10	1	eth	access	down	Link not connected	auto(D)	--
Eth160/1/11	1	eth	access	down	Link not connected	auto(D)	--
Eth160/1/12	1	eth	access	down	Link not connected	auto(D)	--
Eth160/1/13	1	eth	access	down	Link not connected	auto(D)	--
Eth160/1/14	1	eth	access	down	Link not connected	auto(D)	--
Eth160/1/15	1	eth	access	down	Link not connected	auto(D)	--
Eth160/1/16	1	eth	access	down	Link not connected	auto(D)	--
Eth161/1/1	1	eth	access	up	none	10G(D)	--
Eth161/1/2	1	eth	access	up	none	1000(D)	--
Eth161/1/3	1	eth	access	down	Link not connected	auto(D)	--
Eth161/1/4	1	eth	access	down	Link not connected	auto(D)	--
Eth161/1/5	1	eth	access	up	none	1000(D)	--
Eth161/1/6	1	eth	access	up	none	10G(D)	--
Eth161/1/7	1	eth	access	down	Link not connected	auto(D)	--
Eth161/1/8	1	eth	access	down	Link not connected	auto(D)	--
Eth161/1/9	1	eth	access	down	Link not connected	auto(D)	--
Eth161/1/10	1	eth	access	down	Link not connected	auto(D)	--
Eth161/1/11	1	eth	access	down	Link not connected	auto(D)	--
Eth161/1/12	1	eth	access	down	Link not connected	auto(D)	--
Eth161/1/13	1	eth	access	up	none	1000(D)	--
Eth161/1/14	1	eth	access	up	none	10G(D)	--
Eth161/1/15	1	eth	access	down	Link not connected	auto(D)	--
Eth161/1/16	1	eth	access	down	Link not connected	auto(D)	--
Eth191/1/1	182	eth	access	up	none	10G(D)	201
Eth191/1/2	1	eth	access	down	Link not connected	auto(D)	--
Eth191/1/3	182	eth	access	up	none	10G(D)	203
Eth191/1/4	182	eth	access	up	none	10G(D)	202
Eth191/1/5	1	eth	access	down	Link not connected	auto(D)	--
Eth191/1/6	1	eth	access	down	Link not connected	auto(D)	--
Eth191/1/7	182	eth	trunk	up	none	10G(D)	207
Eth191/1/8	1	eth	access	down	Link not connected	auto(D)	--
Eth191/1/9	1	eth	access	down	Link not connected	auto(D)	--
Eth191/1/10	1	eth	access	down	Link not connected	auto(D)	--
Eth191/1/11	1	eth	access	down	Link not connected	auto(D)	--
Eth191/1/12	1	eth	access	down	Link not connected	auto(D)	--
Eth191/1/13	1	eth	access	down	Link not connected	auto(D)	--
Eth191/1/14	182	eth	access	up	none	10G(D)	214
Eth192/1/1	182	eth	access	up	none	10G(D)	--
Eth192/1/2	1	eth	access	down	Link not connected	auto(D)	--
Eth192/1/3	182	eth	access	up	none	10G(D)	203
Eth192/1/4	182	eth	access	up	none	10G(D)	--
Eth192/1/5	1	eth	access	down	Link not connected	auto(D)	--



Eth192/1/6	1	eth	access	down	Link not connected	auto(D)	--
Eth192/1/7	182	eth	trunk	up	none	10G(D)	207
Eth192/1/8	1	eth	access	down	Link not connected	auto(D)	--
Eth192/1/9	1	eth	access	down	Link not connected	auto(D)	--
Eth192/1/10	1	eth	access	down	Link not connected	auto(D)	--
Eth192/1/11	1	eth	access	down	Link not connected	auto(D)	--
Eth192/1/12	1	eth	access	down	Link not connected	auto(D)	--
Eth192/1/13	1	eth	access	down	Link not connected	auto(D)	--
Eth192/1/14	182	eth	trunk	up	none	10G(D)	215
Eth193/1/1	1	eth	access	down	Link not connected	auto(D)	--
Eth193/1/2	1	eth	access	up	none	10G(D)	--
Eth193/1/3	1	eth	access	down	Link not connected	auto(D)	--
Eth193/1/4	1	eth	access	down	Link not connected	auto(D)	--
Eth193/1/5	1	eth	access	down	Link not connected	auto(D)	--
Eth193/1/6	1	eth	access	down	Link not connected	auto(D)	--
Eth193/1/7	1	eth	access	down	Link not connected	auto(D)	--
Eth193/1/8	1	eth	access	down	Link not connected	auto(D)	--
Eth193/1/9	1	eth	access	down	Link not connected	auto(D)	--
Eth193/1/10	1	eth	access	down	Link not connected	auto(D)	--
Eth193/1/11	1	eth	access	down	Link not connected	auto(D)	--
Eth193/1/12	1	eth	access	down	Link not connected	auto(D)	--
Eth193/1/13	1	eth	access	down	Link not connected	auto(D)	--
Eth193/1/14	1	eth	access	down	Link not connected	auto(D)	--
Eth194/1/1	1	eth	access	down	Link not connected	auto(D)	--
Eth194/1/2	1	eth	access	up	none	10G(D)	--
Eth194/1/3	1	eth	access	down	Link not connected	auto(D)	--
Eth194/1/4	1	eth	access	down	Link not connected	auto(D)	--
Eth194/1/5	1	eth	access	down	Link not connected	auto(D)	--
Eth194/1/6	1	eth	access	down	Link not connected	auto(D)	--
Eth194/1/7	1	eth	access	down	Link not connected	auto(D)	--
Eth194/1/8	1	eth	access	down	Link not connected	auto(D)	--
Eth194/1/9	1	eth	access	down	Link not connected	auto(D)	--
Eth194/1/10	1	eth	access	down	Link not connected	auto(D)	--
Eth194/1/11	1	eth	access	down	Link not connected	auto(D)	--
Eth194/1/12	1	eth	access	down	Link not connected	auto(D)	--
Eth194/1/13	1	eth	access	down	Link not connected	auto(D)	--
Eth194/1/14	1	eth	access	down	Link not connected	auto(D)	--



show interface ethernet 191/1/1

This command displays detailed statistics for Cisco Nexus B22 for IBM fabric extender port 1.

```
N5548-Bottom# show interface ethernet 191/1/1
Ethernet191/1/1 is up
  Belongs to Po201
  Hardware: 1000/10000 Ethernet, address: f84f.57ce.3642 (bia f84f.57ce.3642)
  MTU 1500 bytes, BW 10000000 Kbit, DLY 10 usec
  reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA
  Port mode is access
  full-duplex, 10 Gb/s
  Beacon is turned off
  Input flow-control is off, output flow-control is on
  Switchport monitor is off
  EtherType is 0x8100
  Last link flapped 19:40:49
  Last clearing of "show interface" counters never
  12 interface resets
  30 seconds input rate 40 bits/sec, 0 packets/sec
  30 seconds output rate 2592 bits/sec, 4 packets/sec
  Load-Interval #2: 5 minute (300 seconds)
    input rate 152 bps, 0 pps; output rate 3.31 Kbps, 4 pps
  RX
    1414070 unicast packets  6375 multicast packets  11769 broadcast packets
    1432214 input packets  108330909 bytes
    0 jumbo packets  0 storm suppression bytes
    0 runts  0 giants  0 CRC  0 no buffer
    0 input error  0 short frame  0 overrun  0 underrun  0 ignored
    0 watchdog  0 bad etype drop  0 bad proto drop  0 if down drop
    0 input with dribble  0 input discard
    0 Rx pause
  TX
    3062593 unicast packets  87916 multicast packets  318028 broadcast packets
    3468537 output packets  4619474058 bytes
    0 jumbo packets
    0 output error  0 collision  0 deferred  0 late collision
    0 lost carrier  0 no carrier  0 babble  0 output discard
    0 Tx pause
```



show vlan

This command displays the VLAN and the ports associated with the VLAN.

```
N5548-Bottom(config-if) # show vlan
```

```
N5548-Bottom(config-if) #
```

```
N5548-Bottom# show vlan
```

VLAN Name	Status	Ports
1 default	active	Po20, Eth1/2, Eth1/3, Eth1/4 Eth1/5, Eth1/6, Eth1/9, Eth1/10 Eth1/11, Eth1/12, Eth1/13 Eth1/14, Eth1/15, Eth1/16 Eth1/21, Eth1/22, Eth1/23 Eth1/24, Eth1/25, Eth1/26 Eth1/27, Eth1/28, Eth1/29 Eth1/30, Eth1/31, Eth1/32 Eth1/33, Eth1/34, Eth1/35 Eth1/36, Eth1/37, Eth1/38 Eth1/39, Eth1/40, Eth2/1, Eth2/2 Eth2/3, Eth2/4, Eth2/5, Eth2/6 Eth2/7, Eth2/8, Eth2/9, Eth2/10 Eth2/11, Eth2/12, Eth2/13 Eth2/14, Eth2/15, Eth2/16 Eth191/1/2, Eth191/1/5 Eth191/1/6, Eth191/1/8 Eth191/1/9, Eth191/1/10 Eth191/1/11, Eth191/1/12 Eth191/1/13, Eth192/1/2 Eth192/1/5, Eth192/1/6 Eth192/1/8, Eth192/1/9 Eth192/1/10, Eth192/1/11 Eth192/1/12, Eth192/1/13 Eth193/1/1, Eth193/1/2 Eth193/1/3, Eth193/1/4 Eth193/1/5, Eth193/1/6 Eth193/1/7, Eth193/1/8 Eth193/1/9, Eth193/1/10 Eth193/1/11, Eth193/1/12 Eth193/1/13, Eth193/1/14

```

Eth194/1/1, Eth194/1/2
Eth194/1/3, Eth194/1/4
Eth194/1/5, Eth194/1/6
Eth194/1/7, Eth194/1/8
Eth194/1/9, Eth194/1/10
Eth194/1/11, Eth194/1/12
Eth194/1/13, Eth194/1/14
50  iSCSI-VL50          active  Po20, Eth1/9, Eth1/10
77  VLAN0077           active  Po20, Eth1/9, Eth1/10
182 MGMT                active  Po20, Po201, Po202, Po203
                                     Po207, Po214, Po215, Eth1/7
                                     Eth1/8, Eth1/9, Eth1/10
                                     Eth191/1/1, Eth191/1/3
                                     Eth191/1/4, Eth191/1/7
                                     Eth191/1/14, Eth192/1/1
                                     Eth192/1/3, Eth192/1/4
                                     Eth192/1/7, Eth192/1/14
200 FCoE-VL200         active  Po20, Po207, Po215, Eth1/9
                                     Eth1/10, Eth191/1/7, Eth192/1/7
                                     Eth192/1/14

```

```
VLAN Type  Vlan-mode
```

```

-----
1    enet  CE
50   enet  CE
77   enet  CE
182  enet  CE
200  enet  CE

```

```
Primary Secondary Type          Ports
```

show interface fex-fabric

This command displays a list of interfaces and their association with fabric extenders.

```
N5K_Bottom# show interface fex-fabric
```

```
N5548-Bottom# show interface fex-fabric
```

```

Fabric      Fabric      Fex      FEX      Fex
Fex  Port      Port State  Uplink   Model    Serial
-----
135  Eth1/1      Configured  0
191  Eth1/17     Active     1        N2K-B22IBM-P  FOC1730R0XQ
192  Eth1/18     Active     1        N2K-B22IBM-P  FOC1730R0XM
193  Eth1/19     Active     1        N2K-B22IBM-P  FOC1730R0WU

```




194 Eth1/20 Active 1 N2K-B22IBM-P FOC1720R0VV
N5596-1-B22#

Cisco Nexus Configurations

Cisco Nexus 5000 Series Switch 1 Configuration

```
N5548-Bottom(config)# show run
```

```
!Command: show running-config  
!Time: Mon Oct 14 16:19:18 2013
```

```
version 6.0(2)N2(1a)  
feature fcoe
```

```
hostname N5596-1-B22
```

```
feature npiv  
feature telnet  
cfs eth distribute  
feature interface-vlan  
feature hsrp  
feature lacp  
feature vpc  
feature lldp  
feature fex
```

```
username admin password 5 $1$WT0Dr2VE$mLbfY0mjbfbBbfc8a1F5en/ role network-admin  
no password strength-check  
ip domain-lookup  
logging event link-status default  
class-map type qos match-all iSCSI-C1  
  match protocol iscsi  
  match cos 5  
policy-map type qos iSCSI-C1  
  class iSCSI-C1  
    set qos-group 2  
class-map type network-qos iSCSI-C1  
  match qos-group 2  
policy-map type network-qos iSCSI-C1  
  class type network-qos iSCSI-C1  
    pause no-drop
```



```
class type network-qos class-default
  mtu 9216
  multicast-optimize
system qos
  service-policy type queuing input fcoe-default-in-policy
  service-policy type queuing output fcoe-default-out-policy
  service-policy type qos input iSCSI-C1
  service-policy type network-qos iSCSI-C1
control-plane
  service-policy input copp-system-policy-customized
fex 135
  pinning max-links 1
  description "FEX0135"
fex 191
  pinning max-links 1
  description "FEX0191"
  fcoe
fex 192
  pinning max-links 1
  description "FEX0192"
fex 193
  pinning max-links 1
  description "FEX0193"
  fcoe
fex 194
  pinning max-links 1
  description "FEX0194"
  fcoe
slot 1
  port 41-48 type fc
slot 2
  port 1-16 type ethernet
snmp-server user admin network-admin auth md5 0x831c48b6e0670a2b350abe618a78f703 priv
0x831c48b6e
0670a2b350abe618a78f703 localizedkey
snmp-server community public group network-operator
ntp distribute
ntp server 161.44.248.75 use-vrf management
ntp commit

vrf context management
  ip route 0.0.0.0/0 172.25.182.1
vlan 1,77
vlan 182
  name MGMT
vlan 200
```



```
fcoe vsan 200
name FCoE-VL200
spanning-tree vlan 1-3967 priority 4096
vpc domain 5
  role priority 1
  system-priority 1
  peer-keepalive destination 172.25.182.109 source 172.25.182.108
  delay restore 150
port-profile default max-ports 512
```

```
vsan database
  vsan 200 name "VS200"
fcdomain fcid database
  vsan 1 wwn 50:00:40:20:05:df:43:2c fcid 0x190000 dynamic
  vsan 200 wwn 50:00:40:20:05:df:43:2c fcid 0x300000 dynamic
  vsan 200 wwn 10:00:6c:ae:8b:2c:cb:c1 fcid 0x300020 dynamic
  vsan 200 wwn 10:00:6c:ae:8b:2c:d8:41 fcid 0x300040 dynamic
```

```
interface Vlan1
```

```
interface port-channel20
  switchport mode trunk
  spanning-tree port type network
  vpc peer-link
```

```
interface port-channel191
  switchport mode fex-fabric
  fex associate 191
  vpc 191
```

```
interface port-channel192
  switchport mode fex-fabric
  fex associate 192
  vpc 192
```

```
interface port-channel193
  switchport mode fex-fabric
  fex associate 193
  vpc 193
```

```
interface port-channel194
  switchport mode fex-fabric
  fex associate 194
  vpc 194
```



```
interface port-channel201
  switchport mode trunk
  switchport trunk allowed vlan 182-184,200
```

```
interface port-channel202
  switchport access vlan 182
```

```
interface port-channel203
  switchport access vlan 182
```

```
interface port-channel207
  switchport mode trunk
  switchport trunk native vlan 182
  switchport trunk allowed vlan 182,200
  spanning-tree port type edge trunk
```

```
interface port-channel214
  switchport mode trunk
  switchport trunk native vlan 182
  switchport trunk allowed vlan 182,200
  spanning-tree port type edge trunk
```

```
interface port-channel215
  switchport mode trunk
  switchport trunk native vlan 182
  switchport trunk allowed vlan 182,200
  spanning-tree port type edge trunk
```

```
interface vfc1031
  bind interface Ethernet191/1/1
  switchport trunk allowed vsan 200
  no shutdown
```

```
interface vfc1037
  bind interface Ethernet191/1/7
  switchport trunk allowed vsan 200
  no shutdown
```

```
interface vfc1044
  bind interface Ethernet191/1/14
  switchport trunk allowed vsan 200
  no shutdown
```

```
interface vfc1044
  vsan database
  vsan 200 interface vfc1031
```



```
vsan 200 interface vfc1037
vsan 200 interface vfc1044
vsan 200 interface fc1/48

interface fc1/41

interface fc1/42

interface fc1/43

interface fc1/44

interface fc1/45

interface fc1/46

interface fc1/47

interface fc1/48
  no shutdown

interface Ethernet1/1
  switchport mode fex-fabric
  fex associate 135
  spanning-tree port type edge

interface Ethernet1/2

interface Ethernet1/3

interface Ethernet1/4

interface Ethernet1/5

interface Ethernet1/6

interface Ethernet1/7
  description iscsi-net0-nexsan
  switchport access vlan 182
  speed 1000

interface Ethernet1/8
  switchport access vlan 182
  speed 1000

interface Ethernet1/9
```



```
switchport mode trunk
channel-group 20

interface Ethernet1/10
switchport mode trunk
channel-group 20

interface Ethernet1/11

interface Ethernet1/12

interface Ethernet1/13

interface Ethernet1/14

interface Ethernet1/15

interface Ethernet1/16

interface Ethernet1/17

interface Ethernet1/18

interface Ethernet1/19
switchport mode fex-fabric
fex associate 193
channel-group 193

interface Ethernet1/20
switchport mode fex-fabric
fex associate 194
channel-group 194

interface Ethernet1/21
switchport mode fex-fabric
fex associate 191
channel-group 191

interface Ethernet1/22
switchport mode fex-fabric
fex associate 191
channel-group 191

interface Ethernet1/23
switchport mode fex-fabric
fex associate 192
```



```
channel-group 192

interface Ethernet1/24
  switchport mode fex-fabric
  fex associate 192
  channel-group 192

interface Ethernet1/25

interface Ethernet1/26

interface Ethernet1/27

interface Ethernet1/28

interface Ethernet1/29

interface Ethernet1/30

interface Ethernet1/31

interface Ethernet1/32

interface Ethernet1/33

interface Ethernet1/34

interface Ethernet1/35

interface Ethernet1/36

interface Ethernet1/37

interface Ethernet1/38

interface Ethernet1/39

interface Ethernet1/40

interface Ethernet2/1

interface Ethernet2/2

interface Ethernet2/3
```



```
interface Ethernet2/4

interface Ethernet2/5

interface Ethernet2/6

interface Ethernet2/7

interface Ethernet2/8

interface Ethernet2/9

interface Ethernet2/10

interface Ethernet2/11

interface Ethernet2/12

interface Ethernet2/13

interface Ethernet2/14

interface Ethernet2/15

interface Ethernet2/16

interface mgmt0
  ip address 172.25.182.108/24

interface Ethernet191/1/1
  switchport mode trunk
  switchport trunk allowed vlan 182,200

interface Ethernet191/1/2

interface Ethernet191/1/3
  switchport access vlan 182
  channel-group 203

interface Ethernet191/1/4
  switchport access vlan 182
  channel-group 202

interface Ethernet191/1/5
```



```
interface Ethernet191/1/6

interface Ethernet191/1/7
  switchport mode trunk
  switchport trunk native vlan 182
  switchport trunk allowed vlan 182-184,200
  channel-group 201 mode active

interface Ethernet191/1/8

interface Ethernet191/1/9

interface Ethernet191/1/10

interface Ethernet191/1/11

interface Ethernet191/1/12

interface Ethernet191/1/13

interface Ethernet191/1/14
  switchport mode trunk
  switchport trunk native vlan 182
  switchport trunk allowed vlan 182,200
  channel-group 214

interface Ethernet192/1/1
  switchport mode trunk
  switchport trunk allowed vlan 182,200

interface Ethernet192/1/2

interface Ethernet192/1/3
  switchport access vlan 182
  channel-group 203

interface Ethernet192/1/4
  switchport access vlan 182

interface Ethernet192/1/5

interface Ethernet192/1/6

interface Ethernet192/1/7
  switchport mode trunk
  switchport trunk native vlan 182
```



```
switchport trunk allowed vlan 182-184,200
channel-group 201 mode active

interface Ethernet192/1/8

interface Ethernet192/1/9

interface Ethernet192/1/10

interface Ethernet192/1/11

interface Ethernet192/1/12

interface Ethernet192/1/13

interface Ethernet192/1/14
switchport mode trunk
switchport trunk native vlan 182
switchport trunk allowed vlan 182,200

interface Ethernet193/1/1
switchport mode trunk
spanning-tree port type edge trunk
channel-group 311

interface Ethernet193/1/2

interface Ethernet193/1/3

interface Ethernet193/1/4

interface Ethernet193/1/5

interface Ethernet193/1/6

interface Ethernet193/1/7
switchport mode trunk
spanning-tree port type edge trunk
channel-group 317

interface Ethernet193/1/8

interface Ethernet193/1/9

interface Ethernet193/1/10
```



```
interface Ethernet193/1/11

interface Ethernet193/1/12

interface Ethernet193/1/13

interface Ethernet193/1/14
clock timezone pst -7 0
system default zone default-zone permit
system default zone distribute full
cli alias name wr copy run start
line console
line vty
    exec-timeout 1440
boot kickstart bootflash:/n5000-uk9-kickstart.6.0.2.N2.1a.19.bin
boot system bootflash:/n5000-uk9.6.0.2.N2.1a.19.bin
interface fc1/41
interface fc1/42
interface fc1/43
interface fc1/44
interface fc1/45
interface fc1/46
interface fc1/47
interface fc1/48
    switchport mode F
zone default-zone permit vsan 200
zoneset distribute full vsan 200
!Full Zone Database Section for vsan 200
zone name zone1 vsan 200
    member pwn 50:00:40:20:05:df:43:2c
    member pwn 10:00:6c:ae:8b:2c:cb:c1

zone name zone2 vsan 200
    member pwn 50:00:40:20:05:df:43:2c
    member pwn 10:00:6c:ae:8b:2c:d8:41

zoneset name zoneset1 vsan 200
    member zone1
    member zone2

zoneset activate name zoneset1 vsan 200
```



Cisco Nexus 5000 Series Switch 2 Configuration

```
N5548-Top(config)# show run

!Command: show running-config
!Time: Mon Oct 14 16:21:29 2013

version 6.0(2)N2(1a)
feature fcoe

hostname N5596-2-B22

feature telnet
cfs eth distribute
feature ospf
feature interface-vlan
feature hsrp
feature lacp
feature vpc
feature lldp
feature fex

username admin password 5 $1$p4Mv/hIx$qEBLcupJS.7vx1a16TB6w1 role network-admin
no password strength-check
ip domain-lookup
logging event link-status default
class-map type qos match-all iSCSI-C1
  match protocol iscsi
  match cos 5
policy-map type qos iSCSI-C1
  class iSCSI-C1
    set qos-group 2
class-map type network-qos iSCSI-C1
  match qos-group 2
policy-map type network-qos iSCSI-C1
  class type network-qos iSCSI-C1
    pause no-drop
  class type network-qos class-default
    mtu 9216
    multicast-optimize
system qos
  service-policy type queuing input fcoe-default-in-policy
```



```
service-policy type queuing output fcoe-default-out-policy
service-policy type qos input iSCSI-C1
service-policy type network-qos iSCSI-C1
control-plane
service-policy input copp-system-policy-customized
fex 160
pinning max-links 2
description "FEX0160"
fex 161
pinning max-links 1
description "FEX0161"
fex 191
pinning max-links 1
description "FEX0191"
fex 192
pinning max-links 1
description "FEX0192"
fcoe
fex 193
pinning max-links 1
description "FEX0193"
fcoe
fex 194
pinning max-links 1
description "FEX0194"
fcoe
fex 196
pinning max-links 1
description "FEX0196"
slot 1
port 41-48 type fc
slot 2
port 1-16 type ethernet
snmp-server user admin network-admin auth md5 0xa497c8207ab2dcc7b56b764f6d34be5 priv
0xa497c8207
ab2dcc7b56b764f6d34be5 localizedkey
snmp-server community public group network-operator
ntp distribute
ntp server 161.44.248.75 use-vrf management
ntp commit

vrf context management
ip route 0.0.0.0/0 172.25.182.1
vlan 1,77
vlan 182
name MGMT
```



```
vlan 201
  fcoe vsan 201
  name FCoE-VL201
spanning-tree vlan 1-3967 priority 8192
vpc domain 5
  role priority 2
  system-priority 1
  peer-keepalive destination 172.25.182.108 source 172.25.182.109
  delay restore 150
port-profile default max-ports 512

vsan database
  vsan 201 name "VS201"
fcdomain fcid database
  vsan 201 wwn 50:00:40:20:05:df:43:2c fcid 0x330000 dynamic
  vsan 201 wwn 10:00:6c:ae:8b:2c:cb:c5 fcid 0x330020 dynamic
  vsan 201 wwn 50:00:40:21:05:df:43:2c fcid 0x330001 dynamic
  vsan 201 wwn 10:00:6c:ae:8b:2c:d8:45 fcid 0x330040 dynamic

interface Vlan1

interface port-channel10
  switchport mode trunk
  spanning-tree port type network

interface port-channel20
  switchport mode trunk
  spanning-tree port type network
  speed 10000
  vpc peer-link

interface port-channel61
  switchport mode fex-fabric
  fex associate 161

interface port-channel191
  switchport mode fex-fabric
  fex associate 191
  vpc 191

interface port-channel192
  switchport mode fex-fabric
  fex associate 192
  vpc 192
```



```
interface port-channel193
  switchport mode fex-fabric
  fex associate 193
  vpc 193

interface port-channel194
  switchport mode fex-fabric
  fex associate 194
  vpc 194

interface port-channel201
  switchport mode trunk
  switchport trunk allowed vlan 182-184,201

interface port-channel202
  switchport access vlan 182

interface port-channel203
  switchport access vlan 182

interface port-channel207
  switchport mode trunk
  switchport trunk native vlan 182
  switchport trunk allowed vlan 182,201
  spanning-tree port type edge trunk

interface port-channel214
  switchport mode trunk
  switchport trunk native vlan 182
  switchport trunk allowed vlan 182,201
  spanning-tree port type edge trunk

interface port-channel215
  switchport mode trunk
  switchport trunk native vlan 182
  switchport trunk allowed vlan 182,201
  spanning-tree port type edge trunk

interface port-channel311
  switchport mode trunk

interface port-channel317
  switchport mode trunk

inteface vfc1031
  bind interface ethernet 192/1/1
```



```
switchport allowed vsan 201
no shutdown

interface vfc1037
  bind interface Ethernet192/1/7
  switchport trunk allowed vsan 201
  no shutdown

interface vfc1044
  bind interface Ethernet192/1/14
  switchport trunk allowed vsan 201
  no shutdown

vsan database
  vsan 201 interface vfc1031
  vsan 201 interface vfc1037
  vsan 201 interface vfc1044
  vsan 201 interface fc1/48

interface fc1/41

interface fc1/42

interface fc1/43

interface fc1/44

interface fc1/45

interface fc1/46

interface fc1/47

interface fc1/48
  no shutdown

interface Ethernet1/1
  switchport mode fex-fabric
  fex associate 160

interface Ethernet1/2
  switchport mode fex-fabric
  fex associate 160

interface Ethernet1/3
```




```
interface Ethernet1/4

interface Ethernet1/5
  switchport mode fex-fabric
  fex associate 161
  channel-group 61

interface Ethernet1/6
  switchport mode fex-fabric
  fex associate 161
  channel-group 61

interface Ethernet1/7
  description iscsi-net1-nexsan
  switchport access vlan 182
  speed 1000

interface Ethernet1/8
  switchport access vlan 182
  speed 1000

interface Ethernet1/9
  switchport mode trunk
  channel-group 20

interface Ethernet1/10
  switchport mode trunk
  channel-group 20

interface Ethernet1/11

interface Ethernet1/12

interface Ethernet1/13

interface Ethernet1/14

interface Ethernet1/15

interface Ethernet1/16

interface Ethernet1/17

interface Ethernet1/18
```



```
interface Ethernet1/19
  switchport mode fex-fabric
  fex associate 193
  channel-group 193
```

```
interface Ethernet1/20
  switchport mode fex-fabric
  fex associate 194
  channel-group 194
```

```
interface Ethernet1/21
  switchport mode fex-fabric
  fex associate 191
  channel-group 191
```

```
interface Ethernet1/22
  switchport mode fex-fabric
  fex associate 191
  channel-group 191
```

```
interface Ethernet1/23
  switchport mode fex-fabric
  fex associate 192
  channel-group 192
```

```
interface Ethernet1/24
  switchport mode fex-fabric
  fex associate 192
  channel-group 192
```

```
interface Ethernet1/25
  switchport mode fex-fabric
  fex associate 196
```

```
interface Ethernet1/26
  switchport mode fex-fabric
  fex associate 196
```

```
interface Ethernet1/27
  switchport mode fex-fabric
  fex associate 196
```



```
interface Ethernet1/28
  switchport mode fex-fabric
  fex associate 196
```

```
interface Ethernet1/29
  switchport mode fex-fabric
  fex associate 196
```

```
interface Ethernet1/30
  switchport mode fex-fabric
  fex associate 196
```

```
interface Ethernet1/31
  switchport mode fex-fabric
  fex associate 196
```

```
interface Ethernet1/32
  switchport mode fex-fabric
  fex associate 196
```

```
interface Ethernet1/33
```

```
interface Ethernet1/34
```

```
interface Ethernet1/35
```

```
interface Ethernet1/36
```

```
interface Ethernet1/37
```

```
interface Ethernet1/38
```

```
interface Ethernet1/39
```

```
interface Ethernet1/40
```

```
interface Ethernet2/1
```

```
interface Ethernet2/2
```

```
interface Ethernet2/3
```

```
interface Ethernet2/4
```

```
interface Ethernet2/5
```



```
interface Ethernet2/6

interface Ethernet2/7

interface Ethernet2/8

interface Ethernet2/9

interface Ethernet2/10

interface Ethernet2/11

interface Ethernet2/12

interface Ethernet2/13

interface Ethernet2/14

interface Ethernet2/15

interface Ethernet2/16

interface mgmt0
  ip address 172.25.182.109/24

interface Ethernet160/1/1

interface Ethernet160/1/2

interface Ethernet160/1/3

interface Ethernet160/1/4

interface Ethernet160/1/5

interface Ethernet160/1/6

interface Ethernet160/1/7

interface Ethernet160/1/8

interface Ethernet160/1/9

interface Ethernet160/1/10
```



```
interface Ethernet160/1/11

interface Ethernet160/1/12

interface Ethernet160/1/13

interface Ethernet160/1/14

interface Ethernet160/1/15

interface Ethernet160/1/16

interface Ethernet161/1/1

interface Ethernet161/1/2

interface Ethernet161/1/3

interface Ethernet161/1/4

interface Ethernet161/1/5

interface Ethernet161/1/6

interface Ethernet161/1/7

interface Ethernet161/1/8

interface Ethernet161/1/9

interface Ethernet161/1/10

interface Ethernet161/1/11

interface Ethernet161/1/12

interface Ethernet161/1/13

interface Ethernet161/1/14

interface Ethernet161/1/15

interface Ethernet161/1/16

interface Ethernet191/1/1
    switchport access vlan 182
```



```
switchport trunk allowed vlan 182-184,201

interface Ethernet191/1/2

interface Ethernet191/1/3
  switchport access vlan 182
  channel-group 203

interface Ethernet191/1/4
  switchport access vlan 182
  channel-group 202

interface Ethernet191/1/5

interface Ethernet191/1/6

interface Ethernet191/1/7
  switchport mode trunk
  switchport trunk native vlan 182
  switchport trunk allowed vlan 182-184,201
  channel-group 201 mode active

interface Ethernet191/1/8

interface Ethernet191/1/9

interface Ethernet191/1/10

interface Ethernet191/1/11

interface Ethernet191/1/12

interface Ethernet191/1/13

interface Ethernet191/1/14
  switchport mode trunk
  switchport trunk native vlan 182
  switchport trunk allowed vlan 182,201
  channel-group 214

interface Ethernet192/1/1
  switchport mode trunk
  switchport trunk allowed vlan 182,201

interface Ethernet192/1/2
```



```
interface Ethernet192/1/3
  switchport access vlan 182
  channel-group 203

interface Ethernet192/1/4
  switchport access vlan 182

interface Ethernet192/1/5

interface Ethernet192/1/6

interface Ethernet192/1/7
  switchport mode trunk
  switchport trunk native vlan 182
  switchport trunk allowed vlan 182-184,201
  channel-group 201 mode active

interface Ethernet192/1/8

interface Ethernet192/1/9

interface Ethernet192/1/10

interface Ethernet192/1/11

interface Ethernet192/1/12

interface Ethernet192/1/13

interface Ethernet192/1/14
  switchport mode trunk
  switchport trunk native vlan 182
  switchport trunk allowed vlan 182,201

interface Ethernet193/1/1
  switchport mode trunk
  spanning-tree port type edge trunk
  channel-group 311

interface Ethernet193/1/2

interface Ethernet193/1/3

interface Ethernet193/1/4

interface Ethernet193/1/5
```




```
interface Ethernet193/1/6

interface Ethernet193/1/7
  switchport mode trunk
  spanning-tree port type edge trunk
  channel-group 317

interface Ethernet193/1/8

interface Ethernet193/1/9

interface Ethernet193/1/10

interface Ethernet193/1/11

interface Ethernet193/1/12

interface Ethernet193/1/13

interface Ethernet193/1/14

interface Ethernet196/1/1

interface Ethernet196/1/2

interface Ethernet196/1/3

interface Ethernet196/1/4

interface Ethernet196/1/5

interface Ethernet196/1/6

interface Ethernet196/1/7

interface Ethernet196/1/8

interface Ethernet196/1/9

interface Ethernet196/1/10

interface Ethernet196/1/11

interface Ethernet196/1/12
```



```
interface Ethernet196/1/13

interface Ethernet196/1/14
clock timezone pst -7 0
system default zone default-zone permit
system default zone distribute full
cli alias name wr copy run start
line console
line vty
    exec-timeout 1440
boot kickstart bootflash:/n5000-uk9-kickstart.6.0.2.N2.1a.19.bin
boot system bootflash:/n5000-uk9.6.0.2.N2.1a.19.bin
interface fc1/41
interface fc1/42
interface fc1/43
interface fc1/44
interface fc1/45
interface fc1/46
interface fc1/47
interface fc1/48
    switchport mode F
zone default-zone permit vsan 201
zoneset distribute full vsan 201
!Full Zone Database Section for vsan 201
zone name zone1 vsan 201
    member pwn 50:00:40:21:05:df:43:2c
    member pwn 10:00:6c:ae:8b:2c:cb:c5

zone name zone2 vsan 201
    member pwn 50:00:40:21:05:df:43:2c
    member pwn 10:00:6c:ae:8b:2c:d8:45

zoneset name zoneset1 vsan 201
    member zone1
    member zone2

zoneset activate name zoneset1 vsan 201
```



Conclusion

The advent of Cisco Nexus 2000 Series Fabric Extenders has enabled customers to benefit from both top-of-rack (ToR) and end-of-row (EoR) designs. This technology achieves these benefits while reducing the costs associated with cabling and cooling in EoR models and without introducing any additional management points, in contrast to traditional ToR designs. This unique architecture has been tremendously successful in the first generation of Cisco Nexus fabric extenders and rack-mount servers.

The Cisco Nexus B22 for IBM Blade Fabric Extender brings these innovations to third-party blade server chassis and offers unified fabric with FCoE deployments for blade server chassis. This solution brings Cisco networking innovations to the server access layer from rack-mount servers using Cisco Nexus 2000 Series Fabric Extenders into third-party blade chassis.

For More Information

- Cisco NX-OS operations guide for Cisco Nexus 5000 Series Switches:
http://www.cisco.com/en/US/docs/switches/datacenter/nexus5000/sw/operations/n5k_ops_guide.html
- Fabric extender configuration (Cisco NX-OS 6.x):
http://www.cisco.com/en/US/docs/switches/datacenter/nexus6000/sw/layer2/6x/b_6k_Layer2_Config_6x.html
- SAN Switching Configuration Guide (Cisco NX-OS 6.x):
http://www.cisco.com/en/US/docs/switches/datacenter/nexus6000/sw/san_switching/6x/b_6k_SAN_Switching_Config_6x.html
- Nexus B22 Blade Fabric Extender Datasheet:
<http://www.cisco.com/en/US/products/ps11975/index.html>

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