HP Virtual Connect for c-Class BladeSystem Setup and Installation Guide

Version 4.30/4.31

Abstract

This document contains setup, installation, and configuration information for HP Virtual Connect. This document is for the person who installs, administers, and troubleshoots servers and storage systems. HP assumes you are qualified in the servicing of computer equipment and trained in recognizing hazards in products with hazardous energy levels.

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Contents

Documentation resources

Virtual Connect documentation

The following Virtual Connect documentation is available on the HP website (http://www.hp.com/go/vc/manuals):

- *HP Virtual Connect for c-Class BladeSystem User Guide*

  This guide provides details for the Virtual Connect GUI, including descriptions of screen contents and steps to set up domains, profiles, networks, and storage.

- *HP Virtual Connect for c-Class BladeSystem Setup and Installation Guide*

  This guide provides hardware installation and configuration information for initial setup of a Virtual Connect solution. The guide also provides Virtual Connect module component and LED descriptions and guidelines for module installation and upgrades.

- *HP Virtual Connect Manager Command Line Interface for c-Class BladeSystem User Guide*

  This guide provides information for using the Virtual Connect Command Line Interface, including use scenarios and complete descriptions of all subcommands and managed elements.

- *HP Virtual Connect Ethernet Cookbook: Single and Multiple Domain (Stacked) Scenarios*

  This guide helps new Virtual Connect users understand the concepts of and implement steps for integrating Virtual Connect into a network. The scenarios in this guide vary from simplistic to more complex while covering a range of typical building blocks to use when designing Virtual Connect solutions.

- *HP Virtual Connect Fibre Channel Networking Scenarios Cookbook*

  This guide details the concepts and implementation steps for integrating HP BladeSystem Virtual Connect Fibre Channel components into an existing SAN fabric. The scenarios in this guide are simplistic while covering a range of typical building blocks to use when designing a solution.

- *HP Virtual Connect with iSCSI Cookbook*

  This guide describes how to configure HP Virtual Connect for an iSCSI environment. It provides tips and troubleshooting information for iSCSI boot and installation.

- *HP Virtual Connect FlexFabric Cookbook*

  This guide provides users with an understanding of the concepts and steps required when integrating HP BladeSystem and Virtual Connect Flex-10 or FlexFabric components into an existing network.

- *FCoE Cookbook for HP Virtual Connect*

  This guide provides concept, implementation details, troubleshooting and use case scenarios of Fibre Channel over Ethernet through FIP Snooping using FC-BB-5 with HP Virtual Connect.

- *HP BladeSystem c-Class Virtual Connect Support Utility User Guide*

  This guide provides instructions for using the Virtual Connect Support Utility, which enables administrators to upgrade VC-Enet and VC-FC firmware and to perform other maintenance tasks remotely on both HP BladeSystem c7000 and c3000 enclosures using a standalone, Windows-based, HP-UX, or Linux command line utility.

- Release Notes

  Release notes document new features, resolved issues, known issues, and important notes for each release of the Virtual Connect product and support utility.

The *HP Virtual Connection Migration Guide* technical white paper on the HP website (http://h20564.www2.hp.com/portal/site/hpsc/public/kb/docDisplay/?docId=emr_na-c03885329) provides you with procedures to migrate from HP VC 1/10 Ethernet modules to HP Virtual Connect Flex-10/10D modules and retain VC-administered MAC and WW identifiers unchanged throughout the migration.

Planning the installation

Virtual Connect overview

HP Virtual Connect is a set of interconnect modules and embedded software for HP BladeSystem c-Class enclosures. VC implements server edge virtualization between the server and the data center infrastructure so networks can communicate with individual servers or pools of HP BladeSystem server blades. Upgrade, replace, or move server blades within the enclosures without visible changes to the external LAN and SAN environments. The external networks connect to a shared resource server pool rather than to individual servers. VC cleanly separates server enclosure administration from LAN and SAN administration. VC simplifies the setup and administration of server connections and includes the following components:

- HP Virtual Connect Manager
- VC-Enet modules:
  - HP VC Flex-10 10Gb Ethernet Module for BladeSystem c-Class
  - HP VC FlexFabric 10Gb/24-port Module for BladeSystem c-Class
  - HP VC FlexFabric-20/40 F8 Module for BladeSystem c-Class
  - HP VC Flex-10/10D Module for BladeSystem c-Class

  NOTE: Using a Flex-10 capable NIC with an HP VC Flex-10 or FlexFabric module provides the ability to divide a 10Gb NIC into four FlexNICs with configurable bandwidth.
- VC-FC modules:
  - HP VC 4Gb Fibre Channel Module for BladeSystem c-Class (enhanced NPIV)
  - HP VC 8Gb 24-Port Fibre Channel Module for BladeSystem c-Class
  - HP VC 8Gb 20-Port Fibre Channel Module for BladeSystem c-Class

  NOTE: Beginning with VC 4.10, the HP 4GB Virtual Connect Fibre Channel Module is no longer supported.

VC modules support HP BladeSystem Enclosures and all server blades and networks contained within the enclosure:

- VC-Enet modules enable connectivity to data center Ethernet switches. VC-Enet modules can also be directly connected to other types of devices, such as printers, laptops, rack servers, and network storage devices.
- VC-FC and FlexFabric modules enable connectivity of the enclosure to data center FC switches. Every FC fabric is limited in the number of switches it can support, but the VC-FC and FlexFabric modules do not appear as switches to the FC fabric and do not count against FC fabric limits.

  For information on module support of enclosures and configurations, see the product QuickSpecs on the HP website (http://www.hp.com/go/qs).

VCM is embedded on VC-Enet modules and is accessed through a web-based GUI or CLI. These interfaces are also accessible from Onboard Administrator.

A basic VC domain includes a single HP c-Class BladeSystem c7000 Enclosure for a total of 16 servers (or up to 32 servers if the double-dense option is enabled), or a single HP c-Class BladeSystem c3000 Enclosure for a total of 8 servers (or up to 16 servers if the double-dense option is enabled). For more information on the double-dense option, see "Double-dense server bay option." Within the domain, any server blade with the requisite LAN or SAN devices can access any LAN or SAN connected to a VC module, and a server blade of a given processor type (Integrity or X86) can be used as a spare for any server blade of the same processor type within the same enclosure, as long as the server has the requisite number and type of connections. Using the network access groups feature, the network administrator can clearly define a separation of networks based on their allowed functionality and prevent the server administrator from assigning specific network combinations in the same server profile.

By stacking (cabling) the VC-Enet modules together within the domain and connecting the VC-FC or FlexFabric module FC uplinks on the same bay of all enclosures to the same FC switch, every server blade in the domain can be configured to access any external network or fabric connection. With this configuration, you can use VCM to deploy and migrate a server blade profile to any server in the Virtual Connect domain without changing external LAN or SAN configurations.

Beginning with VC 4.10, the FTP service on VC-Enet modules is disabled by default. The VCSU software temporarily enables and disables the FTP service during firmware upgrades of VC-FC modules as needed. More recent versions of VC use SFTP instead of FTP for firmware upgrades.

Each version of VC is tested and supported with one or more SPPs. For a list of supported SPPs that must be installed, see the VC release notes.

VC module supported firmware

The following table lists all Virtual Connect modules and the highest firmware supported on that module.

Module	**Highest VC firmware supported**
HP Virtual Connect FlexFabric-20/40 F8 Module	4.31
HP Virtual Connect Flex-10/10D Module	4.31
HP Virtual Connect FlexFabric 10Gb/24-port Module	4.31
HP Virtual Connect Flex-10 10Gb Ethernet Module	4.31
HP Virtual Connect 8Gb 24-Port Fibre Channel Module	4.31
HP Virtual Connect 8Gb 20-Port Fibre Channel Module	4.31
HP Virtual Connect 4Gb Fibre Channel Module	4.31
HP 4Gb Virtual Connect Fibre Channel Module	4.01
HP 1/10Gb-F Virtual Connect Ethernet Module	3.61
HP 1/10Gb Virtual Connect Ethernet Module	3.61

Using multiple enclosures

Observe the following information:

- A single domain supports up to four c7000 enclosures.

  c3000 enclosures are not supported in multiple enclosure domains.
- If double-dense mode is enabled in the Domain Setup Wizard, each enclosure can support a total of 128 servers.

- Stacking cables are used to connect multiple enclosures. This allows all VC-Enet modules to be interconnected and redundantly stacked.
- When the domain stacking mode is configured, stacking cables connect the primary slice of each enclosure. The primary slice is the primary and standby interconnect modules for the enclosure.
- All enclosures must have the same FC, FlexFabric, or Flex-10/10D module configuration.

  For example, if bays 1 and 2 of the Primary Enclosure contain FlexFabric-20/40 F8 modules, then bays 1 and 2 of Remote Enclosures 1, 2, and 3 must also contain FlexFabric-20/40 F8 modules.
- A total of 16 Ethernet and 16 VC-FC type modules can be installed in a multi-enclosure domain.

  Each FlexFabric module counts as one Ethernet and one VC-FC module. Combinations of FlexFabric, VC-Enet and VC-FC modules are allowed as long as the 16-module limit for each module type (Ethernet and FC) is not exceeded in the domain.
- VC-FC or FlexFabric modules must be in the same bay of all enclosures and connected to the same FC switch to enable profile mobility.
- All FC-capable modules in the same horizontally adjacent bay pair (bays 1-2, 3-4, and so on) must be of the same type and position in all enclosures.
- Multi-enclosure double-dense domains require similar and compatible VC-FC modules in bays 5, 6, 7, and 8 in all enclosures when FC connectivity is required. If a multi-enclosure double-dense configuration contains incompatible VC-FC modules in bays 5, 6, 7, or 8 in any of the enclosures, some or all of the compatible VC-FC modules in the remote enclosures might be designated INCOMPATIBLE after import.
- Be sure all Onboard Administrator and VC module management interfaces within the same VC domain are on the same lightly loaded subnet and highly reliable network.

  If the management network is overloaded, configuration attempts may be disabled until the connectivity is re-established and synchronized with the domain.
- HP recommends using a static IP address for Onboard Administrator.
- Be sure all Onboard Administrators use the same user credentials. VCSU uses the primary credentials for the remote enclosures to propagate firmware updates to all VC modules in each enclosure.
- When both Primary and Standby modules in the base enclosure are taken down for maintenance or lose power and are no longer present in the domain, the management capabilities in the VC domain are lost. Both the Primary and Standby modules in the base enclosure must be recovered to regain management access to the VC domain.

  If network and fabric uplinks are defined on the remaining enclosures, the servers continue to have network and storage access.

Pre-deployment planning

During the planning phase, the LAN and server administrator must determine how each server blade will connect to the network and on which IP network and VLAN the server will reside. In a traditional network, these connections are established through physical cables. If a move from one network to another is required, the cables must also be moved. Virtual Connect provides a wire-once implementation when VC modules are connected to upstream or core switches and the VC networks and server profiles are defined. Assigning a server profile to a server blade completes the physical connection to the core network. If a server blade fails or moves, all of the configuration parameters can be transferred easily to the new server.

Before beginning installation, complete the following tasks:

- Be sure that the firmware revisions on all VC modules in the domain are at the same revision level. The active VCM does not allow incompatible modules to be managed as part of the same VC domain.
- Be sure that OA, iLO, server blade system ROM, Ethernet option ROM, and FC option ROM firmware are up-to-date.
- Determine which mezzanine cards, HBAs, and interconnect modules are going to be used and where they will be installed in the enclosure. For installation and information on mapping server ports to interconnect bays, see the appropriate HP BladeSystem enclosure setup and installation guide on the HP website (http://h17007.www1.hp.com/us/en/enterprise/servers/solutions/info-library/index.aspx?cat=bladesystem).
- If your organization requires the use of secure protocols and standards, consider the security requirements and restrictions of enabling FIPS mode ("Virtual Connect FIPS mode of operation" on page 34).

  For a current status on FIPS certification, see the HP website (http://government.hp.com/Certifications.aspx).
- Determine the Ethernet stacking cable layout, and ensure that the proper cable and transceiver options are ordered. Stacking cables enable any Ethernet NIC from any server to be connected to any of the Ethernet networks defined for the enclosure using stacking links.
  - For information on stacking links, see "Stacking links (on page 23)."
  - For information on stacking cable configurations, see "Recommended stacking connections (on page 24)."
  - For information on supported cable and transceiver options, see the Virtual Connect module QuickSpecs on the HP website (http://www.hp.com/go/vc/manuals).
- Determine which Ethernet networks will be connected to or contained within the enclosure.

  Most installations will have multiple Ethernet networks, each typically mapped to a specific IP subnet. Virtual Connect Ethernet networks can be contained completely within the enclosure for server-to-server communication, or connected to external networks through rear panel ports (uplinks). For each network, the administrator must use the VCM to identify the network by name and to define any external port connections.
- Determine which Fibre Channel fabrics will be connected to the enclosure.

  Each uplink has a capability of aggregating up to 16 server HBA N-port links into an N-port uplink through the use of NPIV.
- Coordinate with data center personnel to ensure Ethernet network cable connections and Fibre Channel cable connections to the enclosure are installed or scheduled to be installed.
- Determine the Ethernet MAC address range to be used for the servers within the enclosure.

  Server and networking administrators should fully understand the selection and use of MAC address ranges before configuring the enclosure. For more information, see "MAC address settings (on page 74)."
- Determine the FC World Wide Name (WWN) range to be used for servers within the enclosure.

  Server and storage administrators should fully understand the selection and use of WWN ranges before configuring the enclosure. For more information, see "WWN settings (on page 89)."
- Identify the administrators for the Virtual Connect environment, and identify what roles and administrative privileges they will require. The VCM classifies each operation as requiring server, network, domain, or storage privileges. A single user may have any combination of these privileges.

For more information, see the information on local users in the *HP Virtual Connect for c-Class BladeSystem User Guide* on the HP website (http://www.hp.com/go/vc/manuals).

IMPORTANT: If you plan on using VC-assigned MAC addresses and WWNs and are also working with server software that will be licensed by MAC addresses or WWNs, assign server profiles before deploying an image through RDP or attaching a license.

Hardware setup overview

The following steps provide an overview of setting up the interconnect modules:

1. Install and set up the enclosure. See the appropriate HP BladeSystem enclosure quick install instructions on the HP website (http://h17007.www1.hp.com/us/en/enterprise/servers/solutions/info-library/index.aspx?cat=bladesystem).
2. Install the interconnect modules ("Installation" on page 15).

   To enable FIPS mode for the domain, be sure to configure the Virtual Connect Ethernet modules ("Virtual Connect FIPS mode of operation" on page 34).

   Plan your installation carefully. After the VC domain has been created, the position and type of the primary and backup VC modules cannot be changed without deleting and recreating the domain.
3. Install stacking links ("Recommended stacking connections" on page 24).
4. Connect the VC-Enet module uplinks to data center networks. The network administrator should have already installed the network cables into the rack with the proper labels. See "Connecting Virtual Connect Ethernet module uplinks (on page 47)."
5. Connect data center FC fabric links (if applicable).
6. Note the default DNS name, user name, and password settings for the primary VC module, available on the module Default Network Settings label.

   The primary VC module is the first VC-Enet module in an odd-numbered interconnect bay.
7. Note the default DNS name, user name, and password for the HP Onboard Administrator, available on the module Default Network Settings label. See the *HP BladeSystem Onboard Administrator User Guide* on the HP website (http://www.hp.com/go/oa).
8. Apply power to the enclosures. See "Default module configuration (on page 13)." Also see the appropriate HP BladeSystem enclosure quick install instructions on the HP website (http://h17007.www1.hp.com/us/en/enterprise/servers/solutions/info-library/index.aspx?cat=bladesystem).
9. Use the HP Onboard Administrator for basic setup of the enclosures (including enclosure name and passwords). See the *HP BladeSystem Onboard Administrator User Guide* on the HP website (http://www.hp.com/go/oa).
10. Be sure that all Virtual Connect interconnect module management interfaces and server blade iLO interfaces have valid IP and gateway addresses using one of the following methods:
    - Run DHCP on the management network connected to the Onboard Administrator.
    - Configure the Onboard Administrator to set enclosure bay IP addresses. See "Virtual Connect and EBIPA (on page 22)."
11. Be sure that OA, iLO, server blade system ROM, Ethernet option ROM, and FC option ROM firmware are current.
12. Access VCM using one of the following methods:

- Use a web link from within the Onboard Administrator GUI or use the dynamic DNS name from the Default Network Settings label. See "Accessing HP Virtual Connect Manager (on page 60)."
- Access the VCM CLI remotely through an SSH session. See the *HP Virtual Connect Manager Command Line Interface User Guide* on the HP website (http://www.hp.com/go/vc/manuals).

IMPORTANT: For proper management of enclosure devices there must be an Ethernet connection from the Onboard Administrator module to the external management network. For information on Onboard Administrator module cabling, see the *HP BladeSystem Onboard Administrator User Guide*.

Default module configuration

When VC modules are inserted into an enclosure that is not yet part of a Virtual Connect domain, the modules are configured to provide basic connectivity. After a Virtual Connect domain is defined for an enclosure, server blades within that enclosure are isolated from all external network and fabric connections until configured explicitly within VCM.

When not part of a Virtual Connect domain, each VC-Enet module is configured so that all server ports connected to that module are connected to a single network, which is then connected to a single uplink. To provide greater bandwidth, you can use LACP to aggregate additional ports on that module, as long as they are connected to the same external switch. For aggregation of links to an external switch, the external switch must support dynamic creation of link aggregation groups using the IEEE 802.3ad LACP. All stacking links are disabled. This default configuration enables connectivity testing between server NICs and devices outside the enclosure prior to Virtual Connect domain configuration.

When not part of a Virtual Connect domain, all of the VC-FC Module uplink ports are grouped into an uplink port group and dynamically distribute connectivity from all server blades across all available uplink ports.

Virtual Connect Manager setup overview

The following steps provide an overview of setting up VCM:

1. Log in and run the domain setup wizard ("HP Virtual Connect Domain Setup Wizard" on page 63).
   a. Import the enclosure.
   b. Name the Virtual Connect domain.
   c. Set up local user accounts and privileges.

TIP: If you want to setup network access groups, uncheck the "Start the Network Setup Wizard" checkbox on the Finish screen of the Domain Setup Wizard.

2. Define network access groups. For more information about network access groups, see "Network Access Groups screen" in the user guide.
   a. Select **Network Access Group** from the Define pull-down menu.
   b. Set up network access groups. For more information about creating network access groups, see "Define Network Access Group screen" in the user guide.
3. Run the network setup wizard ("HP Virtual Connect Network Setup Wizard" on page 73).
   a. Assign the MAC addresses used by server blade Ethernet network adapters within the Virtual Connect domain ("MAC Address Settings" on page 74).
   b. Configure server VLAN tagging support.

c. Set up the networks.

4. Run the Fibre Channel setup wizard.
   a. Select a WWN range to be used by server blade FC HBAs ("WWN settings" on page 89).
   b. Define the SAN fabrics.
5. If you created associated networks using the network setup wizard, all networks are assigned to the Default network access group. You must be sure that all networks are in the proper network access group before running the server profile setup wizard. For more information about editing network access groups, see "Edit Network Access Group screen" in the user guide.
6. Run the server profile setup wizard ("HP Virtual Connect Manager Server Profile Setup Wizard" on page 94).
   a. Assign serial numbers to server blades within the domain.
   b. Create a server profile definition.
   c. Assign server profiles.
   d. Name server profiles.
   e. Create server profiles.

After an enclosure is imported into a Virtual Connect domain, server blades that have not been assigned a server profile are isolated from all networks to ensure that only properly configured server blades are attached to data center networks.

A server profile can be assigned and defined for each device bay so that the server blade can be powered on and connected to a deployment network. These profiles can then later be modified or replaced by another server profile.

A server profile can also be assigned to an empty bay to enable deployment at a later date.

Installation

Installation requirements

CAUTION: Always use blanks to fill empty spaces in enclosures. This arrangement ensures proper airflow. Using an enclosure without the proper blanks results in improper cooling that can lead to thermal damage.

Observe the following requirements:

- In all Virtual Connect configurations, a VC-Enet or FlexFabric module must be installed in the enclosure. The embedded VCM operates on this module.
- VC-Enet modules are used typically in pairs to provide access to all Ethernet controllers on the server blade.
- The specific interconnect bays with Ethernet connectivity depend on mezzanine card locations within the server blade.
- For c3000 enclosures, when two Fibre Channel mezzanine cards are installed in slots 2 and 3 of a full-height server blade, the VC Manager only creates Fibre Channel connections and assigns WWNs to the ports associated with the Fibre Channel mezzanine card in slot 2. This restriction does not apply for c7000 enclosures.
- For each Ethernet mezzanine port you want to manage with VCM, install a VC-Enet, HP VC FlexFabric-20/40 F8 Module, or HP VC FlexFabric 10Gb/24-port Module in the interconnect bay connected to that port. For more information, see the appropriate HP BladeSystem enclosure setup and installation guide.
- For Ethernet connections, Virtual Connect can be configured to assign or migrate MAC addresses for device bay ports connected to VC-Enet or FlexFabric modules.
- For Fibre Channel connections, FlexFabric module SFP ports can be connected only to Fibre Channel switch ports that support N_port_ID virtualization. To verify that NPIV support is provided, see the firmware documentation that ships with the Fibre Channel switch.
- When using optional transceiver modules, or when using stacking cables to connect multiple VC-Enet modules or multiple FlexFabric modules, order the cables and transceiver modules separately. For more information, see the HP Virtual Connect QuickSpecs on the HP website (http://www.hp.com/go/vc/manuals).
- All modules in the enclosure require a valid and unique IP address, and all modules must be on the same subnet. Use a DHCP server or the Onboard Administrator EBIPA feature to assign each module an IP address.
- For server or I/O interconnect hardware changes that involve adding or removing Flex-10 functionality, the profile assigned to a server or server bay must be removed, all hardware changes performed, and the profile reassigned. Otherwise, indeterminate network operation might occur. For more information, see "Upgrading or removing an HP Virtual Connect Flex-10, HP Virtual Connect FlexFabric, or HP Virtual Connect Flex-10/10D module (on page 54)."

Additional information

- For the most up-to-date support information, see the HP website (http://www.hp.com/storage/spock). Simple registration is required.
- For more information on the association between the server blade mezzanine connectors and the interconnect bays, see the HP BladeSystem enclosure setup and installation guide that ships with the enclosure. During server blade installation, the location of the mezzanine card determines the installation location of the interconnect modules.
- For specific interconnect module port connection information for each server blade, see the HP BladeSystem enclosure setup and installation guide that ships with the enclosure. Connections differ by server blade type.
- For more information on BladeSystem port mapping, see the HP BladeSystem enclosure setup and installation guide that ships with the enclosure.
- For the most current product information, see the release notes on the HP website (http://www.hp.com/go/vc/manuals).

Supported configurations

The following table outlines the Ethernet, Fibre Channel, and enclosure support for each version of Virtual Connect.

VC firmware version	Enclosure	FlexFabric Support per domain	Ethernet support per domain	FC support per domain	Enclosures per single VC domain
1.10	c3000	—	—	—	—
1.10	c7000	—	Up to 8 modules	Up to 4 modules	1
1.20	c3000	—	Up to 4 modules	Up to 2 modules	1
2.10/3.00/3.10	c7000	—	Up to 16 modules	Up to 16 modules	Up to 4
2.10/3.00/3.10	c3000	—	Up to 4 modules	Up to 2 modules	1
3.15/3.17/3.30/3.51 /3.60/ 3.70/3.75/4.01/4.10	c7000	Up to 16 modules*	Up to 16 modules	Up to 16 modules	Up to 4
3.15/3.17/3.30/3.51 /3.60/ 3.70/3.75/4.01/4.10 / 4.20/4.30/4.31	c3000	—	Up to 4 modules	Up to 2 modules	1
4.20/4.30/4.31	c7000	Up to 16 modules*	Up to 16 modules	Up to 16 modules	Up to 4

*Each FlexFabric module counts as one Ethernet and one VC-FC module. Combinations of FlexFabric, VC-Enet, and VC-FC modules are allowed as long as the 16-module limit for each module type (Ethernet and FC) is not exceeded in the domain.

HP BladeSystem c3000 Enclosure supported configurations

The following tables show several typical, supported configurations for an HP BladeSystem c3000 Enclosure.

In the following tables, "Other" indicates any c-Class interconnect module including a VC, Pass-Thru, or switch.

[Bay 1]	**VC Ethernet**	[Bay 2]	**VC Ethernet**

[Bay 3]	Other/empty	[Bay 4]	Other/empty

[Bay 1]	**VC Ethernet**	[Bay 2]	**VC Ethernet**
[Bay 3]	**VC Ethernet**	[Bay 4]	**VC Ethernet**

[Bay 1]	**VC Ethernet**	[Bay 2]	**VC Ethernet**
[Bay 3]	**VC-FC**	[Bay 4]	**VC-FC**

[Bay 1]	Other/empty	[Bay 2]	Other/empty
[Bay 3]	**VC Ethernet**	[Bay 4]	**VC Ethernet**

IMPORTANT: The HP Virtual Connect FlexFabric 10Gb 24-port Module and HP Virtual Connect Flex-Fabric-20/40 F8 Module are not supported in c3000 enclosures.
The use of an HP VC-Enet in bay 1 and a Fibre Channel module (for example, VC-FC, SNA switch, or FC pass-thru) in bay 2 is not supported in c3000 enclosures.

IMPORTANT: The HP Virtual Connect Flex10/10D Module is supported in c3000 enclosures as an Ethernet only module.

HP BladeSystem c7000 Enclosure supported configurations

The following tables show a number of typical, supported configurations for an HP BladeSystem c7000 Enclosure.

In the following tables, "Other" indicates any c-Class interconnect module including a VC, Pass-Thru, or switch.

[Bay 1]	**VC Ethernet**	[Bay 2]	Empty
[Bay 3]	Other/empty	[Bay 4]	Other/empty
[Bay 5]	Other/empty	[Bay 6]	Other/empty
[Bay 7]	Other/empty	[Bay 8]	Other/empty

[Bay 1]	**VC Ethernet**	[Bay 2]	**VC Ethernet**
[Bay 3]	Other/empty	[Bay 4]	Other/empty
[Bay 5]	Other/empty	[Bay 6]	Other/empty
[Bay 7]	Other/empty	[Bay 8]	Other/empty

[Bay 1]	Other/empty	[Bay 2]	Other/empty
[Bay 3]	**VC Ethernet***	[Bay 4]	**VC Ethernet**
[Bay 5]	Other/empty	[Bay 6]	Other/empty
[Bay 7]	Other/empty	[Bay 8]	Other/empty

*Requires minimum VC v3.10 firmware

[Bay 1]	**VC Ethernet**	[Bay 2]	**VC Ethernet**
[Bay 3]	Other/empty	[Bay 4]	Other/empty
[Bay 5]	**VC Ethernet**	[Bay 6]	**VC Ethernet**
[Bay 7]	Other/empty	[Bay 8]	Other/empty

[Bay 1]	**VC Ethernet**	[Bay 2]	**VC Ethernet**
[Bay 3]	**VC Ethernet**	[Bay 4]	**VC Ethernet**

[Bay 5]	**VC Ethernet**	[Bay 6]	**VC Ethernet**
[Bay 7]	Other/empty	[Bay 8]	Other/empty

[Bay 1]	**VC Ethernet**	[Bay 2]	Empty
[Bay 3]	**VC-FC**	[Bay 4]	Empty
[Bay 5]	Other/empty	[Bay 6]	Other/empty
[Bay 7]	Other/empty	[Bay 8]	Other/empty

[Bay 1]	**VC Ethernet**	[Bay 2]	**VC Ethernet**
[Bay 3]	**VC-FC**	[Bay 4]	**VC-FC**
[Bay 5]	Other/empty	[Bay 6]	Other/empty
[Bay 7]	Other/empty	[Bay 8]	Other/empty

[Bay 1]	**VC Ethernet**	[Bay 2]	**VC Ethernet**
[Bay 3]	**VC Ethernet**	[Bay 4]	**VC Ethernet**
[Bay 5]	**VC-FC**	[Bay 6]	**VC-FC**
[Bay 7]	Other/empty	[Bay 8]	Other/empty

[Bay 1]	**VC Ethernet***	[Bay 2]	**VC Ethernet**
[Bay 3]	**VC Ethernet**	[Bay 4]	**VC Ethernet**
[Bay 5]	**VC-FC**	[Bay 6]	**VC-FC**
[Bay 7]	**VC-FC**	[Bay 8]	**VC-FC**

* This configuration only applies to enclosures with full-height servers.

[Bay 1]	**VC Ethernet**	[Bay 2]	**VC Ethernet**
[Bay 3]	**VC-FC**	[Bay 4]	**VC-FC**
[Bay 5]	**VC Ethernet**	[Bay 6]	**VC Ethernet**
[Bay 7]	Other/empty	[Bay 8]	Other/empty

[Bay 1]	**VC Ethernet**	[Bay 2]	**VC Ethernet**
[Bay 3]	**VC-FC**	[Bay 4]	**VC-FC**
[Bay 5]	**VC Ethernet**	[Bay 6]	**VC Ethernet**
[Bay 7]	**VC Ethernet**	[Bay 8]	**VC Ethernet**

[Bay 1]	**VC Ethernet**	[Bay 2]	**VC Ethernet**
[Bay 3]	Other/empty	[Bay 4]	Other/empty
[Bay 5]	**VC-FC**	[Bay 6]	**VC-FC**
[Bay 7]	Other/empty	[Bay 8]	Other/empty

[Bay 1]	**VC Ethernet**	[Bay 2]	**VC Ethernet**
[Bay 3]	**VC-FC**	[Bay 4]	**VC-FC**
[Bay 5]	**VC-FC**	[Bay 6]	**VC-FC**
[Bay 7]	Other/empty	[Bay 8]	Other/empty

[Bay 1]	**VC Ethernet**	[Bay 2]	**VC Ethernet**
[Bay 3]	**VC Ethernet**	[Bay 4]	**VC Ethernet**
[Bay 5]	**VC Ethernet**	[Bay 6]	**VC Ethernet**
[Bay 7]	**VC Ethernet**	[Bay 8]	**VC Ethernet**

Bay configuration requirements

Primary and backup VC modules

Observe the following requirements when installing primary and backup interconnect modules:

- Plan your installation carefully. After the VC domain has been created, the position and type of the primary and backup VC modules cannot be changed without deleting and recreating the domain.

  IMPORTANT: The primary bay pair cannot be changed after the domain is created, including through a restore configuration file operation.

- To support failover configurations for VC, install two VC-Enet modules or two FlexFabric modules in horizontally adjacent bays.
- To support high availability of the Virtual Connect environment, HP recommends that VC-Enet modules be used in horizontally adjacent interconnect bays. The embedded VCM operates in an active/standby configuration. For more information, see "Failover and check-pointing (on page 52)."
- To set up and configure VC, an odd-numbered interconnect bay must be populated with a VC-Enet module or FlexFabric module. The lowest odd-numbered interconnect bay populated with a VC-Enet module or FlexFabric module becomes the primary VC module.

Horizontally adjacent interconnect bays

Observe the following requirements when installing interconnect modules in horizontally adjacent bays:

- Only like VC modules can reside in adjacent horizontal bays.
  - If a VC-Enet module is installed in an interconnect bay, the only module that can be installed in the horizontally adjacent bay is another VC-Enet module of the same type.
  - HP Virtual Connect Flex-10 10Gb Ethernet Modules can reside in any bay. However, only another HP Virtual Connect Flex-10 10Gb Ethernet Module can reside in an adjacent bay.
  - HP Virtual Connect Flex-10/10D Modules can reside in any bay. However, only another HP Virtual Connect Flex-10/10D Module can reside in an adjacent bay.
  - HP Virtual Connect FlexFabric-20/40 F8 Modules can reside in any bay. However, only another HP Virtual Connect FlexFabric-20/40 F8 Module can reside in an adjacent bay.
  - HP Virtual Connect FlexFabric 10Gb/24-port Modules can reside in any bay. However, only another HP Virtual Connect FlexFabric 10Gb/24-port Module can reside in an adjacent bay
  - HP VC 8Gb 20-Port FC Modules can reside in any bay. However, only another HP VC 8Gb 20-Port FC Module can reside in an adjacent bay.
  - HP Virtual Connect 8Gb 24-Port Fibre Channel Modules can reside in any bay. However, only another 8Gb 24-Port Fibre Channel Module can reside in an adjacent bay.
  - Do not mix HP Virtual Connect 8Gb 24-Port FC Modules with HP Virtual Connect 4Gb or 8Gb 20-Port FC Modules in the horizontally adjacent interconnect bays connected to the same server blade mezzanine card.
- For c3000 enclosures, VC-FC modules are not supported in interconnect bay 2.
- To avoid connectivity loss, do not install VC and non-VC modules in interconnect bays connected to the same server blade mezzanine card. Non-VC modules cannot be installed in an interconnect bay adjacent to a VC module.
- Do not mix VC-Enet modules and VC-FC modules in interconnect bays connected to the same server blade mezzanine card. This action generates an enclosure electronic keying error.

Odd numbered bay	Horizontally adjacent bay	Good configuration?	Notes
VC FlexFabric 10Gb/24-port	VC FlexFabric 10Gb/24-port	Yes	—
VC FlexFabric 10Gb/24-port	Flex-10 Enet	No	Install only HP VC FlexFabric 10Gb/24-port Modules into bays horizontally adjacent to bays containing HP VC FlexFabric 10Gb/24-port Modules.
VC FlexFabric-20/40 F8	VC FlexFabric-20/40 F8	Yes	—
VC FlexFabric-20/40 F8	VC FlexFabric 10Gb/24-port	No	Install only HP VC FlexFabric-20/40 F8 Modules into bays horizontally adjacent to bays containing HP VC FlexFabric-20/40 F8 Modules.
Flex-10 Enet	Flex-10 Enet	Yes	—
Flex-10 Enet	Flex-10/10D	No	Install only HP Flex-10 10Gb VC-Enet Modules into bays horizontally adjacent to bays containing HP Flex-10 10Gb VC-Enet Modules.
Flex-10 Enet	4Gb FC with enhanced NPIV	No	Do not mix Ethernet and FC modules in horizontally adjacent bays.
Flex-10/10D	Flex-10/10D	Yes	—
Flex-10/10D	Flex-10 Enet	No	Install only HP VC Flex-10/10D Modules into bays horizontally adjacent to bays containing HP VC Flex-10/10D Modules.
4Gb FC	4Gb FC	Yes for 4.01 No for 4.10	Beginning with VC 4.10, the HP 4Gb VC-FC Module is no longer supported.
4Gb FC	4Gb FC with enhanced NPIV	Yes for 4.01 No for 4.10	Beginning with VC 4.10, the HP 4Gb VC-FC Module is no longer supported.
4Gb FC with enhanced NPIV	8Gb 20-Port FC	Yes	You can mix HP VC 4Gb FC Modules (with enhanced NPIV) and HP 8Gb 20-Port FC Modules in horizontally adjacent bays.
8Gb 24-Port FC	8Gb 20-Port FC	No	Do not mix HP 8Gb 24-Port FC and 8Gb 20-Port FC Modules in horizontally adjacent bays.
VC FlexFabric 10Gb/24-port	8Gb 20-Port FC	No	The VC FlexFabric 10Gb/24-port module can only have another VC FlexFabric 10Gb/24-port module in the horizontally adjacent bay.
VC-Enet or VC-FC	non-VC Other	No	Do not mix VC and non-VC (switch or pass-thru) modules in horizontally adjacent bays.

HP Virtual Connect Flex-10 Module requirements

The following requirements apply to the installation or replacement of HP Virtual Connect Flex-10 10Gb Ethernet Modules:

- Only install HP Virtual Connect Flex-10 Modules into bays horizontally adjacent to bays containing another HP Virtual Connect Flex-10 Module.

  If any other type of module is installed, the second one discovered is set to UNKNOWN, and no connections are made to the server NICs attached to the interconnect bay. The module is set to UNKNOWN because it is removed automatically from the VC domain when removed physically from the interconnect bay.

- If an HP Virtual Connect Flex-10 Module is connected to a Flex-10 NIC that corresponds to an Ethernet connection in a server profile, then replacing the module with any other type of Virtual Connect Ethernet module requires that all network uplinks be removed from the module before replacement. For more information on module removal, see "Interconnect module removal and replacement (on page 52)."

  If the replacement module is not removed from the GUI, the module is marked as INCOMPATIBLE, and no connections are made to the server NICs attached to the interconnect bay.
- An empty interconnect bay horizontally adjacent to a bay containing an HP Virtual Connect Flex-10 Module is treated as if it has a Flex-10-compatible Ethernet module for server configuration. If the corresponding server NIC is Flex-10, it is partitioned according to the connections in the server profile. Adding a module that does not support Flex-10 when the corresponding server is configured for Flex-10 results in the module being set to INCOMPATIBLE.

HP Virtual Connect Flex-10/10D Module requirements

The following requirements apply to the installation or replacement of HP Virtual Connect Flex-10/10D Modules:

- Only install HP Virtual Connect Flex-10/10D Modules into bays horizontally adjacent to bays containing another HP Virtual Connect Flex-10/10D Module.

  If any other type of module is installed, the second one discovered is set to UNKNOWN, and no connections are made to the server NICs attached to the interconnect bay. The module is set to UNKNOWN because it is removed automatically from the VC domain when removed physically from the interconnect bay.
- If an HP Virtual Connect Flex-10/10D Module is connected to a Flex-10 NIC that corresponds to an Ethernet connection in a server profile, then replacing the module with any other type of Virtual Connect Ethernet module requires that all network uplinks be removed from the module before replacement. For more information on module removal, see "Interconnect module removal and replacement (on page 52)."

  If the replacement module is not removed from the GUI, the module is marked as INCOMPATIBLE, and no connections are made to the server NICs attached to the interconnect bay.
- An empty interconnect bay horizontally adjacent to a bay containing an HP Virtual Connect Flex-10/10D Module is treated as if it has a Flex-10-compatible Ethernet module for server configuration. If the corresponding server NIC is Flex-10, it is partitioned according to the connections in the server profile. Adding a module that does not support Flex-10 when the corresponding server is configured for Flex-10 results in the module being set to INCOMPATIBLE.
- An HP Virtual Connect Flex-10/10D Module can only be used in a domain running VC firmware v3.70 or higher, otherwise the module is marked as UNKNOWN.
- When the HP Virtual Connect Flex-10/10D Module has ports configured to carry FCoE traffic, those ports do not support stacking.

HP Virtual Connect FlexFabric 10Gb/24-port Module requirements

The following requirements apply to the installation or replacement of HP Virtual Connect FlexFabric 10Gb/24-port Modules:

- For full storage network compatibility, each server blade attached to the HP VC FlexFabric 10Gb/24-port Module must have either an embedded or mezzanine-based FlexFabric converged network adapter.
- Only install an HP VC FlexFabric 10Gb/24-port Module in an interconnect bay horizontally adjacent to a bay that contains an HP VC FlexFabric 10Gb/24-port Module.
- The HP VC FlexFabric 10Gb/24-port Module only supports external stacking for Ethernet traffic. When the HP VC FlexFabric 10Gb/24-port Module has ports configured to carry Fibre Channel or FCoE traffic, those ports do not support stacking.
- An HP VC FlexFabric 10Gb/24-port Module can only be used in a domain running VC firmware v3.15 or higher, otherwise the module is marked as UNKNOWN.

HP Virtual Connect FlexFabric-20/40 F8 Module requirements

The following requirements apply to the installation or replacement of HP Virtual Connect FlexFabric-20/40 F8 Modules:

- The HP VC FlexFabric-20/40 F8 Module is supported only on the following c7000 SKUs:
  - 5XXXXX-B21
  - 6XXXXX-B21
  - 7XXXXX-B21

  This module is not supported in c3000 enclosures.

  For information on updated SKUs, see the QuickSpecs on the HP website (http://www.hp.com/go/qs).
- If more than two HP VC FlexFabric-20/40 F8 Modules are installed in a c7000 enclosure, the ambient operating temperature cannot exceed 30°C (86°F).
- Do not install more than six HP VC FlexFabric-20/40 F8 Modules in a c7000 enclosure.
- HP recommends a c7000 enclosure with a 10-fan configuration when HP Virtual Connect FlexFabric-20/40 F8 Modules are installed.
- For full storage network compatibility, each server blade attached to the HP VC FlexFabric-20/40 F8 Module must have either an embedded or mezzanine-based FlexFabric converged network adapter.
- Only install an HP VC FlexFabric-20/40 F8 Module in an interconnect bay horizontally adjacent to a bay that contains an HP VC FlexFabric-20/40 F8 Module.
- The HP VC FlexFabric-20/40 F8 Module only supports external stacking for Ethernet traffic. When the HP VC FlexFabric-20/40 F8 Module has ports configured to carry Fibre Channel or FCoE traffic, those ports do not support stacking.
- An HP VC FlexFabric-20/40 F8 Module can only be used in a domain running VC firmware v4.20 or higher, otherwise the module is marked as UNKNOWN.

Virtual Connect and EBIPA

Enclosure Bay IP Addressing is used to specify IP addresses for the interconnect modules, which are then provided to the modules by the Onboard Administrator.

For information on using IPv6 with Virtual Connect, see the *HP Virtual Connect for c-Class BladeSystem User Guide* on the HP website (http://www.hp.com/go/vc/manuals).

Because Virtual Connect communicates with other components through the Onboard Administrator, special considerations are required when using EBIPA with Virtual Connect Ethernet modules:

- The Onboard Administrator must be on the same IP subnet as all Virtual Connect modules.
- The Onboard Administrator IP address must be set properly before changing the IP addresses of the Virtual Connect modules.

Stacking Links

Stacking links are used to add VC-Enet modules to a VC domain. This feature enables any server NIC physically connected to a VC module to be connected to any Ethernet network. By using stacking links, a single pair of uplinks can function as the data center network connections for the entire Virtual Connect domain.

Observe the following guidelines:

- Use uplink ports to connect modules to data center switches or stack VC-Enet modules and enclosures.
- Virtual Connect does not support stacking for FC modules. Each VC-FC module or FlexFabric module configured to carry Fibre Channel or FCoE traffic requires uplink connections to the external FC SAN environment.
- The following modules only support external stacking for Ethernet traffic:
  - HP VC FlexFabric 10Gb/24-port
  - HP VC FlexFabric-20/40 F8
  - HP VC Flex-10/10D

  When these modules have ports configured to carry Fibre Channel or FCoE traffic, those ports do not support stacking.
- Observe the following information when Ethernet modules are horizontally-adjacent:
  - HP VC Flex-10 Enet modules

    Uplink ports X7 and X8 form internal stacking links between the modules when left unpopulated.
  - HP VC FlexFabric 10Gb/24-Port modules

    Uplink ports X7 and X8 form internal stacking links between the modules when left unpopulated.
  - HP VC Flex-10/10D Modules

    Ports X11, X12, X13, and X14 are dedicated internal stacking links.
  - HP VC FlexFabric-20/40 F8 Modules

    Ports X9 and X10 are dedicated internal stacking links.
- Virtual Connect automatically detects when one VC-Enet module port is connected to another VC-Enet module port within the domain and changes the port ID indicator color to amber to indicate a stacking link.
- All VC-Enet modules within the Virtual Connect domain must be interconnected. Any combination of 1Gb and 10Gb cables can be used to interconnect the modules. If connecting HP VC FlexFabric-20/40 F8 modules, 40Gb stacking cables can be used.
- ISL ports provide stacking links between horizontally adjacent modules.
- In partially stacked domains, the combination of a stacking link and horizontally-adjacent Enet modules is considered a logical interconnect. Logical interconnects are formed in horizontal and primary slice stacking modes.

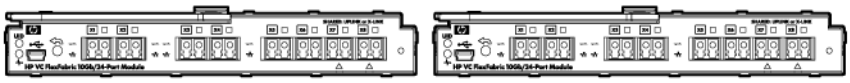
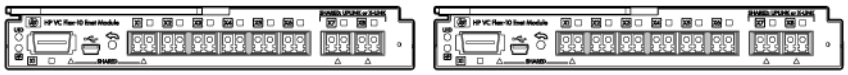
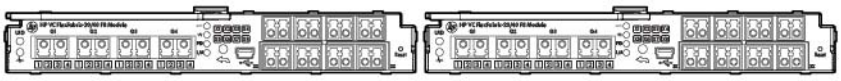
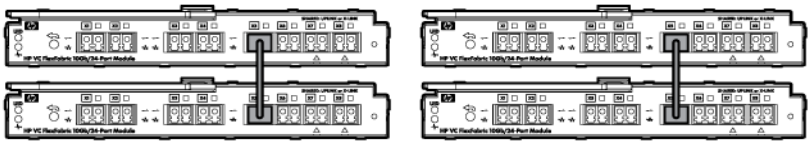
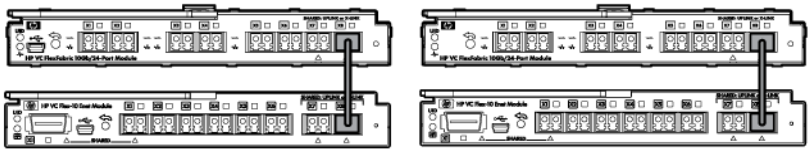
To configure a partially stacked domain, see "Configuring partially stacked domains (on page 27)."

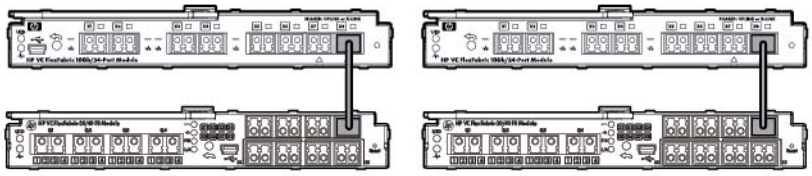
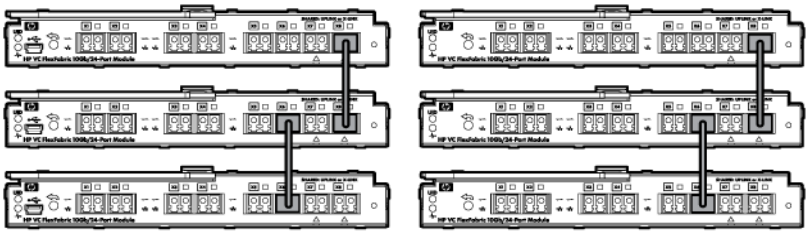
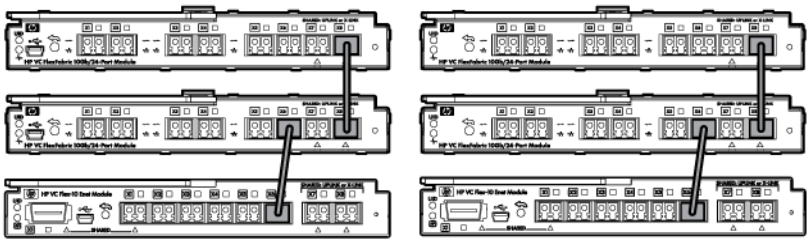
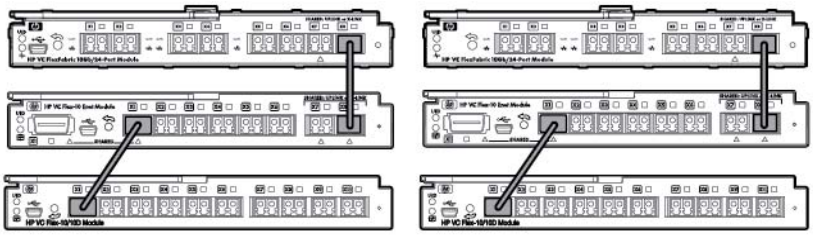
- Be sure to connect any stacking cables before running the network setup wizard.

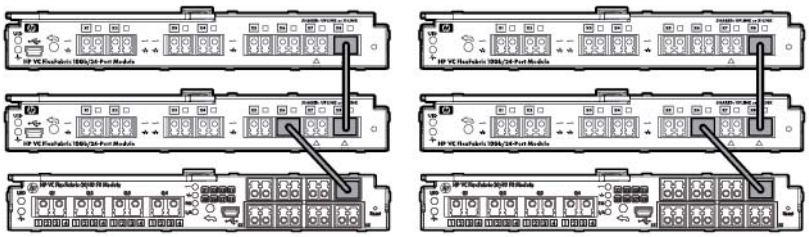
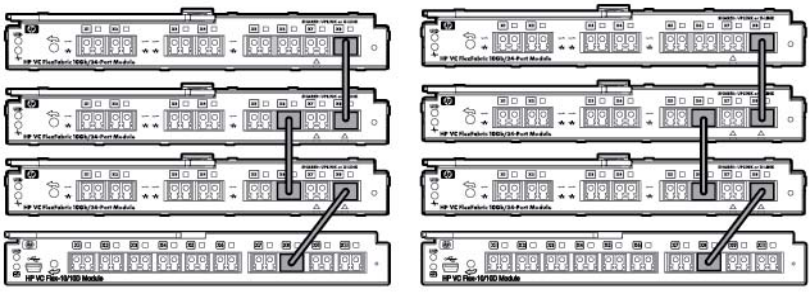
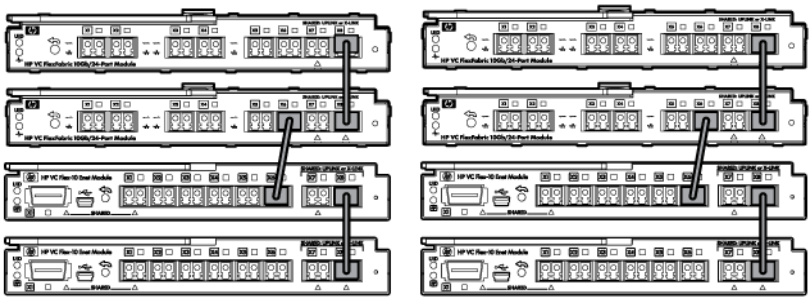
  For recommended stacking cable configurations, see "Recommended stacking connections (on page 24)."

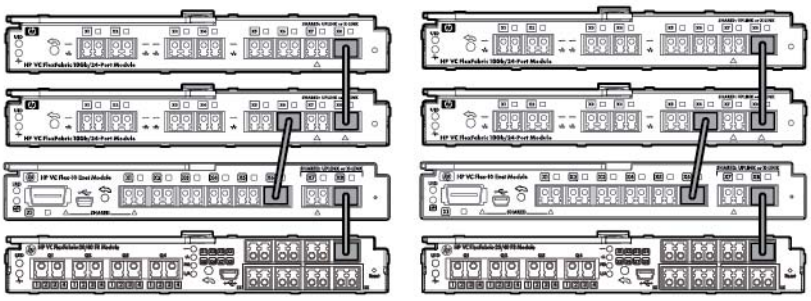
Recommended stacking connections

Use the following table for recommended stacking connections.

Single enclosure stacking	**Modules (top to bottom)**
Stacking two modules	
	HP Virtual Connect FlexFabric 10Gb/24-port Modules
	HP Virtual Connect Flex-10 10Gb Ethernet Modules
	HP Virtual Connect FlexFabric-20/40 F8 Modules
Stacking four modules	
	• HP Virtual Connect FlexFabric 10Gb/24-port Modules • HP Virtual Connect FlexFabric 10Gb/24-port Modules
	• HP Virtual Connect FlexFabric 10Gb/24-port Modules • HP Virtual Connect Flex-10 10Gb Ethernet Modules

Single enclosure stacking	Modules (top to bottom)
	• HP Virtual Connect FlexFabric 10Gb/24-port Modules • HP Virtual Connect FlexFabric-20/40 F8 Modules
Stacking six modules	
	• HP Virtual Connect FlexFabric 10Gb/24-port Modules • HP Virtual Connect FlexFabric 10Gb/24-port Modules • HP Virtual Connect FlexFabric 10Gb/24-port Modules
	• HP Virtual Connect FlexFabric 10Gb/24-port Modules • HP Virtual Connect FlexFabric 10Gb/24-port Modules • HP Virtual Connect Flex-10 10Gb Ethernet Modules
	• HP Virtual Connect FlexFabric 10Gb/24-port Modules • HP Virtual Connect Flex-10 10Gb Ethernet Modules • HP Virtual Connect Flex-10/10D Modules

Single enclosure stacking	Modules (top to bottom)
	• HP Virtual Connect FlexFabric 10Gb/24-port Modules • HP Virtual Connect FlexFabric 10Gb/24-port Modules • HP Virtual Connect FlexFabric-20/40 F8 Modules
Stacking eight modules	
	• HP Virtual Connect FlexFabric 10Gb/24-port Modules • HP Virtual Connect FlexFabric 10Gb/24-port Modules • HP Virtual Connect FlexFabric 10Gb/24-port Modules • HP Virtual Connect Flex-10/10D Modules
	• HP Virtual Connect FlexFabric 10Gb/24-port Modules • HP Virtual Connect FlexFabric 10Gb/24-port Modules • HP Virtual Connect Flex-10 10Gb Ethernet Modules • HP Virtual Connect Flex-10 10Gb Ethernet Modules

Single enclosure stacking	Modules (top to bottom)
	• HP Virtual Connect FlexFabric 10Gb/24-port Modules • HP Virtual Connect FlexFabric 10Gb/24-port Modules • HP Virtual Connect Flex-10 10Gb Ethernet Modules • HP Virtual Connect FlexFabric-20/40 F8 Modules

The 1000BASE-T links can be used as stacking links of up to 100 m (328 ft). Ports with different connector types can be aggregated if the link speed is the same. For example, CX4 and SFP+ ports both running at 10G can be aggregated to provide enhanced throughput for the stacking link.

NOTE: The CX4 interface uses the same physical connector as InfiniBand, but InfiniBand cables are tuned differently and will not perform as well in CX4 applications. HP recommends purchasing CX4 cable assemblies that meet the IEEE CX4 specifications and support 10-Gigabit communication at distances from 3 m to 15 m (9.84 ft to 49.20 ft).

For information on supported cables, see the module QuickSpecs on the HP website (http://www.hp.com/go/vc/manuals).

HP strongly recommends full redundancy of VC-Enet modules. The recommended stacking configurations have redundant connections. If a stacking cable is disconnected or fails, the Ethernet packets within the Virtual Connect domain are automatically re-routed to the uplink through the redundant path. This configuration helps preserve network connectivity if an Ethernet interconnect module fails or is removed.

Configuring partially stacked domains

A partially stacked domain uses logical interconnects to create stacking configurations in a VC domain. A logical interconnect is the combination of horizontally adjacent Enet modules and the internal stacking link that connects them.

The following stacking modes are available:

- **Full Stacking** is the default stacking mode for the VC domain. In Full Stacking, all Ethernet modules within the domain are connected by horizontal cross connects or by stacking cables.
- **Horizontal Stacking** disables all vertical stacking links. In horizontal stacking mode, each horizontal bay pair is a separate logical interconnect. For example, if bay 1 and bay 2 are populated, they form a logical interconnect.
- **Primary Slice Stacking** disables all stacking links outside of the primary slice. The primary slice is the primary and standby interconnect modules for the enclosure. In primary slice stacking, the primary slice is a logical interconnect.

When configuring horizontal or primary slice stacking, observe the following:

- A brief network outage occurs when you change the domain stacking mode.

- The following connections must reside within their configured logical interconnect for proper functionality. These connections must not span outside of their logical interconnect:
  - Network uplink ports
  - Shared uplink sets
  - Monitored ports
  - sFlow ports

  When configuring networks, uplink ports are filtered to ensure that all ports belong to the same logical interconnect.
- If there are connections not configured as stacking links between modules, the ports are linked and function as normal uplink ports.
- Server to server communications between logical interconnects requires a connection between the logical interconnects.
- Multiple enclosure configurations are supported and require that the primary slices of the enclosures be connected with stacking cables.
- Profile migrations are not supported in multi-enclosure domains.
- Double-dense mode is not supported.
- HP BladeSystem c3000 Enclosures are not supported.
- HP recommends enabling Smart Link.

To configure the domain stacking mode, see the latest versions of the following documents in the Virtual Connect Information Library (http://www.hp.com/go/vc/manuals):

- *HP Virtual Connect for c-Class BladeSystem User Guide*
- *HP Virtual Connect Manager Command Line Interface for c-Class BladeSystem User Guide*

Network loop protection

To avoid network loops, Virtual Connect first verifies that only one active uplink exists per network from the Virtual Connect domain to the external Ethernet switching environment. Second, Virtual Connect makes sure that no network loops are created by the stacking links between Virtual Connect modules.

- One active link—A VC uplink set can include multiple uplink ports. To prevent a loop with broadcast traffic coming in one uplink and going out another, only one uplink or uplink LAG is active at a time. The uplink or LAG with the greatest bandwidth should be selected as the active uplink. If the active uplink loses the link, then the next best uplink is made active.
- No loops through stacking links—If multiple VC-Enet modules are used, they are interconnected using stacking links, which might appear as an opportunity for loops within the VC environment. For each individual network in the Virtual Connect environment, VC blocks certain stacking links to ensure that each network has a loop-free topology.

Enhanced network loop protection detects loops on downlink ports, which can be a Flex-10 logical port or physical port. The feature applies to Flex-10 logical function if the Flex-10 port is operating under the control of DCC protocol. If DCC is not available, the feature applies to a physical downlink port.

Enhanced network loop protection uses two methods to detect loops:

- It periodically injects a special probe frame into the VC domain and monitors downlink ports for the looped back probe frame. If this special probe frame is detected on downlink ports, the port is considered to cause the loop condition.
- It monitors and intercepts common loop detection frames used in other switches. In network environments where the upstream switches send loop detection frames, the VC Enet modules must ensure that any downlink loops do not cause these frames to be sent back to the uplink ports. Even though VC probe frames ensure loops are detected, there is a small time window depending on the probe frame transmission interval in which the loop detection frames from the external switch might loop through down link ports and reach uplink ports. By intercepting the external loop detection frames on downlinks, the possibility of triggering loop protection on the upstream switch is eliminated. When network loop protection is enabled, VC-Enet modules intercept the following types of loop detection frames:
  - PVST+ BPDUs
  - Procurve Loop Protect frames

When the network loop protection feature is enabled, any probe frame or other supported loop detection frame received on a downlink port is considered to be causing the network loop, and the port is disabled immediately until an administrative action is taken. The administrative action involves resolving the loop condition and clearing the loop protection error condition. The "loop detected" status on a port can be cleared by one of the following administrative actions:

- Restart loop detection by issuing "reset" loop protection from the CLI or GUI
- Unassign all networks from the port in "loop detected" state

The SNMP agent supports trap generation when a loop condition is detected or cleared.

Virtual Connect provides the ability to enable or disable network loop protection. The feature is enabled by default and applies to all VC-Enet modules in the domain. Network loops are detected and server ports can be disabled even prior to any enclosure being imported.

A loop-protect reset command resets and restarts loop detection for all server ports in a “loop-detected” error condition.

For each individual network in the Virtual Connect environment, VC blocks certain stacking links to ensure that each network has a loop-free topology. VCM determines which stacking links are used to forward traffic by determining the shortest route from the module with the active uplink to the remaining stacked VC-Enet modules. For optimal stacking strategies, see *HP Virtual Connect for the Cisco Network Administrator* on the Functionality & Value tab of the HP BladeSystem Technical Resources website (http://www.hp.com/go/bladesystem/documentation).

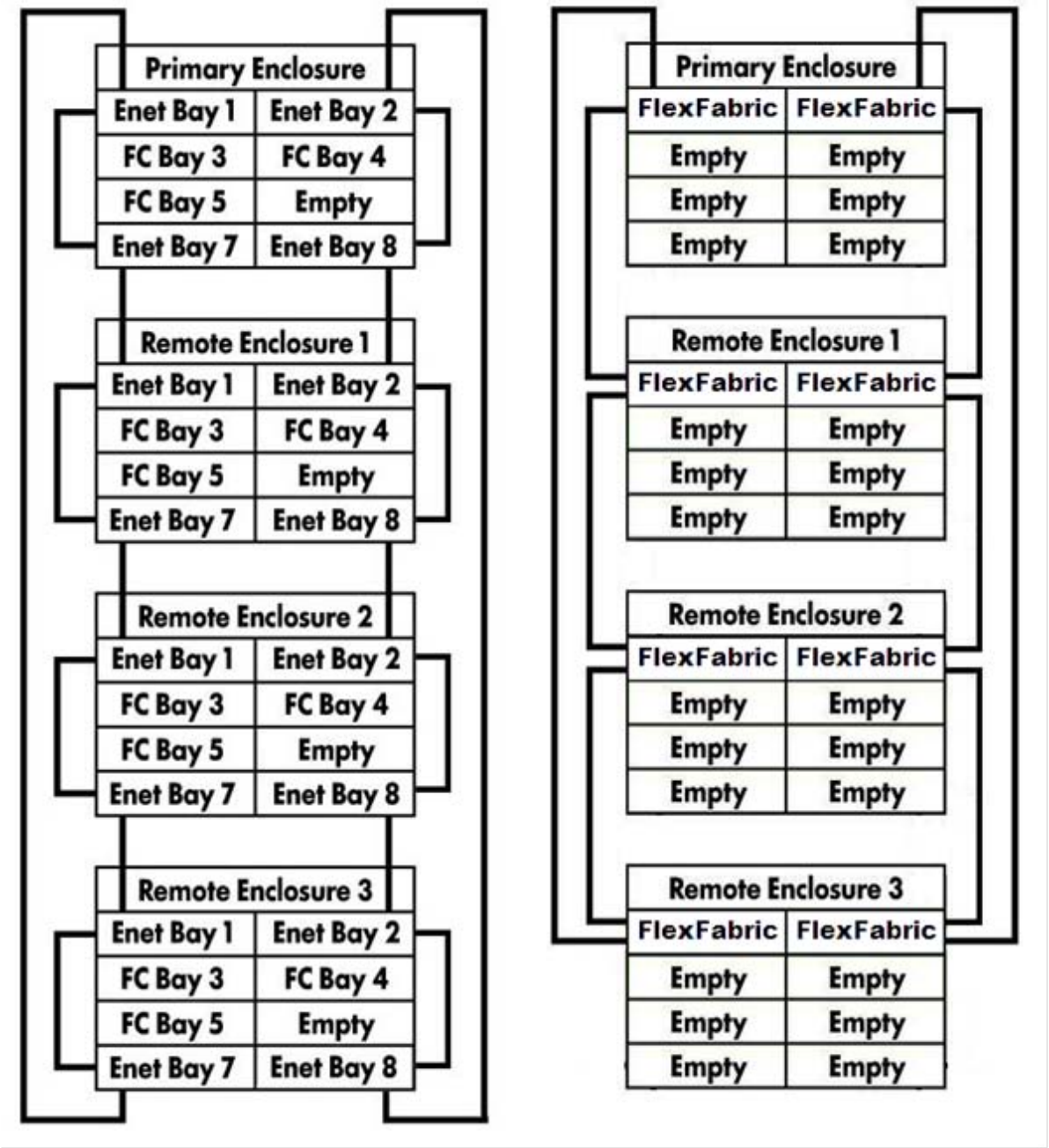
Connecting multiple enclosures

Virtual Connect supports the connection of up to four c7000 enclosures, which can reduce the number of network connections per rack and also enables a single VC Manager to control multiple enclosures. A single set of cables can be used to carry all external Ethernet traffic from a single rack.

Multiple enclosure support enables up to four c7000 enclosures to be managed within a single Virtual Connect domain.

Stacking multiple enclosures enables the management of up to four enclosures from a single control point. VC Manager operates in the primary enclosure, and it enables up to three additional remote enclosures of the same type to be added as part of a single VC domain. The locally managed primary enclosure must be

imported into the domain before importing additional (remote) enclosures. If a failure occurs, the standby module in the primary enclosure takes over.



The VC Manager in the primary enclosure accesses all remote modules and OAs over the management network. The OAs for each enclosure to be managed as part of a VC domain must be on the same management subnet along with all of the VC-Enet and VC-FC modules that are in each enclosure. All enclosure OAs and VC modules within the same VC domain must be on the same lightly loaded subnet. HP recommends that the OA IP addresses used are configured to be static. The VC-Enet modules use stacking cables between enclosures to route network traffic from any server port to any uplink port within the VC domain.

The VC-FC modules and FlexFabric FC-configured ports do not support stacking. Connecting multiple enclosures requires identical FC and FlexFabric module bay configuration in each enclosure. For more information, see "FC and FlexFabric bay configuration using multiple enclosures (on page 32)."

Multi-enclosure double dense domains require similar and compatible FC modules in bays 5, 6, 7, and 8 in all enclosures. If a multi-enclosure double dense configuration contains incompatible FC modules in bays 5, 6, 7, or 8 in either the local or remote enclosures, some or all of the compatible FC modules in the remote enclosures might be designated INCOMPATIBLE after import.

To add additional enclosures to a domain, see the *HP Virtual Connect for c-Class BladeSystem User Guide* on the HP website (http://www.hp.com/go/vc/manuals).

Multiple enclosure requirements

Observe the following requirements when connecting multiple enclosures:

- A single domain supports up to four c7000 enclosures.
- Each enclosure must have at least one supported VC-Enet module installed.
- If the domain stacking mode is configured to full stacking, all VC-Enet modules must be interconnected and redundantly stacked.
- If the domain stacking mode is configured to horizontal or primary slice stacking, the primary slice of each enclosure must be connected with stacking cables.
- All enclosures must have the same FC and FlexFabric module configuration.

  For example, if bays 1 and 2 of the Primary Enclosure contain FlexFabric-20/40 F8 modules, then bays 1 and 2 of Remote Enclosures 1, 2, and 3 must also contain FlexFabric-20/40 F8 modules.
- All enclosures must have the same HP VC Flex-10/10D module configuration.

  For example, if bays 1 and 2 of the Primary Enclosure contain HP VC Flex-10/10D modules, then bays 1 and 2 of Remote Enclosures 1, 2, and 3 must also contain HP VC Flex-10/10D modules.
- A total of 16 Ethernet and 16 VC-FC type modules can be installed in a multi-enclosure domain.
- Each FlexFabric module counts as one Ethernet and one VC-FC module. Combinations of FlexFabric, VC-Enet and VC-FC modules are allowed as long as the 16-module limit for each module type (Ethernet and FC) is not exceeded in the domain.

  Additional constraints apply for the FlexFabric-20/40 F8 module ("HP Virtual Connect FlexFabric-20/40 F8 Module requirements" on page 22).
- All Onboard Administrators and VC modules must be on the same lightly loaded and highly reliable management Ethernet network and IP subnet.
- The VC-FC and FlexFabric FC-configured uplink port configuration must be identical across all enclosures.
- The Onboard Administrator firmware must be version 3.11 or higher. HP recommends using the latest version available.
- All Onboard Administrators must use the same user credentials. VCSU uses the primary credentials for the remote enclosure.
- When both Primary and Standby modules in the base enclosure are taken down for maintenance or lose power and are no longer present in the domain, the management capabilities in the VC domain are lost. Both the Primary and Standby modules in the base enclosure must be recovered to regain management access to the VC domain.

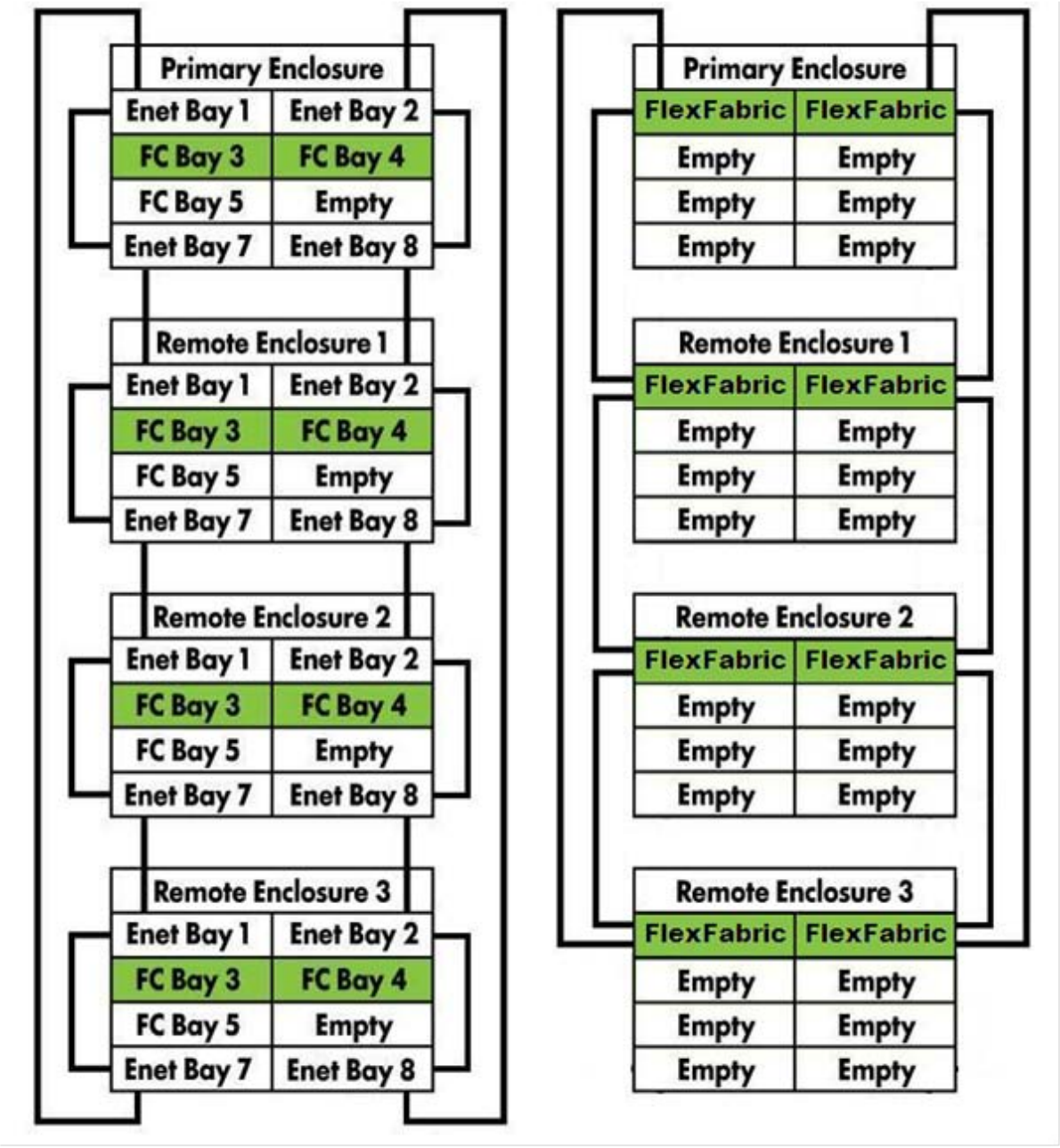
  If network and fabric uplinks are defined on the remaining enclosures, the servers continue to have network and storage access.

FC and FlexFabric bay configuration using multiple enclosures

The VC-FC modules and FlexFabric FCoE or FC-configured uplinks do not support stacking. To ensure server profile mobility, the VC-FC and FlexFabric bay configurations must be identical for all enclosures in the domain.

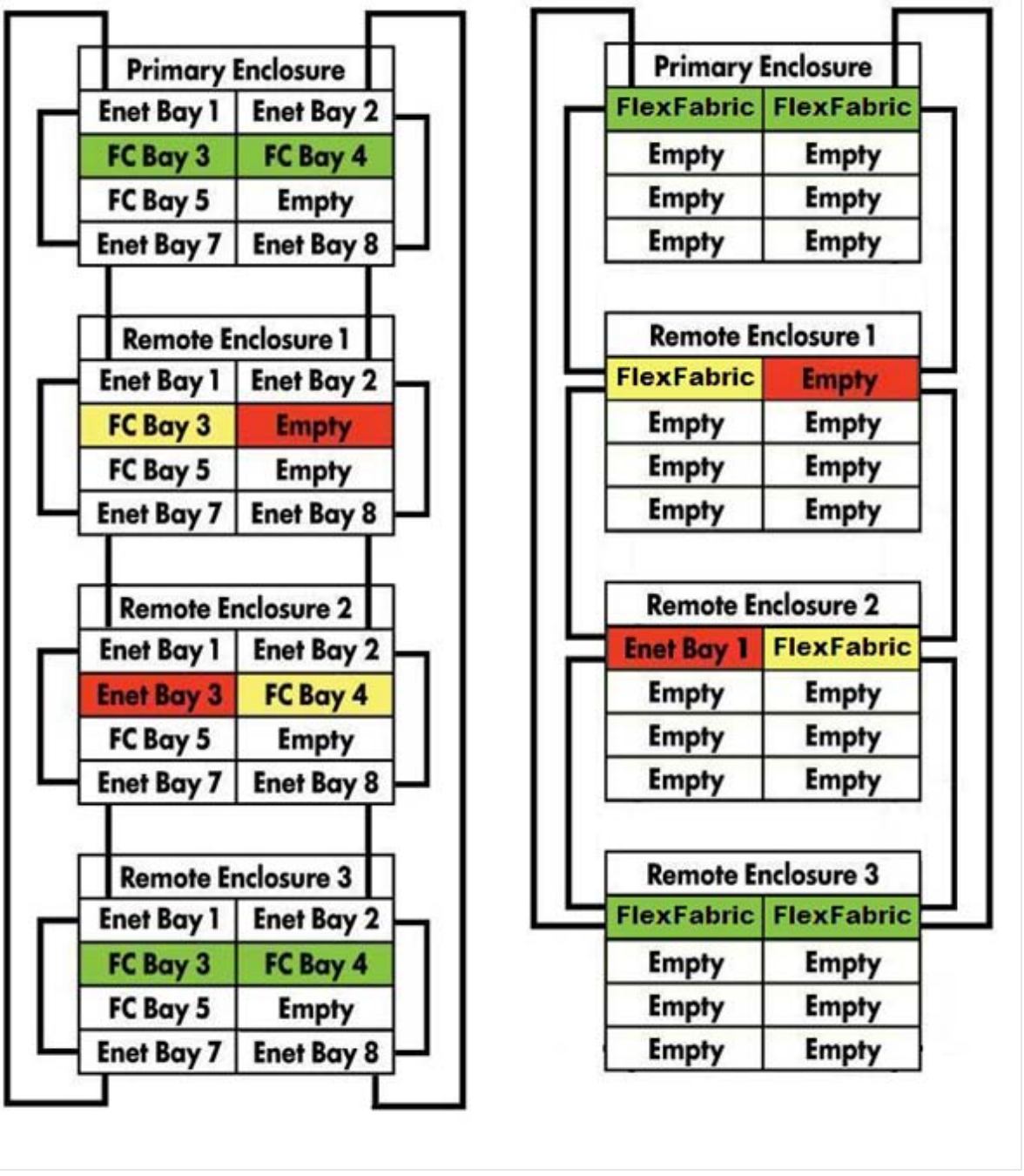
For example, in a multi-enclosure domain with a total of four enclosures, if bays 3 and 4 of the Primary Enclosure contain VC-FC modules, then bays 3 and 4 of Remote Enclosures 1, 2, and 3 must also contain VC-FC modules. If bays 1 and 2 of the Primary Enclosure contain FlexFabric modules, then bays 1 and 2 of Remote Enclosures 1, 2, and 3 must also contain FlexFabric modules. The following illustration shows a valid VC-FC and FlexFabric bay configuration.

Sample valid VC-FC and FlexFabric bay configuration



The following illustration shows an invalid VC-FC and FlexFabric bay configuration. For VC-FC bay compatibility, Bay 4 in Remote Enclosure 1 is empty, and Bay 3 of Remote Enclosure 2 has an Ethernet module present. For FlexFabric bay compatibility, Bay 2 in Remote Enclosure 1 is empty, and Bay 1 of Remote Enclosure 2 has an Ethernet module present.

Sample invalid VC-FC and FlexFabric bay configuration



Directly connecting VC domains

In a multi-enclosure domain configuration with properly installed stacking cables, each network defined in the domain is available to all server profiles in the domain without requiring any additional uplink ports. This configuration enables you to establish an open communication path between two or more enclosures.

You can also directly associate the uplinks from two enclosures from different domains so that servers in the two domains attached to the networks configured for those uplinks can communicate with one another. This configuration establishes a private communication path between the two enclosures. However, the communication path is public for all of those servers and applications associated with it. Traffic would not flow from an upstream switch over that direct connection.

The two enclosures can communicate with each other by a dedicated uplink port or a shared uplink port defined on each enclosure. These uplinks on the two enclosures can be "teamed" using LACP because both domains run LACP active. The link between the two enclosures cannot have any additional active links connected to other targets. Only networks defined for that link can be shared between the two enclosures.

Virtual Connect FIPS mode of operation

Beginning with version 4.30, Virtual Connect supports FIPS 140-2 Level 1 security requirements. Enabling FIPS mode requires the use of secure protocols, standards, and procedures within the VC domain. The Virtual Connect FIPS certification is currently based on the standards described in *Federal Information Processing Standards Publication 140-2* (*http://csrc.nist.gov/publications/PubsFIPS.html*).

The term FIPS mode is used throughout this document to describe the feature, not the validation status. For information about current FIPS status of this or any other firmware version, see the following documents:

- *Cryptographic Module Validation Program FIPS 140-1 and FIPS 140-2 Modules In Process List* (*http://csrc.nist.gov/groups/STM/cmvp/documents/140-1/140InProcess.pdf*)
- *FIPS 140-1 and FIPS 140-2 Vendor List* (*http://csrc.nist.gov/groups/STM/cmvp/documents/140-1/1401vend.htm*)

FIPS mode information and guidelines

Before enabling FIPS mode, observe the following information:

- The OA should be enabled with FIPS mode before VCM.

  If FIPS mode cannot be set on the OA, perform the following procedures before enabling FIPS mode on VCM:

  - If it exists, delete the VC domain.
  - Clear the VC mode from the OA.

  A partial VC domain state is created when VCM discovers the local OA in VC mode. Be sure to clear the partial VC domain state by powering off and then powering on the primary VC Enet module.
- When entering or exiting FIPS mode, the VC domain is deleted.
- The firmware must be updated to version 4.30 or higher before FIPS mode can be enabled.
- A rollback or downgrade to firmware earlier than 4.30 is not supported once the domain is in FIPS mode.
- VC Fibre Channel modules are incompatible and cannot be configured for FIPS mode.

The status of VC Fibre Channel modules is displayed as `incompatible`.

- When a VC-Enet module is not in FIPS mode and the domain is in FIPS mode, the status of that module is displayed as `incompatible`.
- The VCM cannot configure modules that are not enabled with FIPS mode.
- VC domain configuration files created in a FIPS enabled domain cannot be used in a non-FIPS domain.
- VC domain configuration files created in a non-FIPS domain cannot be used in a FIPS enabled domain.
- VC domain configuration files are deleted when FIPS mode is enabled or disabled.

When FIPS mode is enabled, security is increased across the domain. The following features are restricted:

- FTP and TFTP
- TACACS+ authentication
- RADIUS authentication
- Automated deployment
- Configurable user roles
- Administrator password recovery
- USB firmware updates
- SNMPv1 and SNMPv2
- MD5 authentication and DES encryption for SNMPv3
- Remote logging, except when using stunnel for encryption
- Short passwords
- Weak passwords

By default, the password strength is set to strong and the minimum password length must be 8 or more characters. VCM uses SCP and SFTP protocols instead of FTP and TFTP.

TLS 1.2 is the default communication security protocol for a FIPS enabled domain. Verify the following components support TLS 1.2:

- The OA version

  OA firmware versions prior to 4.10 do not support TLS 1.2.
- The LDAP server
- The terminal emulator you use for SSH
- The browser you use to access the VCM web interface

If a component does not support TLS 1.2, you can use the VCM CLI or web interface to configure VCM to support all TLS versions.

To verify browser settings, see "Configuring browser support (on page 58)."

Enabling FIPS mode

Enable FIPS mode by setting the DIP switch on the primary VC-Enet or FlexFabric module. To enable FIPS mode:

1. Verify the interconnect module firmware version is at least 4.30/4.31.

If the firmware version is not 4.30/4.31, upgrade the firmware to 4.31.

> **CAUTION:** Before upgrading the firmware, be sure no plans exist to downgrade or rollback firmware. Once the domain is in FIPS mode, the firmware cannot be downgraded.

2. Remove the Virtual Connect Ethernet module from the interconnect bay.
3. Remove the access panel.

   Removing the access panel is not required on HP VC FlexFabric-20/40 F8 modules. The DIP switch is accessible without removing the access panel.
4. Locate the DIP switch ("Component identification" on page 104).
5. Find DIP switch 3, and then set to the ON position. Be sure that all other switches remain in the OFF position.

   `OFF OFF ON OFF`
6. Install the access panel.
7. Install the Virtual Connect Ethernet module into the interconnect bay and allow the module to power up and reach a fully booted and operational state (approximately 1 minute).
8. Log in to VC Manager and verify the domain or the module is in FIPS mode.

FIPS mode indicators (domain)

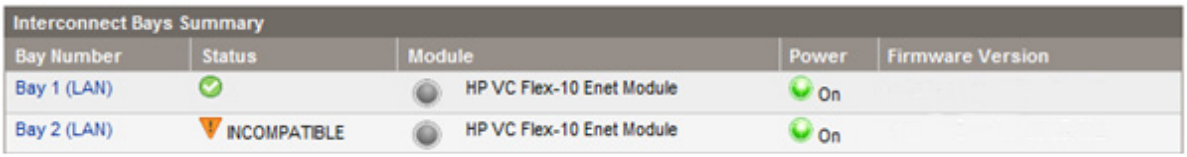
VCM indicates if the domain is in FIPS mode by displaying the following icon in the banner.

The VCM CLI prompt indicates if the domain is in FIPS mode by displaying the following prompt:

`FIPS->`

FIPS mode indicators (VC Ethernet modules)

If a module is not enabled with FIPS mode, it is displayed as `incompatible`. To identify an incompatible module, use the Interconnect Bays screen.

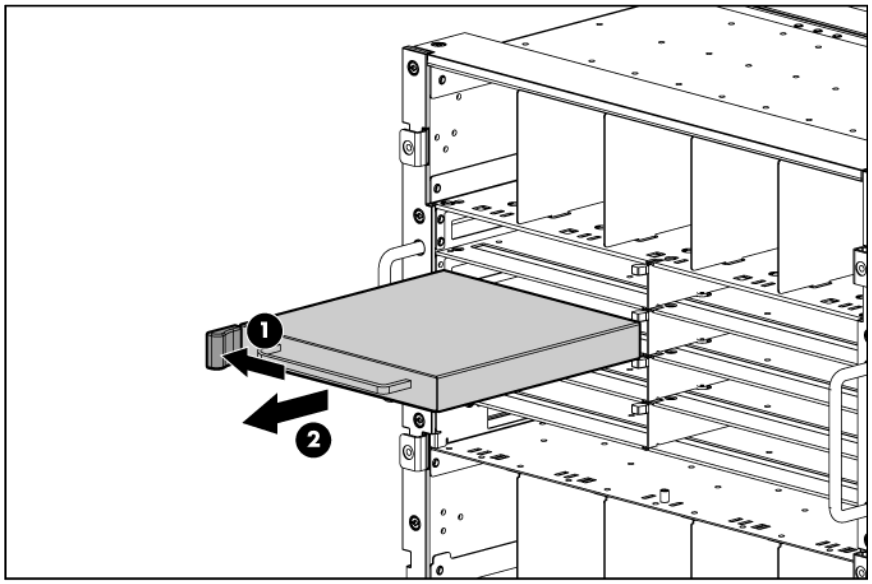


Installing a VC-Enet module

The VC-Enet module can be used in an HP BladeSystem c7000 Enclosure or an HP BladeSystem c3000 Enclosure. The following illustrations show the VC-Enet module being installed in a c7000 enclosure.

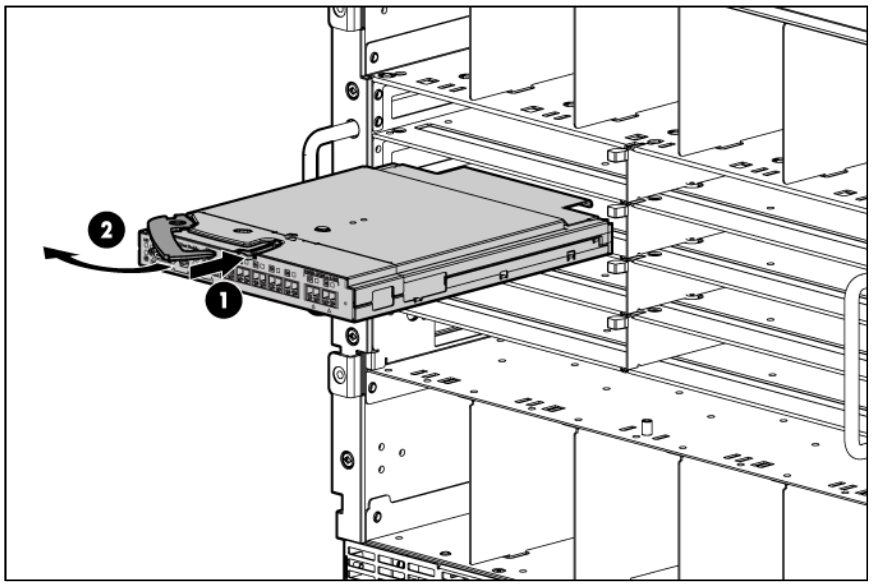
To install the component:

1. Remove the interconnect blank.

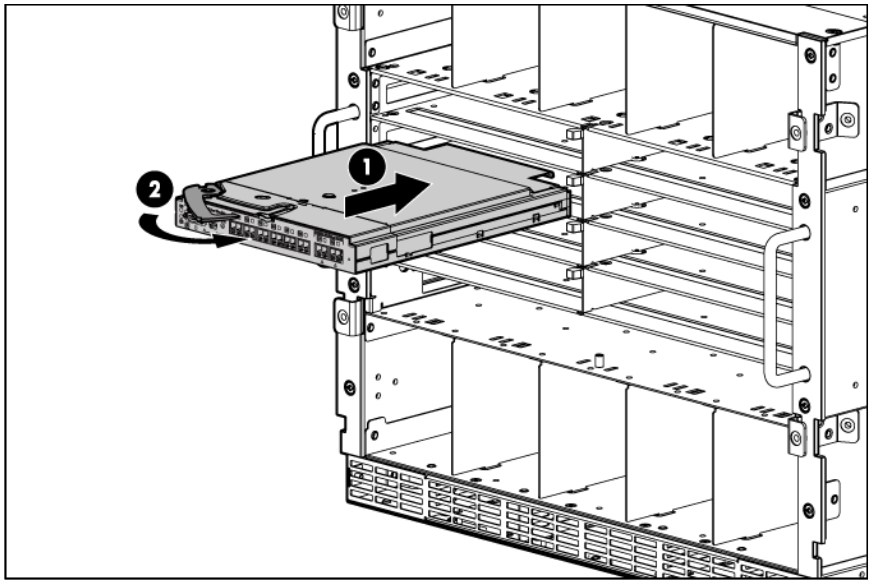


NOTE: HP Virtual Connect works optimally in enclosures configured with HP Virtual Connect interconnect modules only.

2. Prepare the VC-Enet module for installation (HP VC Flex-10 10Gb Ethernet Module shown).



3. Install the module into the interconnect bay (HP VC Flex-10 10Gb Ethernet Module shown). Push the module in slowly and smoothly until it is firmly seated.



4. If the Virtual Connect configuration includes three or more VC-Enet modules, install stacking links (typically 10GBASE-CX4 cables) between the modules. For more information, see "Connecting Virtual Connect Ethernet Module uplinks (on page 47)."
5. Connect the data center network cables to the appropriate VC-Enet module faceplate ports. This step can be deferred until after setup of the Virtual Connect Manager software. See "Default module configuration (on page 13)."

   The SFP+ ports can be used to connect to the data center if they are populated with a supported pluggable SFP or SFP+ transceiver module.

   IMPORTANT: For proper thermal operation, always install SFP dust covers in SFP ports without SFP transceivers installed.

6. Remove the perforated portion of the Default Network Setting label that extends beyond the faceplate of the primary module, or record the information contained on the label.

   The Default Network Settings label contains the DNS name, user name, and password of the primary interconnect module. This information is required for access to VCM.
7. Power on and configure the enclosure. For more information, see the appropriate HP BladeSystem enclosure setup and installation guide on the HP website (http://h17007.www1.hp.com/us/en/enterprise/servers/solutions/info-library/index.aspx?cat=bladesystem).
8. Connect a workstation to the data center network hosting the HP BladeSystem Onboard Administrator for the enclosure.
9. Start and log on to the workstation.
10. Open a compatible web browser.
11. Log on to the HP BladeSystem Onboard Administrator. For specific instructions, see the *HP BladeSystem Onboard Administrator User Guide* on the HP website (http://www.hp.com/go/oa).
12. Verify the HP Onboard Administrator firmware. HP recommends using the latest version available. Using IPv6 requires OA 4.01 or higher. For specific instructions, see the *HP BladeSystem Onboard Administrator User Guide* on the HP website (http://www.hp.com/go/oa).

IMPORTANT: For proper Virtual Connect operation, always assign an IP address to each server blade iLO and interconnect module.

13. Be sure that the server blade BIOS and NIC options ROM are at the appropriate revision level. For more information, see the HP website (http://www.hp.com/go/bladesystemupdates).
14. Review the Onboard Administrator bay summary screens to verify that each server blade iLO and interconnect module has been assigned an IP address. Each IP address must be valid and unique, and all iLOs and VC modules must be on the same subnet. For more information, see the *HP BladeSystem Onboard Administrator User Guide* on the HP website (http://www.hp.com/go/oa).
15. From the Onboard Administrator enclosure overview screen, click the **Virtual Connect Manager** link.

    The VCM logon screen appears.
16. Enter the user name from the Default Network Settings label into the Username field.
17. Enter the password from the Default Network Settings label into the Password field, and then click **Sign In**.

    The HP Virtual Connect Manager Setup Wizard screen appears.
18. Use the VC Manager to administer the VC-Enet module for the enclosure.

After an enclosure is imported into a Virtual Connect domain, server blades that have not been assigned a server profile are isolated from all networks to ensure that only properly configured servers are attached to data center networks.

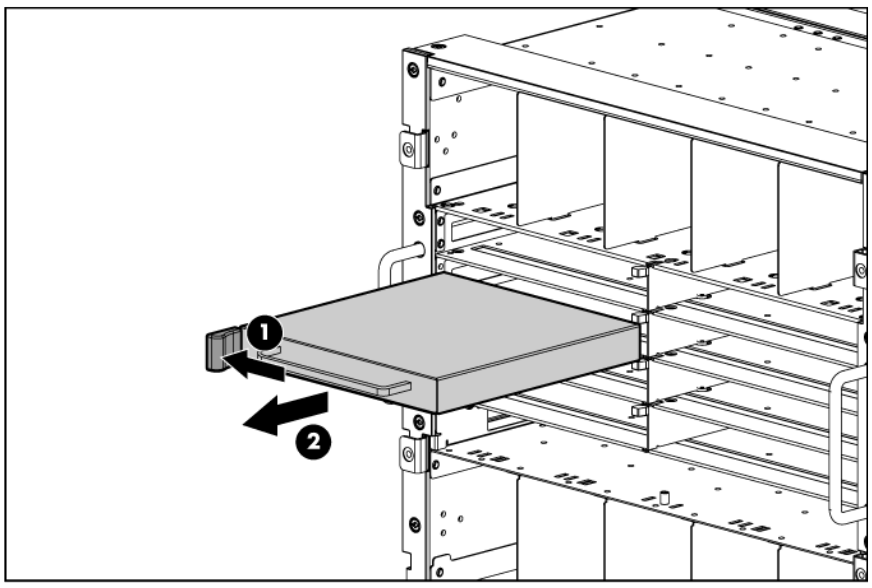
A pre-deployment server profile can be defined within VCM for each device bay so that the server blade can be powered on and connected to a deployment network. These profiles can then be modified at a later time or replaced by another server profile. For more information on server profiles, see the *HP Virtual Connect for c-Class BladeSystem User Guide* on the HP website (http://www.hp.com/go/vc/manuals).

Installing a VC FlexFabric module

For individual FlexFabric module installation requirements, see "Installation requirements (on page 15)."

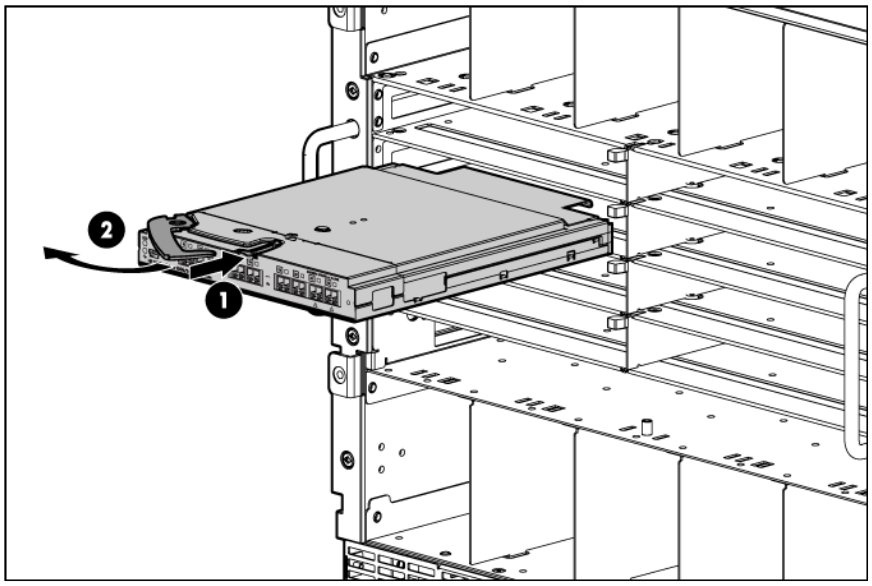
To install the component:

1. Remove the interconnect blank.

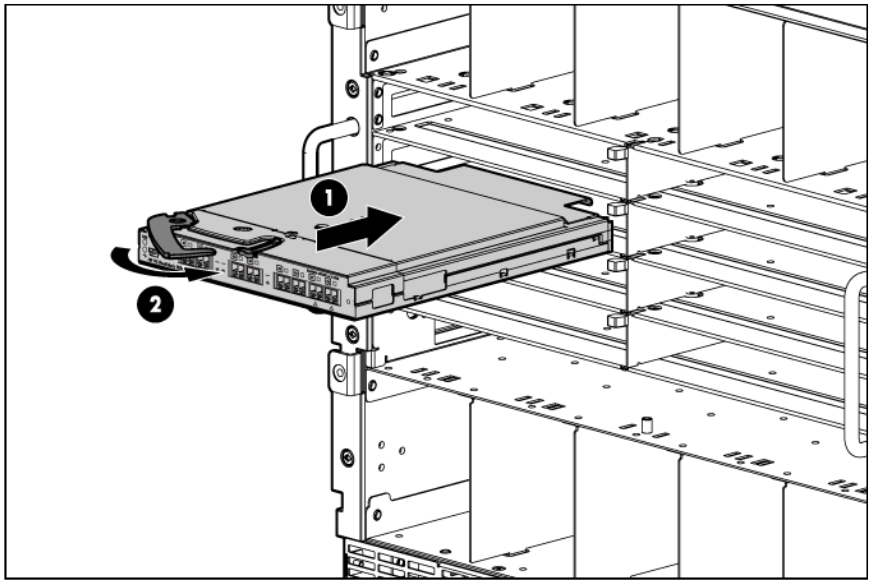


NOTE: HP Virtual Connect works optimally in enclosures configured with HP Virtual Connect interconnect modules only.

2. Prepare the FlexFabric module for installation. (HP Virtual Connect FlexFabric 10/24-port Module shown).



3. Install the FlexFabric module into the interconnect bay.



4. If the enclosure configuration includes more than one VC module, connect any necessary stacking cables between the modules.

   The FlexFabric module supports stacking links for Ethernet traffic only. For more information, see the *HP Virtual Connect for c-Class BladeSystem User Guide* on the HP website (http://www.hp.com/go/vc/manuals).

5. Connect the data center network cables to any FlexFabric module port not being used for Virtual Connect stacking links.

Any available port can be used to connect to the data center for Ethernet traffic. If the port requires a pluggable module, then the port must be populated with a supported pluggable transceiver module that is compatible with the data center port type.

6. If the FlexFabric module is being configured for Fibre Channel traffic, connect the data center SAN switch ports to ports X1 through X4 of the module, or ports X1 through X8 on HP Virtual Connect FlexFabric-20/40 F8 Modules.

IMPORTANT: For proper thermal operation, always install dust covers in QSFP+, SFP+, or SFP ports without transceivers installed.

7. Remove the perforated portion of the Default Network Settings label that extends beyond the faceplate of one of the VC-Enet module or FlexFabric module installed in the enclosure.

   The Default Network Settings label contains the DNS name, user name, and password of the interconnect module. This information is required for access to VCM.

8. Connect a workstation to the data center network hosting the HP BladeSystem Onboard Administrator for the enclosure.
9. Start and log on to the workstation.
10. Open a web browser.
11. Log on to the HP BladeSystem Onboard Administrator. If prompted, follow the steps in the OA First Time Setup Wizard. For specific instructions, see the *HP BladeSystem Onboard Administrator User Guide* on the HP website (http://www.hp.com/go/oa).
12. Before accessing VCM, verify that the HP BladeSystem Onboard Administrator firmware is at the recommended firmware version. For specific instructions, see the HP website (http://www.hp.com/go/oa).

IMPORTANT: For proper Virtual Connect operation, always assign an IP address to each server blade iLO and interconnect module.

13. Verify that each server blade iLO and interconnect module has been assigned an IP address by reviewing the bay summary screens in the Onboard Administrator. Each IP address must be valid and unique, and all iLOs and Virtual Connect modules must be on the same subnet. For more information, see the *HP BladeSystem Onboard Administrator User Guide* on the HP website (http://www.hp.com/go/oa).
14. From the enclosure overview screen, click **Virtual Connect Manager**.

    The VCM logon screen appears.

15. In the Username field, type `Administrator`.
16. Enter the password from the Default Network Settings label into the Password field.

    The HP Virtual Connect Manager Setup Wizard screen appears.

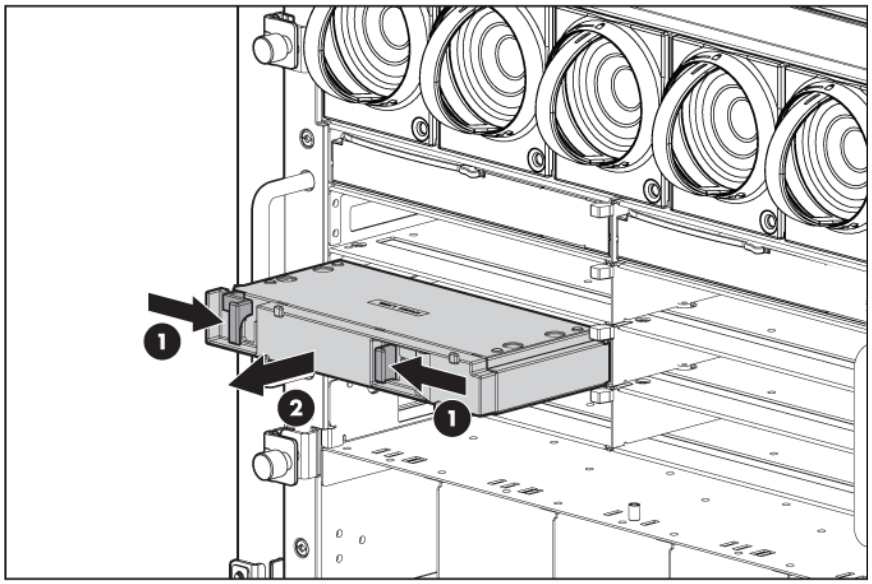
17. Use VCM to administer the Virtual Connect Ethernet module for the enclosure. For more information, see the *HP Virtual Connect for c-Class BladeSystem User Guide* on the HP website (http://www.hp.com/go/vc/manuals).

Installing a VC-FC module

The VC-FC module can be used in an HP BladeSystem c7000 Enclosure or an HP BladeSystem c3000 Enclosure. The following illustrations show the VC-FC module being installed in a c7000 enclosure.

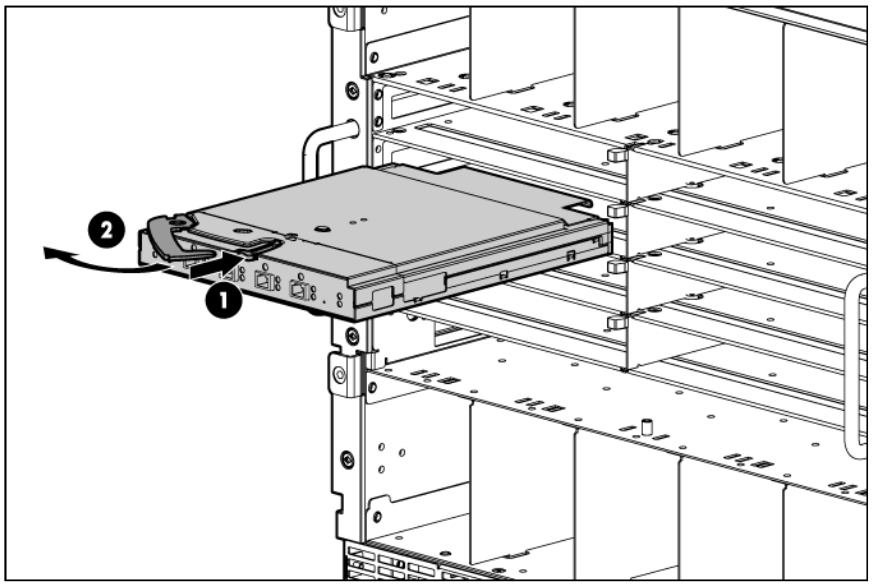
To install the component:

1. Remove the interconnect blank.

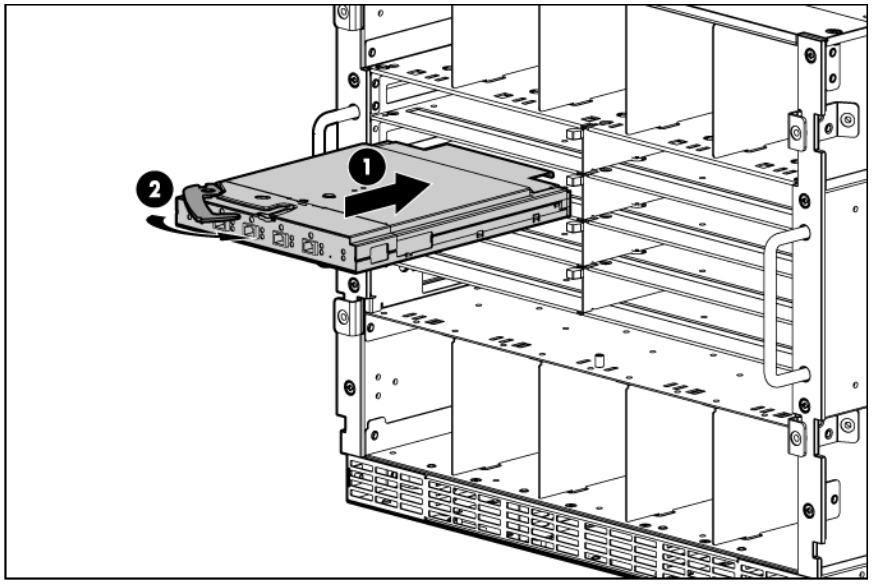


NOTE: HP Virtual Connect works optimally in enclosures configured with HP Virtual Connect interconnect modules only.

2. Prepare the VC-FC module for installation (HP Virtual Connect 4Gb Fibre Channel Module shown).



3. Install the VC-FC module into the interconnect bay (HP Virtual Connect 4Gb Fibre Channel Module shown). Push the module in slowly and smoothly until it is firmly seated.



4. Connect the data center SAN switch ports to the VC-FC module 1/2/4 Gb SFP ports.

IMPORTANT: For proper thermal operation, always install SFP dust covers in SFP ports without SFP transceivers installed.

IMPORTANT: For proper Virtual Connect operation, always assign an IP address to each server blade iLO and interconnect module.

5. Review the Onboard Administrator bay summary screens to verify that each server blade iLO and interconnect module has been assigned an IP address. Each IP address must be valid and unique, and all iLOs and VC modules must be on the same subnet. For more information, see the *HP BladeSystem Onboard Administrator User Guide* on the HP website (http://www.hp.com/go/oa).
6. Configure the VC-FC module:
   - If VC-Enet modules are installed in the same enclosure, use VCM to administer VC-FC modules.
   - If VC-Enet modules are not installed in the same enclosure, the VC-FC module operates in the default configuration only.

Installing DAC/AOC cables and transceivers

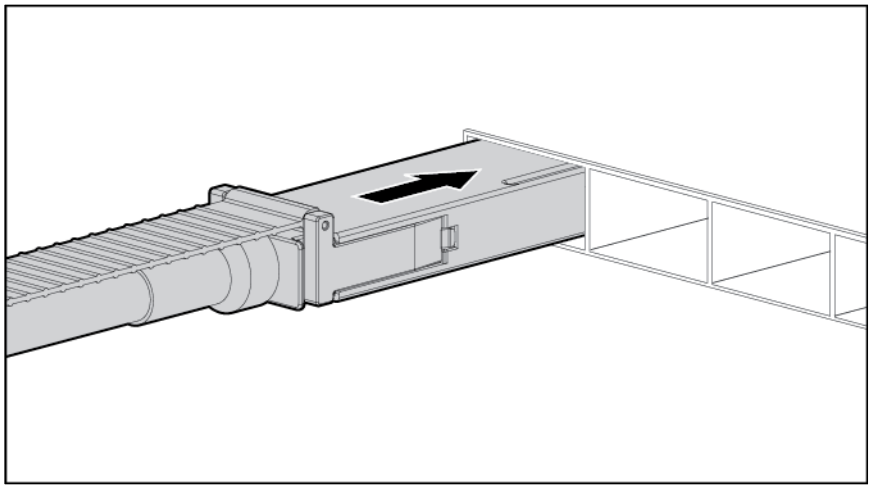
To install a DAC/AOC cable or a QSFP+, SFP+, or SFP transceiver , use the following procedures:

- Installing a DAC/AOC cable ("Installing the cable" on page 43)
- Installing a transceiver ("Installing the transceiver" on page 44)

Installing the cable

1. If needed, remove the packaging and protective caps.
2. Verify the cable is the correct type by checking the label on the transceiver.
3. Remove the dust plug from the correct port.

4. Align the transceiver in front of the port with the label facing up.
5. Install the cable. (QSFP+ DAC cable shown)



Installing the transceiver

WARNING: To avoid serious injury, never look directly into an open transceiver port.

CAUTION: Disconnect all cables before removing or installing any transceivers or transceiver adapters. Leaving the cable connected while handling the transceiver may damage the cable, the cable connector, or the optical interfaces in the transceiver.
Do not remove and install transceivers more often than is necessary. Doing so can shorten the useful life of the transceiver.

CAUTION: Do not remove the dust plugs from the transceiver or the connector until you are ready to connect the cable. The plugs protect the ports and connectors from contamination and ambient light.

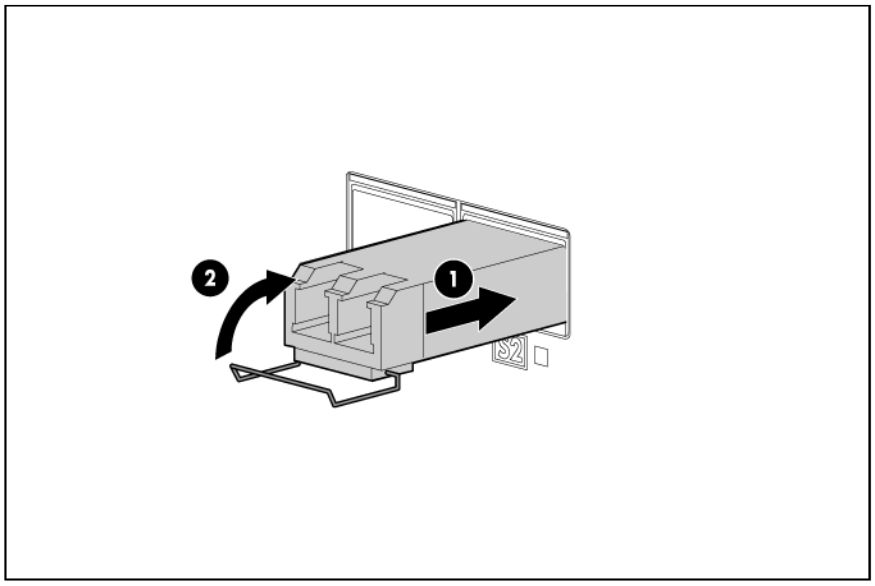
NOTE: Transceivers may have a bail clasp latch or a pull tab latch. If installing a transceiver with a bail clasp latch, be sure the latch is closed before connecting the cable.

To install a transceiver or transceiver adapter:

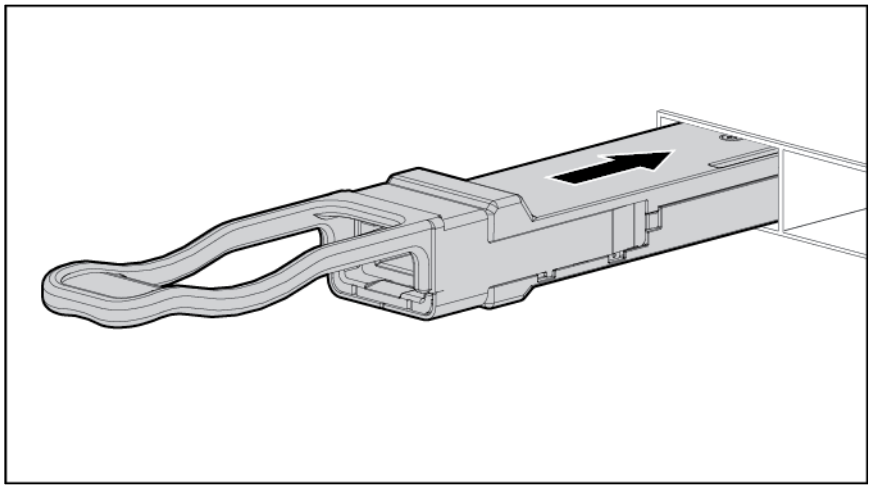
IMPORTANT: Use only HP approved transceivers.

1. Verify the transceiver type by checking the label.
2. Remove the dust plug from the correct port.
3. Align the transceiver in front of the port with the label facing up.
4. Install the transceiver:

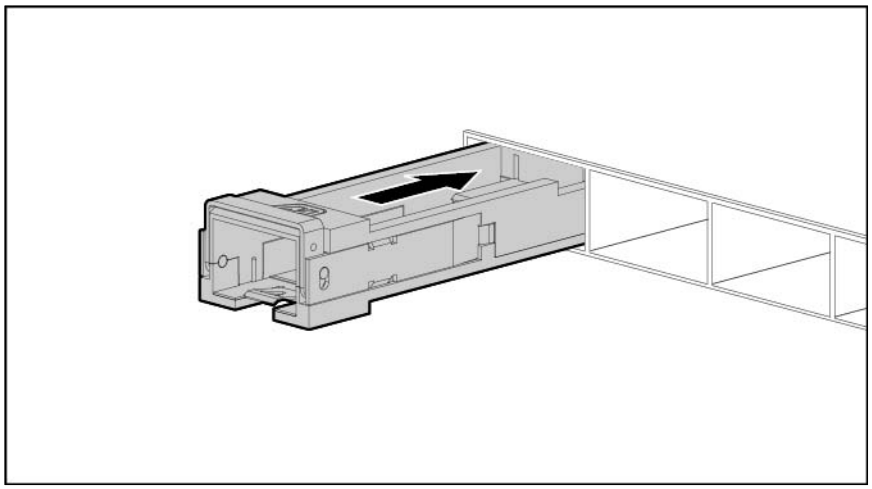
- SFP+



- QSFP+



- Transceiver adapter



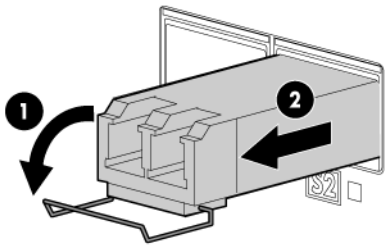
If a cable needs to be connected, remove any dust plugs or covers, and then connect the cable.

Removing QSFP+, SFP+ or SFP transceivers

WARNING: To avoid serious injury, never look directly into an open transceiver port.

CAUTION: Disconnect all cables before removing or installing a QSFP+, SFP+ or SFP transceiver, because of the potential damage to the cables, the cable connector, or the optical interfaces in the transceiver.
Do not remove and install transceivers more often than is necessary. Doing so can shorten the useful life of the transceiver.

1. Disconnect all cables.
2. Open the latch.
3. Remove the transceiver. (SFP transceiver shown).



4. Install dust plugs on the fiber-optic transceiver and rubber plugs on the fiber-optic cable.

CAUTION: Be sure to install the dust plugs on the fiber-optic transceiver and the rubber plugs on the fiber-optic cable. The plugs and caps protect the transceiver ports and cables from contamination and ambient light.

Factory default settings

The Virtual Connect Delete Domain operation returns all VC-FC modules to the factory default settings.

VC-FC modules that are physically removed from a VC domain can be returned to the factory default settings when placed into a new enclosure by applying power, and then pressing and holding the reset button on the front panel for at least 10 seconds. When moved from a VC domain and placed into an enclosure not part of a VC domain, VC-FC modules retain assigned mappings until reset to the factory default.

Connecting Virtual Connect Ethernet module uplinks

Each interconnect module has several numbered Ethernet connectors. All of these connectors can be used to connect to data center switches (uplink ports), or they can be used to stack Virtual Connect modules as part of a single Virtual Connect domain (stacking ports). See "Recommended stacking connections (on page 24)."

Networks must be defined within VCM so that specific named networks can be associated with specific external data center connections. These named networks can then be used to specify networking connectivity for individual servers. The network connection can be between one or many networks to one or many uplink ports:

- One network to one port (unshared network)
- One network to multiple uplink ports (unshared network)
- Multiple networks to one port (shared uplink set)
- Multiple networks to multiple ports (shared uplink set)

In addition, multiple networks can be connected to server downlink ports using server VLAN IDs. For more information, see "Managing server profiles" in the user guide.

The following sections provide an overview of the types of external connections and their behaviors.

Mapping individual networks to individual external uplink ports

The simplest approach to connecting the defined networks to the data center is to map each network to a specific external uplink port. This uplink port is defined by the following:

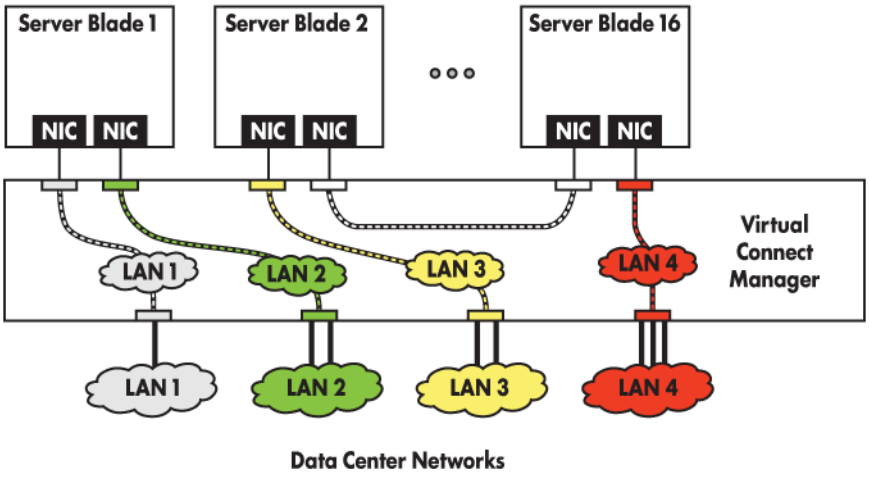
- Enclosure name
- Interconnect bay containing the VC-Enet module
- Selected port on that module

Port status indicators can be used to locate a specific port or to provide additional status.

The following table shows an example of simple network mapping, where the Virtual Connect enclosure is named Enclosure1 and VC-Enet modules are in interconnect module bays 1 and 2.

Network	Uplink port
Production_Network	Enclosure1:Bay1:PortX2
Dev_Network	Enclosure1:Bay1:Port4
Backup_Network	Enclosure1:Bay2:Port3
iSCSI_Storage_Network	Enclosure1:Bay2:PortX2

In this case, the Ethernet packets are passed unchanged between the server blades and the external networks. Any VLAN tags added by the server or external switch are ignored and pass through the VC-Enet modules.



The previous figure also shows a local connection between Server Blade 2 and Server Blade 16, which might be used in a cluster or as a network heartbeat.

Mapping a single network to multiple uplinks (uplink port set)

A single network can be mapped to more than one external uplink port to provide improved throughput and availability, referred to as an uplink port set. Review the following guidelines before mapping a single network to an uplink port set:

- External uplink ports within an uplink port set can be on the same VC-Enet module or on multiple VC-Enet modules within the Virtual Connect domain.
- Cables can be connected to one or more data center Ethernet switches.
- When multiple external uplink ports are used for the same network, the VC-Enet modules provide automatic loop prevention by enabling for a single active link or link set at any one time.
- VC automatically chooses the uplink port that optimizes throughput and availability. Where possible, links within the uplink port set automatically form a link aggregation group with LACP. This action requires multiple uplink ports on a single VC-Enet module to be connected to an external switch that is capable and configured to form link aggregation groups with LACP.

In the following example, a single network is mapped to four external uplink ports.

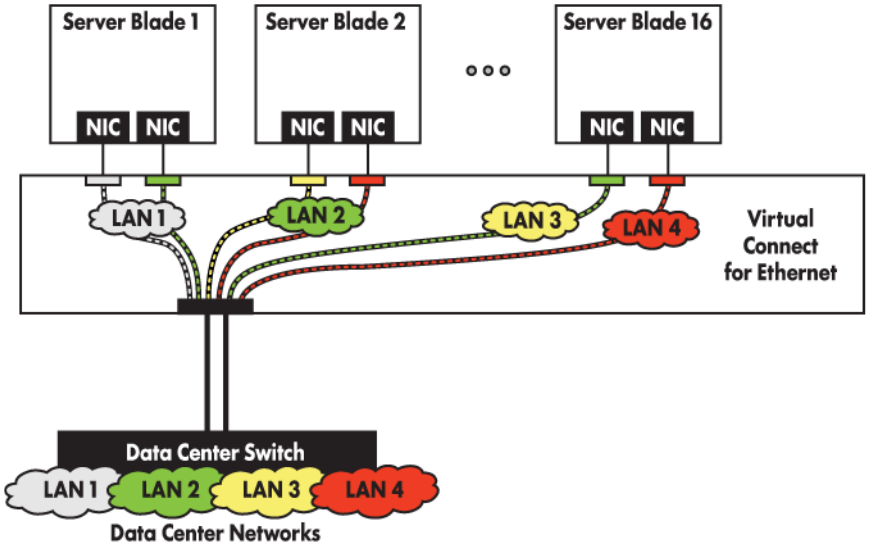
Network	Uplink port set
Production_Network	{ Enclosure1:Bay1:Port1 Enclosure1:Bay1:Port2 Enclosure1:Bay2:Port1 Enclosure1:Bay2:Port2 }

In this example, the ports from Bay 1 could be connected to one external switch, and the ports on Bay 2 could be connected to a second switch. If the external switches support link aggregation, then this configuration would provide an active 2-Gb link to one switch and a standby 2-Gb link to the other.

To make VCM aware of individual network connections, see "Define Ethernet Network screen" in the user guide.

Mapping multiple networks to a single port in a shared uplink set

The network administrator can choose to reduce the number of cables between the Virtual Connect enclosure and the data center switches by mapping multiple networks to a single, shared uplink port. In this case, a network is not just mapped to an uplink port, but to a VLAN on that port. This configuration requires VLAN tags to be added to each packet as it leaves the Virtual Connect domain and that packets entering the Virtual Connect domain be tagged. The VLAN tag is stripped from packets entering the Virtual Connect domain before they are routed to the appropriate server.



In the following example, an uplink port is defined as a shared uplink port so that it can then be used as the external connection for multiple networks.

Shared_Uplink_Port_A = Enclosure1:Bay1:PortX2

Network	Shared uplink port and VLAN
Production_Network	Shared_Uplink_Port_A:VLAN_15
Dev_Network	Shared_Uplink_Port_A:VLAN_21
Backup_Network	Shared_Uplink_Port_A:VLAN_32
iSCSI_Storage_Network	Shared_Uplink_Port_A:VLAN_76

Because appropriate VLAN tags are added as the packets leave the enclosure, this type of uplink should not be used in cases where VLAN tags are already added on the server itself. The system drops any Ethernet packets with server-inserted VLAN tags that are received on networks connected to shared uplink ports.

To make VCM aware of shared network connections, see "Define Shared Uplink Set screen" in the user guide.

Mapping multiple networks to a shared uplink set

It is also possible to map multiple VLAN-tagged networks to a set of shared uplink ports. The resulting shared uplink set allows for the minimum number of cables while still providing for link aggregation and failover.

In the following example, a shared uplink set is first defined to provide aggregation and failover.

Shared_Uplink_Set_A = {Enclosure1:Bay1:PortX2, Enclosure1:Bay2:PortX2}

Network	Shared uplink set and VLAN
Production_Network	Shared_Uplink_Set_A:VLAN_15
Dev_Network	Shared_Uplink_Set_A:VLAN_21
Backup_Network	Shared_Uplink_Set_A:VLAN_32
iSCSI_Storage_Network	Shared_Uplink_Set_A:VLAN_76

In this example, all of the defined networks share a single active uplink port (such as Enclosure1:Bay1:PortX2) using VLAN tagging, while the second link in the shared uplink set is available for failover. The shared uplink set can also be constructed from multiple 1-Gb external ports.

To make VCM aware of shared network connections, see "Define Shared Uplink Set screen" in the user guide.

Mapping FCoE networks to a shared uplink set

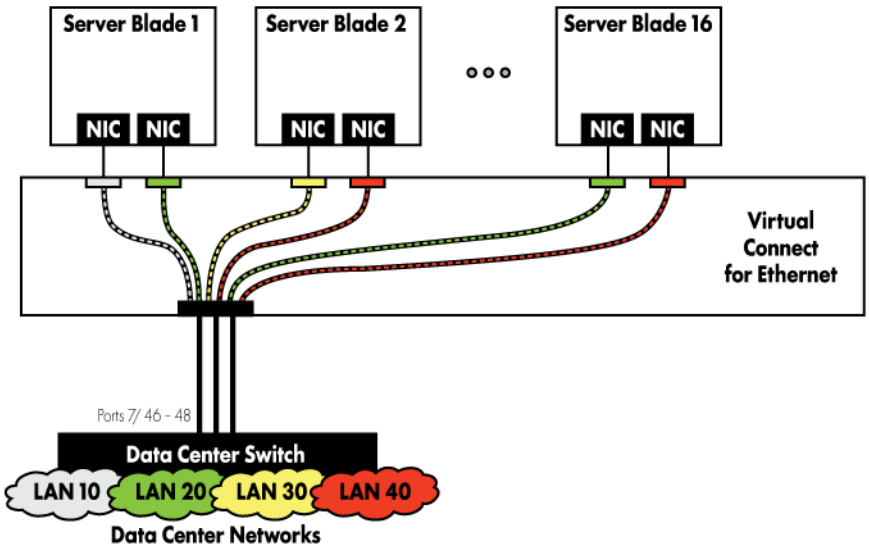
When mapping FCoE networks to a shared uplink set, the shared uplink set uplink port must be connected to a supported FCoE switch that is capable of splitting the converged Enet and FCoE traffic out into native FC or Enet, as it applies.

Configuration example using a Cisco Core switch

There are several ways to implement a redundant Virtual Connect configuration. This example provides a reference for anyone unfamiliar with switch configurations. This example is just one of several ways to connect an HP Virtual Connect to a Cisco Core switch. For more information, see *HP Virtual Connect for the Cisco Network Administrator* on the Functionality & Value tab of the HP BladeSystem Technical Resources website (http://www.hp.com/go/bladesystem/documentation).

Connecting Virtual Connect to a Cisco Core/distribution switch using a shared uplink set and VLAN tagging done at the VC/data center boundary

In the following example, LACP is used on the Cisco Switch to connect to a shared uplink set using three uplink ports. VLANs 10, 20, 30, and 40 from the network are tagged on the three shared uplink ports.



IMPORTANT: Change Channel Mode to LACP on the Cisco switch.

By default, all ports on a Catalyst 4500/4000 switch and a Catalyst 6500/6000 switch use channel protocol PAgP and are not running LACP. For all ports concerned, you must change the channel mode to LACP.

On switches running CatOS, you can only change channel mode per module. In the following example, change the channel mode for slots 1 and 2 by using the following command:

```
set channelprotocol lacp module_number
```

Verify the changes by using the following command:

```
show channelprotocol.

CatOSSwitch (enable) set channelprotocol lacp 1
Mod 1 is set to LACP protocol.
CatOSSwitch (enable) set channelprotocol lacp 2
Mod 2 is set to LACP protocol.
CatOSSwitch (enable) show channelprotocol
        Channel
Module  Protocol
------- --------
1           LACP
2           LACP
3           PAGP
5           PAGP
```

On switches running Cisco IOS Software, specify which interfaces should be using LACP by entering the following interface configuration command:

```
channel-protocol lacp:

CiscoIOSSwitch(config-if)#channel-protocol lacp
```

Example switch configuration of a Cat 6500 switch using IOS. Ports 7/46, 7/47, and 7/48 on the Cat 6500 switch are used to uplink to the Virtual Connect module:

```
interface Port-channel10
switchport
switchport trunk encapsulation dot1q
switchport trunk allowed vlan 10,20,30,40
switchport mode trunk
no ip address

interface GigabitEthernet7/46
description test-VC
switchport
switchport trunk encapsulation dot1q
switchport trunk allowed vlan 10,20,30,40
switchport mode trunk
no ip address
speed 1000
channel-protocol lacp
channel-group 10 mode active
!
interface GigabitEthernet7/47
description test-VC
switchport
switchport trunk encapsulation dot1q
switchport trunk allowed vlan 10,20,30,40
switchport mode trunk
no ip address
speed 1000
channel-protocol lacp
```

```
channel-group 10 mode active
!
interface GigabitEthernet7/48
description test-VC
switchport
switchport trunk encapsulation dot1q
switchport trunk allowed vlan 10,20,30,40
switchport mode trunk
no ip address
speed 1000
channel-protocol lacp
channel-group 10 mode active
```

Failover and check-pointing

VCM runs as a high-availability pair when VC-Enet modules are installed in horizontally adjacent interconnect bays. The active VCM is usually on the lowest odd numbered bay when the enclosure is powered up.

Each time a configuration is changed, it is written to local flash memory and then check-pointed to the standby module. Configurations can also be backed up to a workstation using the GUI or Virtual Connect Support Utility.

NOTE: HP recommends saving a configuration after each session and before updating firmware.

Interconnect module removal and replacement

Virtual Connect modules

It is not necessary to remove the module from the domain if the module is not in use. The module is removed automatically from the domain without user intervention.

Replacing a primary or backup VC module with a different VC module type is not allowed without first deleting the domain.

If a module is in use and configured by the domain at the time it is physically removed from an enclosure, then the module is marked as MISSING, and can only be replaced by a module of the same model and type. If an in-use module is replaced by a module of a different type, then it is marked as INCOMPATIBLE by the domain.

If a module being physically removed is the primary module of a primary bay pair, then it is marked as MISSING and can only be replaced by a module of the same type.

A VC-Enet module is in use if any of the following conditions exist:

- The module physically exists in an interconnect bay using VC release prior to 3.00.
- The uplink and downlink ports of the module are being used by one or more networks, uplink sets, or profiles.
- Port monitoring is enabled for the interconnect module.

A VC-FC capable module is in use if any the following conditions exist:

- The module physically exists in an interconnect bay using VC release prior to 3.00.

- The uplink ports of the module are being used by a fabric that is being used by a profile.
- The module is part of a FC bay group in a multi-enclosure configuration where other FC modules exist in the bay group.

If a VC-FC module is replaced with a spare VC-FC module without powering down the servers, and if the server has profiles assigned to it with FC connections, servers are allowed to log in for a brief period through an uplink of the new module, provided that the uplink is connected to the fabric. Approximately 8 seconds after discovering the new VC-FC module, VCM configures it with the correct information, mapping downlinks to the correct uplinks. To work around this problem, power down the servers in the enclosure before replacing or swapping FC modules. Alternatively, do not connect the VC-FC uplinks to the fabric until VCM recognizes and configures the VC-FC module.

When adding VC interconnect modules to a VC managed enclosure, wait until the modules have been fully integrated into the current domain before attempting to make configuration changes to the VC domain. These changes include adding or editing networks, fabrics, profiles, and shared uplink sets. Verify that the domain status is clear for the newly added interconnect module before making any changes to the configuration. Modifying the configuration before the integration is complete can cause unexpected behavior such as incorrect/invalid connections in a profile.

Upgrading to an HP Virtual Connect 8Gb 24-Port FC Module

Upgrading to an HP VC 8Gb 24-Port FC Module requires several important steps, depending on the starting configuration.

Replacing an HP 4Gb VC-FC Module, HP VC 4Gb FC Module, or HP 8Gb 20-Port FC Module with an HP VC 8Gb 24-Port FC Module

1. Upgrade the VC domain firmware to the latest supported version. See "VC module supported firmware (on page 9)."
2. Verify that the replacement will result in a good configuration. See "Multiple enclosure requirements (on page 31)."
3. Verify that the user has server and storage role permissions.
4. Remove any FC profile connections that are connected to the interconnect bays being upgraded. To remove the profile connections, un-assign the profile, and then delete the connections from the profile.
5. If any FC SAN fabrics were created using uplinks from the interconnect bays that are being upgraded, delete these FC SAN fabrics from the Virtual Connect domain.
6. Physically remove the existing modules from BOTH horizontally adjacent bays for each enclosure in the domain. In a double-dense domain, remove the modules from Bay 7 and Bay 8 when removing modules in Bay 5 and Bay 6.
7. Ensure that the VC-FC modules are no longer shown in the domain.
8. Install the HP VC 8Gb 24-Port FC Modules.
9. Re-create previously deleted FC SAN fabrics.
10. Re-assign the server profiles, and then add the FC connections to the profiles.

Upgrading to an HP Virtual Connect 8Gb 20-Port FC Module

Replacing an HP 4Gb VC-FC Module or HP VC 4Gb FC Module with an HP VC 8Gb 20-Port FC Module

1. Upgrade the VC domain firmware to the latest supported version. See "VC module supported firmware (on page 9)."

2. Physically remove the existing module.
3. Install the HP VC 8Gb 20-port FC Module.

No additional steps are required.

Replacing an HP 8Gb 24-Port FC Module with an HP VC 8Gb 20-Port FC Module

1. Upgrade the VC domain firmware to the latest supported version. See "VC module supported firmware (on page 9)."
2. Verify that the replacement will result in a good configuration. See "Multiple enclosure requirements (on page 31)."
3. Verify that the user has server and storage role permissions.
4. Remove any FC profile connections that are connected to the interconnect bays being upgraded. To remove a profile connection, un-assign the profile, and then delete the connections from the profile.
5. If any FC SAN fabrics were created using uplinks from the interconnect bays that are being upgraded, delete these FC SAN fabrics from the Virtual Connect domain.
6. Physically remove the existing modules from BOTH horizontally adjacent bays for each enclosure in the domain. In a double-dense domain, remove the modules from Bay 7 and Bay 8 when removing modules in Bay 5 and Bay 6.
7. Ensure that the VC-FC modules are no longer shown in the domain.
8. Install the HP VC 8Gb 20-port FC Modules.
9. Re-create previously deleted FC SAN fabrics.
10. Re-assign the server profiles, and then add the FC connections to the profiles.

Possible errors

If the previous steps are not followed exactly, the module might be set to the UNKNOWN or INCOMPATIBLE state depending on how the error state was reached. Physically remove the module. Then, insert the correct module type.

If the previous steps have been followed and the server is not connecting properly to the network, power down the server, and then power it back up.

Upgrading or removing an HP Virtual Connect Flex-10, HP Virtual Connect FlexFabric, or HP Virtual Connect Flex-10/10D module

Upgrading an enclosure to Flex-10 or FlexFabric support or removing Flex-10 support requires several steps, depending on the starting configuration.

- For more information on individual module requirements, see "Installation requirements (on page 15)".
- For detailed migration information, see the *HP Virtual Connection Migration Guide* technical white paper on the HP website (http://h20564.www2.hp.com/portal/site/hpsc/public/kb/docDisplay/?docId=emr_na-c03885329).

Replacing a Virtual Connect Ethernet module with an HP Virtual Connect Flex-10, HP FlexFabric, or HP Flex-10/10D module in a horizontally adjacent bay pair hosting VC Manager (the horizontal bays housing primary and/or backup modules)

CAUTION: Replacing the primary/backup bay pair modules with modules of a different type requires the creation of a new VC domain, creating the probability that VC managed identifiers (MAC, WWN, and serial numbers) could be assigned to different server ports or slots from the original VC domain.
The *HP Virtual Connection Migration Guide* technical white paper on the HP website (http://h20564.www2.hp.com/portal/site/hpsc/public/kb/docDisplay/?docId=emr_na-c03885329) details a procedure for upgrading to newer Virtual Connect modules while maintaining the same VC-managed identifiers.

1. Upgrade the VC domain firmware to the latest supported version. See "VC module supported firmware (on page 9)".
2. Delete the domain.
3. Remove all network uplinks from the modules to be removed.
4. Remove the existing modules from both horizontally adjacent bays.
5. Install the HP Virtual Connect Flex-10, FlexFabric, or Flex-10/10D modules.
6. Import one or more enclosures and create a new VC domain. If available, a user-created CLI script file can accelerate VC domain recreation. However, be sure to verify the settings because VC-managed identifiers, such as MAC, WWN, and serial numbers, might not match the original VC domain settings.

Replacing a Virtual Connect Ethernet module with an HP Virtual Connect Flex-10, HP FlexFabric, or HP Flex-10/10D module in a horizontally adjacent bay pair not hosting VC Manager

1. Upgrade the VC domain firmware to the latest supported version. See "VC module supported firmware (on page 9)".
2. Save the configuration.
3. If any Flex-10 NICs with profile connections are connected to the interconnect bays being upgraded, the profile connections must be removed. To remove a profile connection, unassign the profile (recommended) or delete the connection from the profile.
4. Remove all network uplinks from the modules to be removed.
5. Remove the existing modules from both horizontally adjacent bays.
6. Ensure that the modules are removed from the Virtual Connect GUI. If the modules still appear on the GUI, there are still profiles with connections to the modules or networks with uplinks on the modules. Do not proceed until the modules are removed.
7. Install the HP Virtual Connect Flex-10, FlexFabric, or Flex-10/10D modules.
8. Reassign the server profiles or add the connections to the profiles, depending on what was done in step 3.

Replacing an HP Virtual Connect Flex-10, HP FlexFabric, or HP Flex-10/10D module with a Virtual Connect Ethernet module in a horizontally adjacent bay pair hosting VC Manager (the horizontal bays housing primary and/or backup modules)

CAUTION: Replacing the primary/backup bay pair modules with modules of a different type requires the creation of a new VC domain, creating the probability that VC managed identifiers (MAC, WWN, and serial numbers) could be assigned to different server ports or slots from the original VC domain.
The *HP Virtual Connection Migration Guide* technical white paper on the HP website (http://h20564.www2.hp.com/portal/site/hpsc/public/kb/docDisplay/?docId=emr_na-c03885329) details a procedure for upgrading to newer Virtual Connect modules while maintaining the same VC-managed identifiers.

1. Delete the domain.
2. Remove all network uplinks from the modules to be removed.
3. Remove the existing Flex-10, FlexFabric, or Flex-10/10D modules from both horizontally adjacent bays.
4. Install the Virtual Connect Ethernet modules.
5. Import one or more enclosures and create a new VC domain. If available, a user-created CLI script file may accelerate VC domain recreation. However, be sure to verify the settings because VC-managed identifiers, such as MAC, WWN, and Serial Numbers, might not match the original VC domain settings.

Replacing an HP Virtual Connect Flex-10, HP FlexFabric, or HP Flex-10/10D module with a Virtual Connect Ethernet module in a horizontally adjacent bay pair not hosting VC Manager

1. If any Flex-10 NICs with profile connections are connected to the interconnect bays being upgraded, then the profile connections must be removed. To remove a profile connection, unassign the profile (recommended) or delete the connection from the profile.
2. Remove all network uplinks from the modules to be removed.
3. Remove the existing Flex-10, FlexFabric, or Flex-10/10D modules from both horizontally adjacent bays.
4. Ensure that the modules are removed from the Virtual Connect GUI. If the modules still appear on the GUI, there are still profiles with connections to the modules or networks with uplinks on the modules. Do not proceed until the modules are removed.
5. Install the Virtual Connect Ethernet modules.
6. Reassign the server profiles or add the connections to the profiles, depending on what was done in step 1.

Possible errors

If the previous steps are not followed exactly, the newly inserted module might be set to the UNKNOWN or INCOMPATIBLE state, depending on how the error state was reached. To correct this error:

1. Physically remove the module.
2. Insert the original module.
3. Ensure that all profiles have been unassigned.
4. Remove the module.
5. Verify that the module is removed from the GUI.
6. Insert the correct module type.

If the previous steps have been followed and the server is not connecting properly to the network, power down the server, and then power it back up.

Upgrading to an HP Virtual Connect FlexFabric module from a VC-FC module

Replacing any VC-FC module with an HP VC FlexFabric module:

1. Upgrade the VC domain firmware to the latest supported version. See "VC module supported firmware (on page 9)."

2. Verify that the replacement will result in a good configuration. See "Multiple enclosure requirements (on page 31)."
3. Verify that the user has server and storage role permissions.
4. Remove any FC profile connections that are connected to the interconnect bays being upgraded by deleting the connections from the profile.
5. If any FC SAN fabrics were created using uplinks from the interconnect bays being upgraded, delete these FC SAN fabrics from the Virtual Connect domain.
6. Physically remove the existing modules from both horizontally adjacent bays.
7. Ensure that the VC-FC modules are no longer shown in the domain.
8. Replace the server blade FC HBA mezzanine cards with FlexFabric Adapter mezzanine cards.
9. Install the HP VC FlexFabric Modules with the appropriate FC SFP+ transceivers.
10. Recreate the previously deleted FC SAN fabrics.
11. Add FCoE connections to the profiles.
12. Power up the server and install the appropriate drivers for the FlexFabric Adapter mezzanine card.

Onboard Administrator modules

Replacing the OA in an enclosure containing only one OA causes the OA to leave VC mode. This mode change requires VC Manager to re-establish credentials with the OA. During this process, VC Manager rewrites all server settings and sets the state of the servers to "profile recovered." There should not be any disruption to the servers, but the administrator should be sure that all servers have the correct MAC addresses and WWNs. Powering off the server clears the "profile recovered" state. If any servers are rebooted or power-cycled while the credential recovery occurs, the MAC addresses and WWNs might be returned to the factory default settings.

HP Virtual Connect Manager

Configuring browser support

Access to the VCM GUI is provided through HTTPS (HTTP exchanged over an SSL-encrypted session) and requires HTTPS (port 443) to be enabled on the management network.

The minimum supported screen resolution is 1024 x 768 with 256 colors. For optimal viewing, HP recommends setting the screen resolution to 1280 x 1024.

Requirements

The VCM web interface requires an XSLT-enabled browser with support for JavaScript 1.3 or the equivalent.

The following browsers are supported:

- Microsoft Internet Explorer 10.x and 11.x
- Mozilla Firefox ESR 24 and 29.x

Browsers that provide the required functionality but do not appear in the previous list are not prevented from running the application, but no support is offered for unlisted browsers.

If you receive a notice that your browser does not have the required functionality, examine your browser settings to ensure they meet the following requirements or contact your administrator.

The use of third-party browser download managers is not supported or recommended when using Virtual Connect. Using third-party download managers might cause some VC file download functionality to work incorrectly, for example, when saving the domain configuration, downloading a support information file, and so on.

The following browser settings must be enabled before running the application:

- **JavaScript**

  Client-side JavaScript is used extensively by this application. Check the browser settings to make sure JavaScript is enabled before running the application.

- **ActiveX**

  When using Microsoft Internet Explorer with this application, ActiveX must be enabled. Check the browser settings to make sure ActiveX is enabled before running the application.

- **Adobe Flash Player**

  VC 4.30/4.31 requires Adobe Flash Player 11.1 or higher before you can log in. HP recommends updating to Adobe Flash Player 13 or higher for Windows and 11.2 for Linux systems.

  The recommended Adobe Flash Player web browser plug-in can be downloaded and installed from the Adobe website (http://get.adobe.com/flashplayer/), or downloaded as a standalone executable from the Adobe website (http://www.adobe.com/downloads).

  For the latest Adobe Flash Player Security Bulletin Updates, see the Adobe website (http://www.adobe.com/support/security/index.html#flashplayer).

- **Pop-up windows**

Pop-up windows must be enabled for certain features to function correctly. Check the browser settings to make sure pop-up blockers are not enabled before running the application.

- **Cookies**

  Cookies must be enabled for certain features to function correctly. Check your browser settings to make sure cookies are enabled before running the application.

- **TLS 1.2**

  When managing Virtual Connect domains in FIPS mode, TLSv1.2 must be enabled in the browser.

  The following browser versions support TLS 1.2 natively:

  - Internet Explorer 11 and above
  - Mozilla Firefox 27 and above

  The following browser versions disable TLS 1.2 by default. Be sure to enable TLS 1.2 before attempting to access the VCM GUI:

  - Internet Explorer 8, 9, and 10
  - Mozilla Firefox 24, 25, and 26

To enable TLS 1.2 for Internet Explorer:

a. Click **Tools**, and then select **Internet Options**.
b. Select the **Advanced** tab.
c. Scroll down to the **Security** section, and then check the **Use TLS 1.2** checkbox.

To enable TLS 1.2 for Mozilla Firefox:

a. Enter `about:config` in the URL address bar.

   If prompted, read the warning statement.
b. Search for the TLS preference setting. Enter the following string into the preference search bar:

   `security.tls.version.max`
c. Set the value to **3**.

Virtual Connect and Insight Control Server Deployment

If you plan on using VC-assigned MAC addresses and WWNs and are also working with server software that will be licensed by MAC addresses or WWNs, assign server profiles before deploying an image through HP Insight Control Server Deployment or attaching the license.

Always apply relevant licenses that are dependent on MAC addresses after the server profiles are assigned so that the licenses are not lost due to a change in MAC address.

IMPORTANT: If you plan to use Insight Control Server Deployment for RedHat Linux installation and also plan to use User- or HP-defined MAC addresses, you must import the enclosure and assign profiles before running Insight Control Server Deployment.

"Rip and replace" is not supported in a Virtual Connect environment.

For more information on HP Insight Control Server Deployment, see the HP website (http://www.hp.com/servers/rdp).

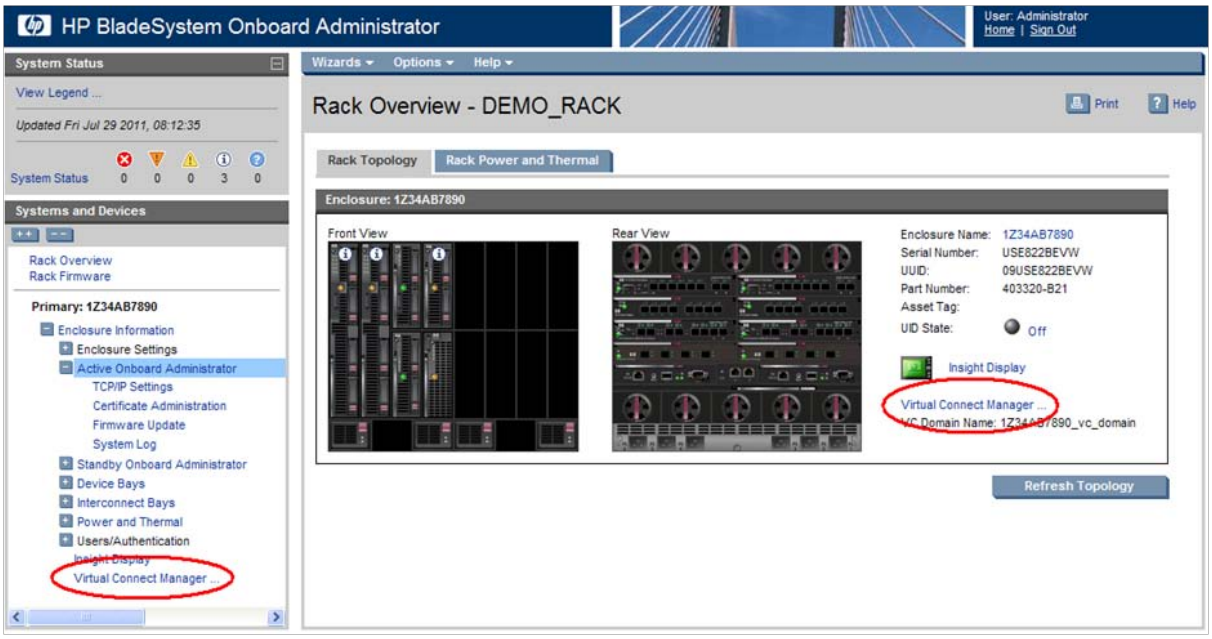
Accessing HP Virtual Connect Manager

Access to VCM occurs over the same Ethernet connection used to access the enclosure Onboard Administrator and server blade iLO connections.

Access VCM in one of the following ways:

- If the management network uses dynamic DNS, locate the Default Network Settings label on the primary VC-Enet module, and then type the DNS name into the address field of the web browser.

  If the management network does not use dynamic DNS, use the Onboard Administrator to access VCM.
- Log on to the enclosure Onboard Administrator. From the rack overview screen, select the **Virtual Connect Manager** link from the left navigation tree.



- Log on to the enclosure Onboard Administrator. To display the Interconnect Bays summary screen, select **Interconnect Bays** in the left navigation tree of the Onboard Administrator user interface. Select the **Management URL** link for the primary VC-Enet module.

  VCM typically operates on the primary VC-Enet module unless that module becomes unavailable, causing a failover to the backup VC-Enet module. If you cannot connect to the primary VC-Enet module, try connecting to the management URL for the backup VC-Enet module.
- Access the VCM CLI remotely through an SSH session by connecting to the VC-Enet module management IP address.

In a multi-enclosure VC domain, VCM runs on the primary module in the primary enclosure. If both the primary and backup modules in the primary enclosure fail, are powered off, or are removed, VCM is not accessible.

Command Line Interface overview

The VCM Command Line Interface can be used as an alternative method for administering the VCM. Using the CLI can be useful in the following scenarios:

- You can develop tools that utilize VCM functions for data collection and for executing provisioning and configuration tasks.
- When no browser is available or you prefer to use a command line interface, you can access management data and perform configuration tasks.
- You can batch commands using script files. These script files can be run manually or scheduled to run automatically.

For more information, see the *HP Virtual Connect Manager Command Line Interface for c-Class BladeSystem User Guide* on HP website (http://www.hp.com/go/vc/manuals).

Logging on to the HP Virtual Connect Manager GUI

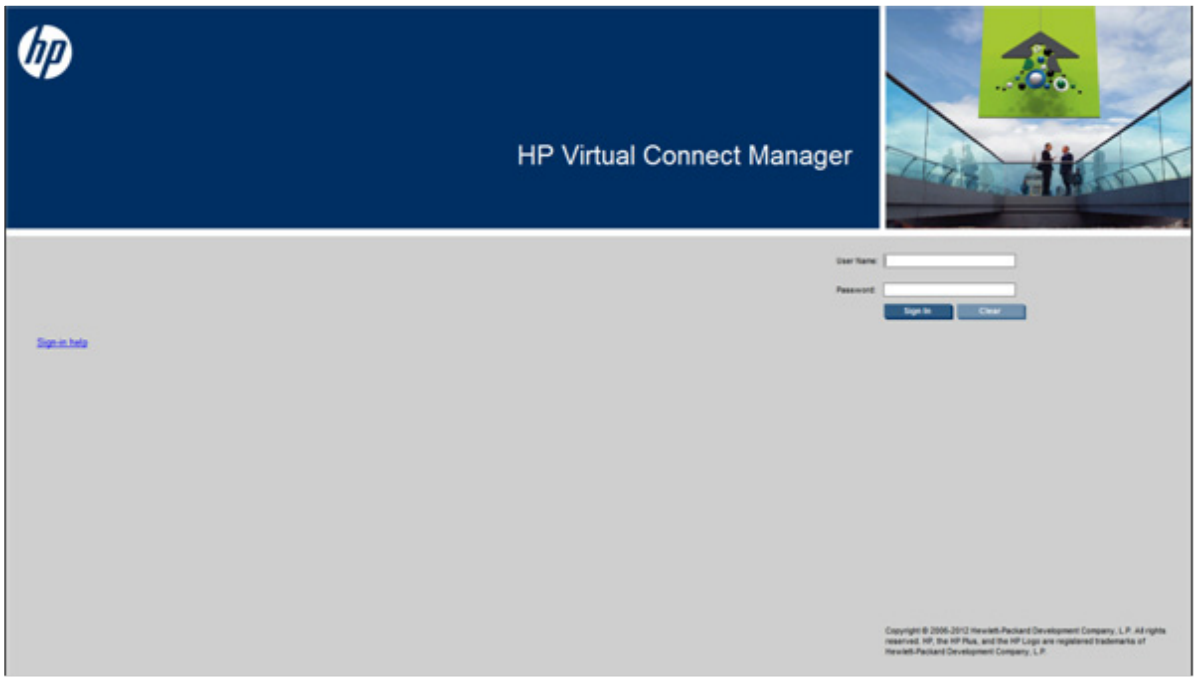
Log on using the user name (Administrator) and password.

You can optionally specify the authentication method or VCM role at log on:

- To specify the authentication method (local, ldap, radius, tacacs), enter the authentication method followed by a colon before the user name. For example, `ldap:user1`.
- To specify the VCM role (domain, network, server, storage), enter the role followed by a colon before the user name. For example, `network:user1`.

For more information on authentication methods and VCM roles, see the information about Virtual Connect users and roles in the *HP Virtual Connect for c-Class BladeSystem User Guide* on the HP website (http://www.hp.com/go/vc/manuals).

If the default password for the Administrator user has been changed and needs to be restored, see "Resetting the Administrator password and DNS settings (on page 128)."



Logon problems might be caused by the following:

- You have recently upgraded the VCM firmware. You might have to clear the browser cache before attempting to log on again.

- The information is not being entered correctly. User names and passwords are case-sensitive.
- The account being entered is not an account for VCM.
- The account being entered has been deleted, disabled, or locked out.
- The password for the account needs to be changed.
- There is no connection to the primary VC-Enet module running VCM.
- VCM is undergoing a failover or recovery.
- The attempted IP sign-in address is not valid for the specified account.
- The attempted IP sign-in address is for a VC-Enet module not running the primary VCM.
- The browser settings are incorrect. See "Configuring browser support (on page 58)."
- You have entered an invalid role or authentication service name.
- Authentication service is disabled, is not correctly configured, or is not up in the server.

About HP Virtual Connect Manager

To view detailed product information, select **About HP Virtual Connect Manager** from the Help pull-down menu.

Reset Virtual Connect Manager

You must have domain privileges to reset VCM. In a multi-enclosure environment, the VC-Enet modules in bays 1 and 2 of the local enclosure host VCM. With VC 3.10 and higher, the primary modules can be in bays other than 1 and 2.

To reset VCM running on the primary VC-Enet module, select **Reset Virtual Connect Manager** from the Tools pull-down menu. The Reset Virtual Connect Manager screen appears.

- If the Force Failover checkbox is selected and a VC-Enet module is available in the alternate interconnect bay, the GUI is redirected to the alternate VC-Enet module for log on after the VCM has restarted. Reset times depend on the size and complexity of the VC domain configuration.
- If the Force Failover checkbox is not selected or a VC-Enet module is not available in the alternate interconnect bay, the VCM restarts on the current VC-Enet module, and you are presented the logon screen for the current VC-Enet module after VCM restarts. Reset times depend on the size and complexity of the VC domain configuration.

When resetting the VC-Enet module, VCM is temporarily unavailable. If failover is specified and a backup VC-Enet module is available, you are logged off and redirected to the backup VC-Enet module IP address.

Recovering remote enclosures

The credentials of the remote enclosure must be restored in the following situations:

- A previously saved configuration file is restored.
- The Onboard Administrator is reset to factory defaults.
- The Onboard Administrator associated with the remote enclosure is replaced.

If the IP address of the OA in the remote enclosure is lost, the remote enclosure is also marked as NO-COMM. If IP connectivity is lost, credential recovery is not required. The enclosure automatically recovers after connectivity is returned.

Running the setup wizards

HP Virtual Connect Domain Setup Wizard

A Virtual Connect domain consists of an enclosure and a set of associated modules and server blades that are managed together by a single instance of the VCM. The Virtual Connect domain contains specified networks, server profiles, and user accounts that simplify the setup and administration of server connections. Establishing a Virtual Connect domain enables you to upgrade, replace, or move servers within your enclosures without changes being visible to the external LAN/SAN environments.

Beginning with VC 4.10, an auto-deployment feature allows for the configuration of a VC domain from a centralized location using DHCP and TFTP to access the configuration script. Auto-deployment is supported only for single-enclosure domains. For more information on auto-deployment, see the *HP Virtual Connect for c-Class BladeSystem User Guide* on the HP website (http://www.hp.com/go/vc/manuals).

Plan your interconnect module usage carefully before running the Virtual Connect Domain Setup Wizard. After an interconnect bay is configured for use with a VC module, it remains configured for that module type until the module is removed or the overall VC domain is deleted. Virtual Connect reports failures for any VC module that is removed from the domain.

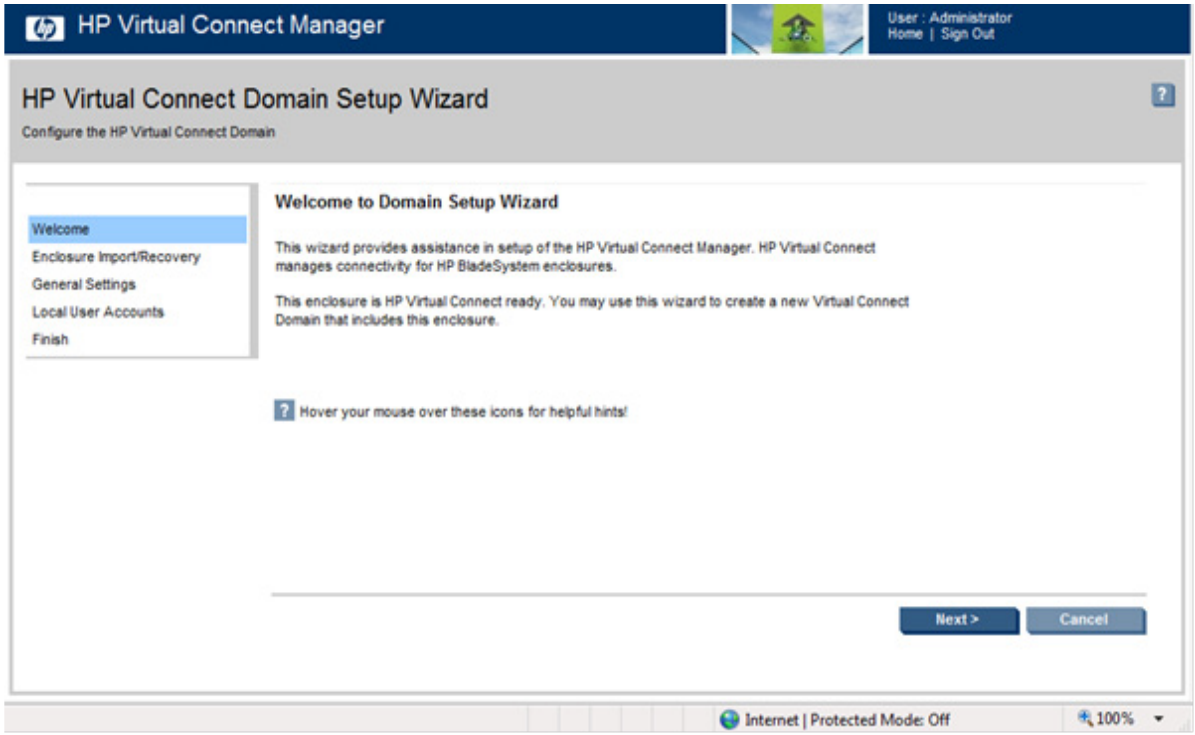
Before getting started, perform the following tasks:

- Verify that the HP Onboard Administrator is running the latest firmware. HP recommends using the latest version available. Using IPv6 requires OA 4.01 or higher.
- Note the following information from the Default Network Settings label attached to the primary module:
  - DNS name
  - User name
  - Password
- Connect any Ethernet module stacking cables ("Recommended stacking connections" on page 24).

After logging in for the first time, the Virtual Connect Domain Setup Wizard appears. This wizard walks you through the following tasks:

- Importing the enclosure (creating the domain)
- Naming the domain
- Administrating local users

If the wizard is canceled before an enclosure is imported, you are returned to the Virtual Connect login page. An enclosure must be imported to proceed.



Local Enclosure

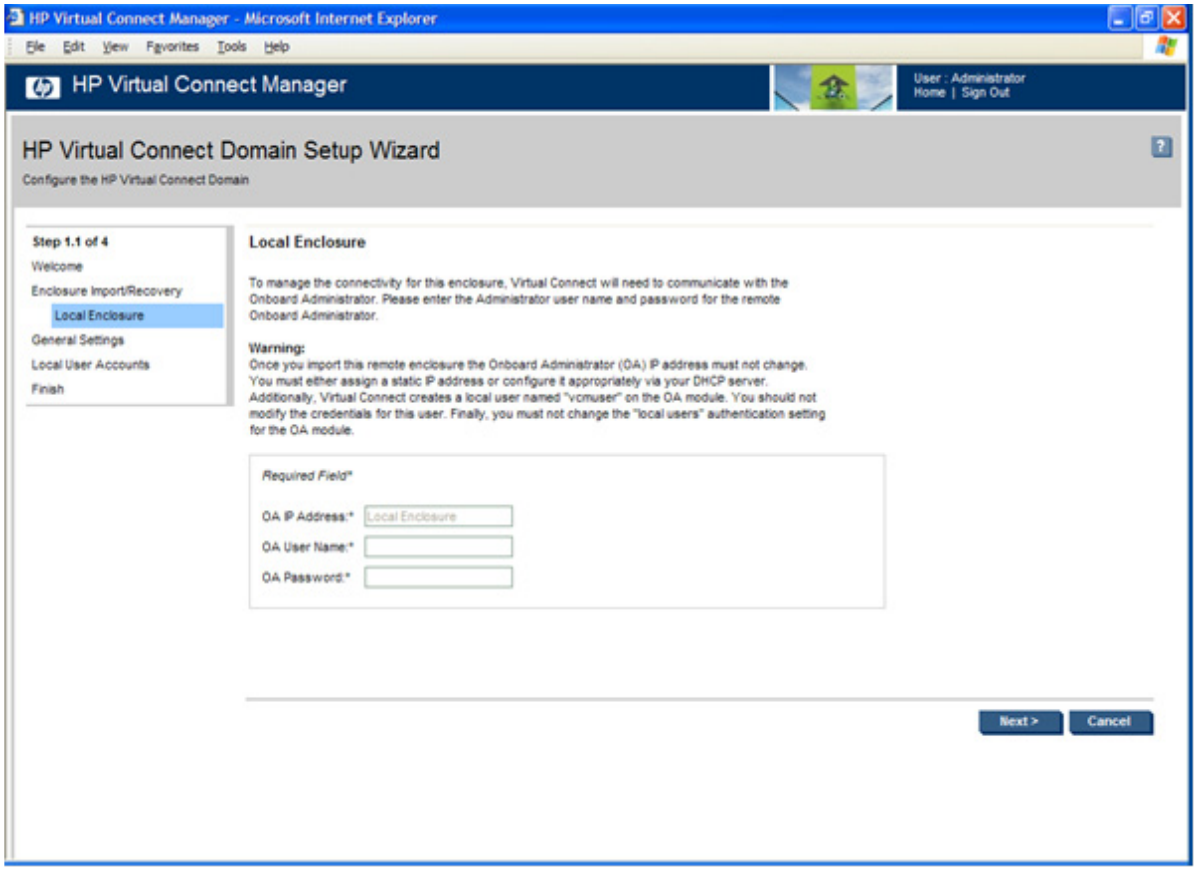
To communicate with other VC modules and server blades, VCM requires the logon credentials for the local Onboard Administrator.

> **IMPORTANT:** An Onboard Administrator user name and password with full administrative privileges for the selected enclosure is required.

Enter the user name and password for the enclosure Onboard Administrator. The local enclosure is detected and selected automatically. If an error appears, it indicates that an invalid Onboard Administrator user name and password, or one without sufficient privileges, might have been used.

After you import the remote enclosure, the OA IP address must not change. You must always assign a static IP address or configure it appropriately through your DHCP server.

VCM creates a local user named "vcmuser" on the OA module. Do not modify the credentials for this user. Do not change the "local users" authentication setting for the OA module.



Enclosure Import/Recovery

After VCM has successfully established contact with the Onboard Administrator, you can create a Virtual Connect domain by importing the enclosure or by restoring a previously created Virtual Connect domain from a saved configuration file.

If you plan to use double density server blades, select the "Enable double dense server support (Restricts single dense server support)" checkbox to display server device bays as double density slots.

This option should only be selected if double-dense servers will be in use. Single-dense servers do not have access to I/O bays 7 and 8 when this option is selected.

> **NOTE:** This option cannot be modified. After the enclosure is imported, select the **Display single dense device bays** checkbox on the Domain Settings (Configuration) screen to display server device bays as single density slots again.

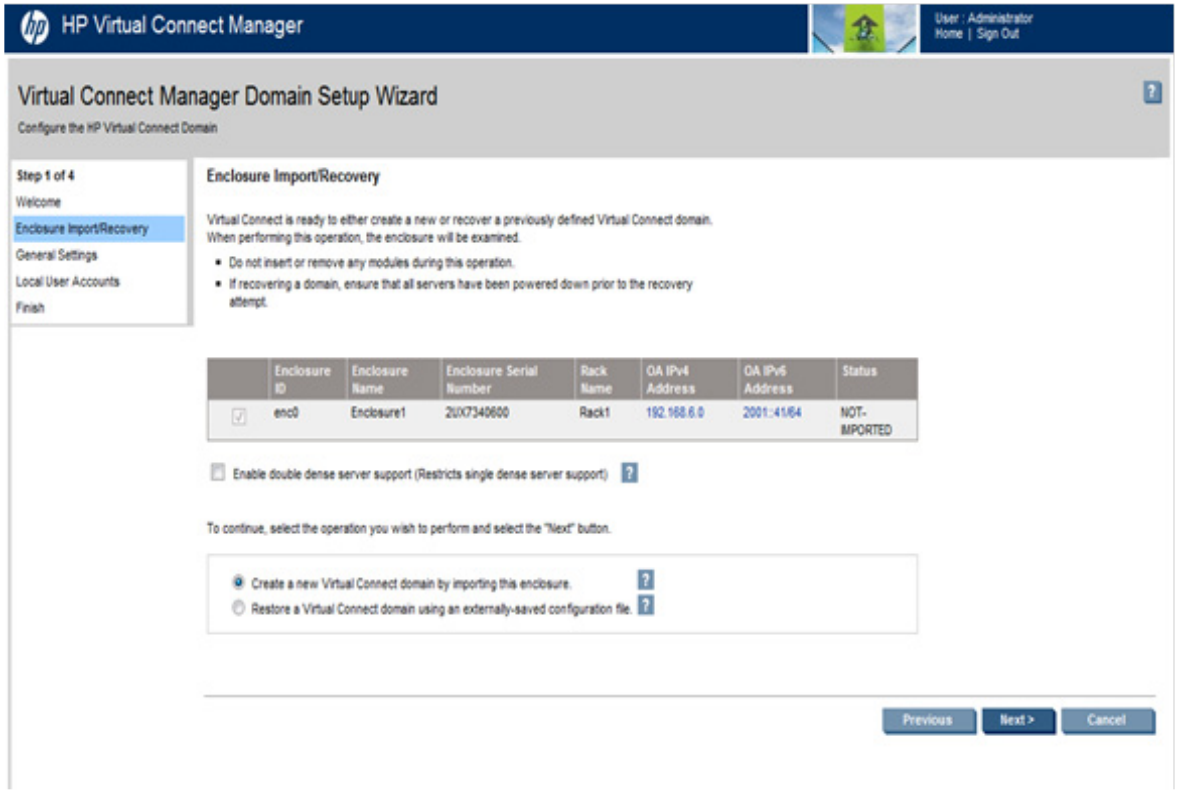
For more information, see "Using double-dense server blades (on page 68)."

Select the appropriate method for creating the Virtual Connect domain.

- To create the Virtual Connect domain by importing an enclosure, select the "Create a new Virtual Connect domain by importing this enclosure" radio button, and then click **Next**. This process can take several minutes as VCM establishes contact with each module in the enclosure and identifies its capabilities.

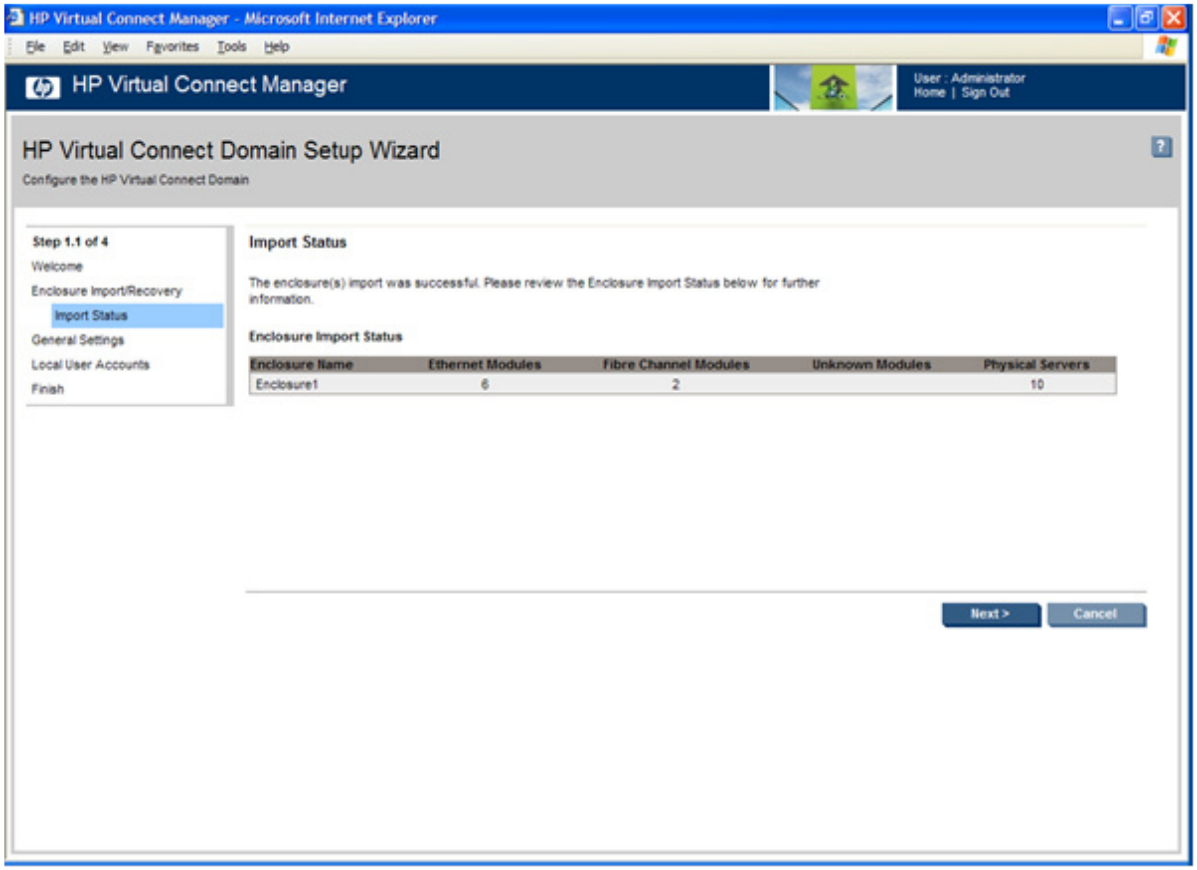
△ **CAUTION:** Restoring a Virtual Connect domain configuration from a backup file that was created on another Virtual Connect domain is not supported and can cause serious faults within this and other Virtual Connect Domains within the environment. The restore selection and configuration files should only be used to restore the same previously existing domain.

- To restore a domain using an existing configuration file, select the "Restore a Virtual Connect domain using an externally-saved configuration file" radio button, and then click **Next**.



Enclosure Import

After making the selection to create a new Virtual Connect domain by importing the enclosure on the Enclosure Import/Recovery screen, the Import Status screen appears and provides information about whether the import was successful. If the import is not successful, error information is displayed.



Importing additional enclosures

To import additional enclosures using the Domain Setup Wizard after the initial enclosure has been imported:

1. Select **Tools** > **Domain Setup Wizard**.
2. On the Enclosure Import Recovery screen, click **Find Enclosure**.
3. Click **Find Enclosure** to find additional enclosures.
4. Enter the OA IP address, user name, and password.
5. Select the checkbox next to the enclosures to import.
6. Click **Next**. The Import status screen appears so that you can verify a successful import.

To import additional enclosures using the Domain Settings screen:

1. Click the **Domain Settings** link on the Virtual Connect Home screen.
2. Click the **Domain Enclosures** tab.
3. Click **Add**.
4. Enter the appropriate OA information, and then click **OK**.
5. Select the checkbox next to the enclosure to import.

6. Click **Import**.

Using double-dense server blades

Virtual Connect Manager supports the use of double-dense server blades, enabling support for up to 32 device bays in a single c7000 enclosure. This support also provides 32 new device bays (1A-16A and 1B-16B) for profile assignment. On a c3000 enclosure, this feature supports 8 additional or 16 total device bays. (1A-8A and 1B-8B)

The two physical servers A and B in a double-dense server blade correspond to the left and the right sides of the device bay in c7000 enclosures, or the top and bottom of the device bay in c3000 enclosures. Servers A and B have independent iLO, power, presence, and status capabilities.

In c7000 enclosures, Bays 1A-16A are associated with the left sides of the double-dense server blades seated in the half-height bays 1-16. Bays 1B-16B are associated with the right sides of the double-dense server blades seated in the half-height bays 1-16. In c3000 enclosures, Bays 1A-8A are associated with the top of the double-dense server blades seated in the half-height bays 1-8. Bays 1B-8B are associated with the bottom of the double-dense server blades seated in the half-height bays 1-8.

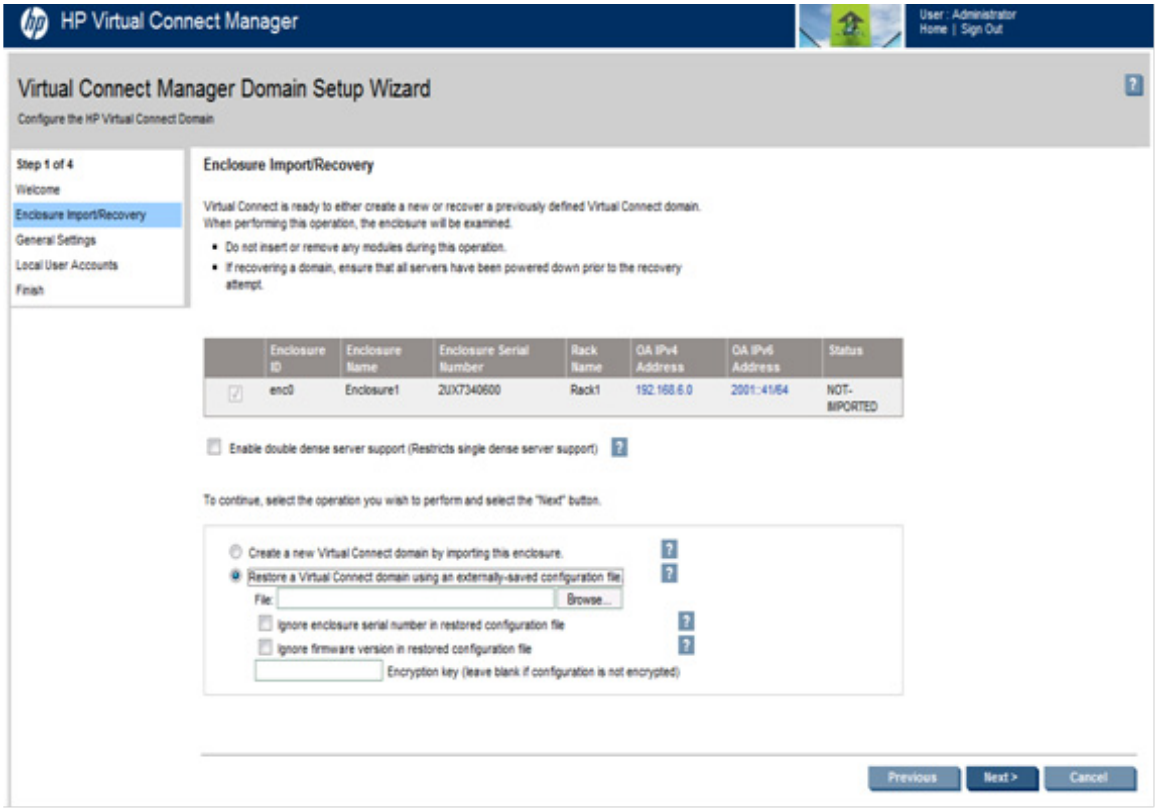
Enclosure recovery

If restoring a Virtual Connect domain using an externally saved configuration file, click **Browse** and locate the saved configuration file.

CAUTION: Restoring a Virtual Connect domain configuration from a backup file that was created on another Virtual Connect domain is not supported and can cause serious faults within this and other Virtual Connect Domains within the environment. The restore selection and configuration files should only be used to restore the same previously existing domain.

If the configuration file was originally created on an enclosure with a different serial number, the **Ignore enclosure serial number in restored configuration file** checkbox must be selected to allow it to be used in a new enclosure. Click **Next** to continue restoring the enclosure. At the end of the restoration, the browser returns to the login screen. After the domain is restored, one of the local user accounts from the original Virtual Connect domain must be used to login.

When restoring from the configuration file, remote enclosure credentials are lost. See "Recovering remote enclosures (on page 62)."

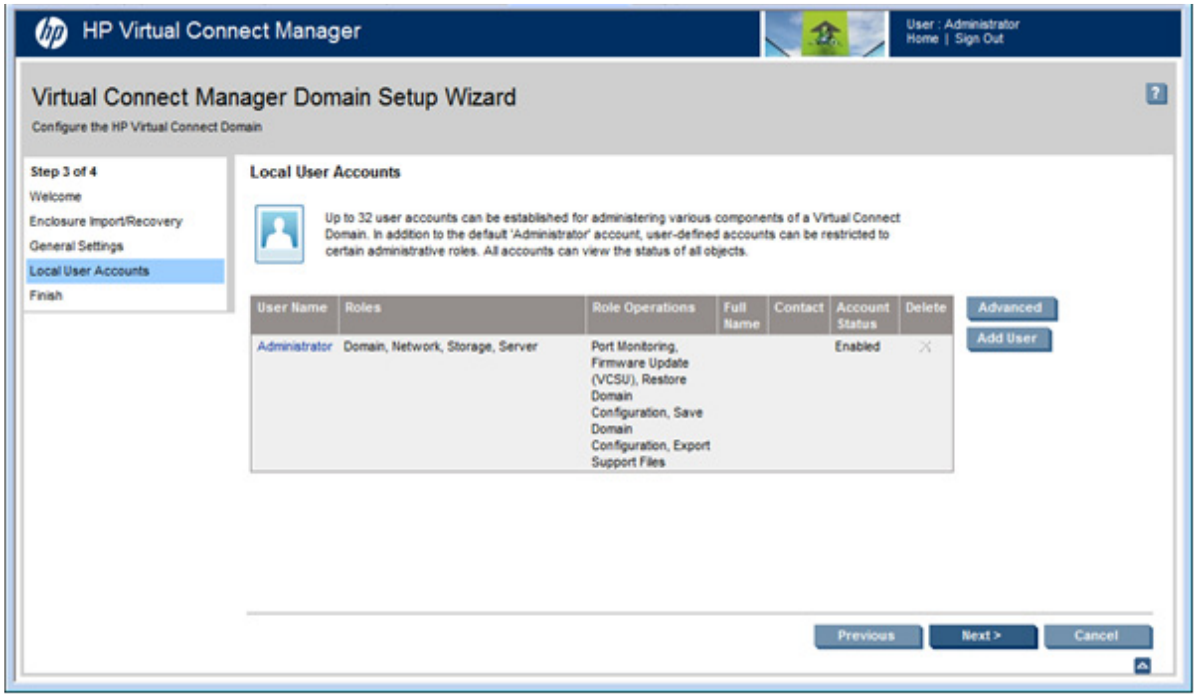


General Settings

The Virtual Connect domain name should be unique within the data center, and can be up to 31 characters without spaces or special characters.

The Domain Setup Wizard automatically assigns a domain name (enclosurename_vc_domain). This name can be changed when running the setup wizard, or at any time from the Domain Settings (Configuration) screen.

Local Users



The first time this screen appears, the Administrator account, which has all administrative user role permissions, might be the only user listed. The Administrator account cannot be deleted or have domain user role permissions removed. However, the Administrator password can be changed, and the network, server, and storage user role permissions can be removed. The default Administrator password is identified on the Default Network Settings label on the primary VC module.

To reset the Administrator password to the factory default, see "Resetting the Administrator password and DNS settings (on page 128)." Resetting the Administrator password using the system maintenance switch does not delete the VC domain, if configured. The password and DNS name of the module is reset to match the information included on the Default Network Settings label on the module.

The following tasks can be performed on this screen:

- To create a new local user account, click **Add**. The Add Local User screen appears.
- To edit attributes of a defined local account, click the **Edit** link in the user row.
- To delete a user account, select the checkbox next to the user name, and then click **Delete**.

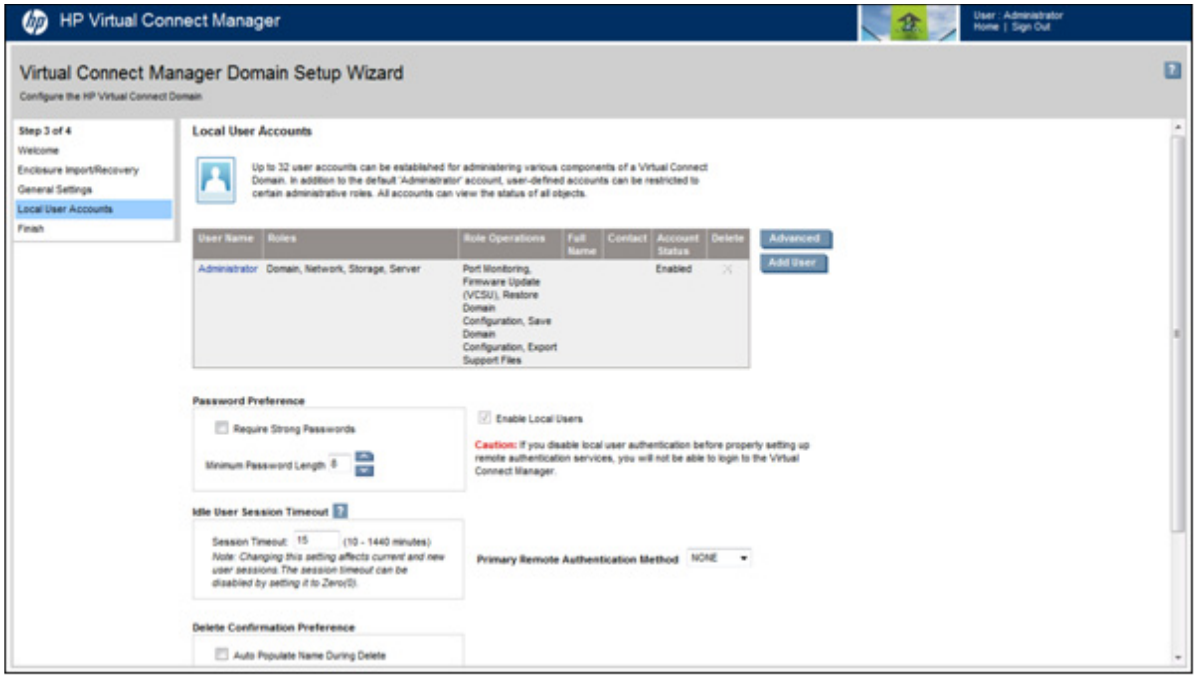
TIP: You can also highlight a user, right-click, and then select Add, Delete, or Edit from the pull-down menu.

- To enable strong passwords, select the **Require Strong Passwords** checkbox. Use the up and down arrows to select a password length between 3 and 40 characters. The default password length for a newly created domain is 8 characters. With strong passwords enabled, passwords must also contain at least one character from three of the following four categories:
  - Upper-case character
  - Lower-case character
  - Numeric character
  - Non-alphanumeric character

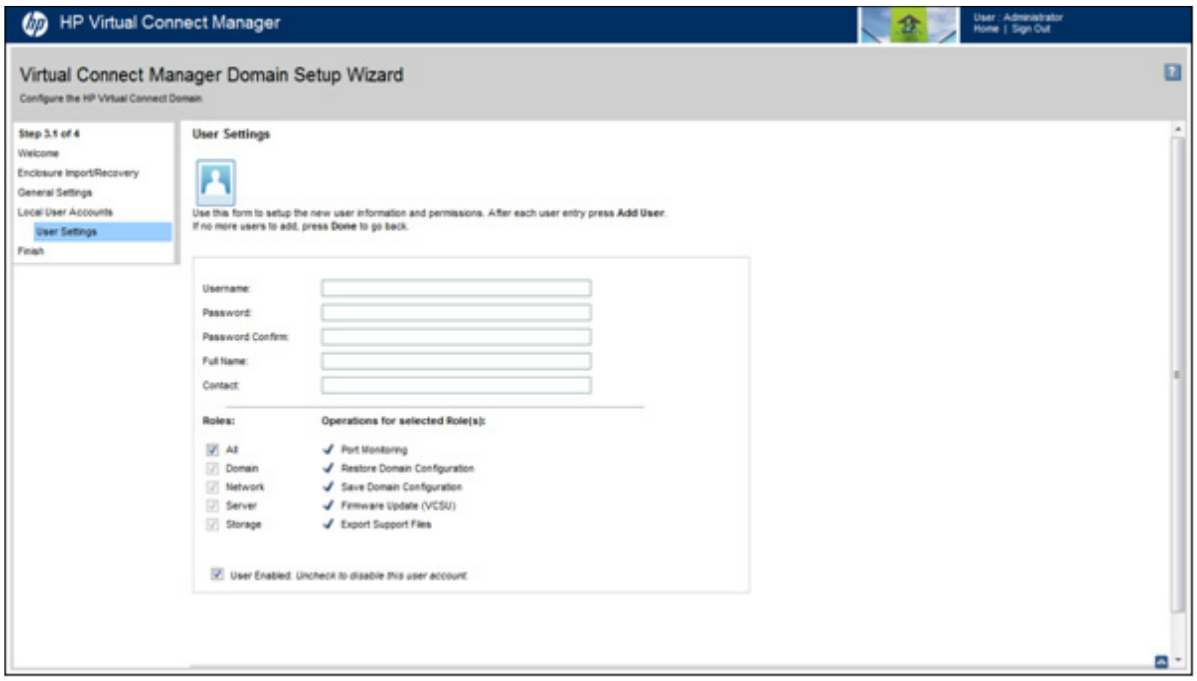
Click **Apply** to save your changes.

- To set a session timeout period, enter a number between 10 and 1440 in the Session Timeout box. To disable a session timeout period, enter 0. Click **Apply** to save your changes.

  Any change in the timeout value affects all open sessions and is applied to new sessions.
- To edit the delete confirmation preference, select or clear **Auto Populate Name During Delete Confirmation**, and then click **Apply**. VCM displays confirmation dialog boxes when deleting objects such as server profiles, networks, and so on. These dialog boxes require you to enter the name of the item you want to delete and, in some cases, you must also enter the word "delete." If you enable the Auto Populate Name During Delete option, the confirmation dialog boxes appear with the required information automatically populated, enabling you to simply click **OK** to proceed with the deletion. This is a domain-wide setting.
- To enable local users, select the **Enable Local Users** checkbox. To disable local users, clear the **Enable Local Users** checkbox. Click **Apply** to save your changes. You cannot disable local users if you are logged in as a local user. Log in as an LDAP, TACACS, or RADIUS authenticated user with domain privileges to disable local users.
- To select the Primary Remote Authentication Method, select an option from the Primary Remote Authentication Method list. Click **Apply** to save your changes. The Primary Remote Authentication Method is the primary authentication mechanism that triggers the re-enablement of local user authentication (if it was disabled) if the remote authentication servers are found to be unavailable during login by a remote VC user. Valid values include NONE, LDAP, RADIUS, and TACACS. The default value is NONE.



User Settings



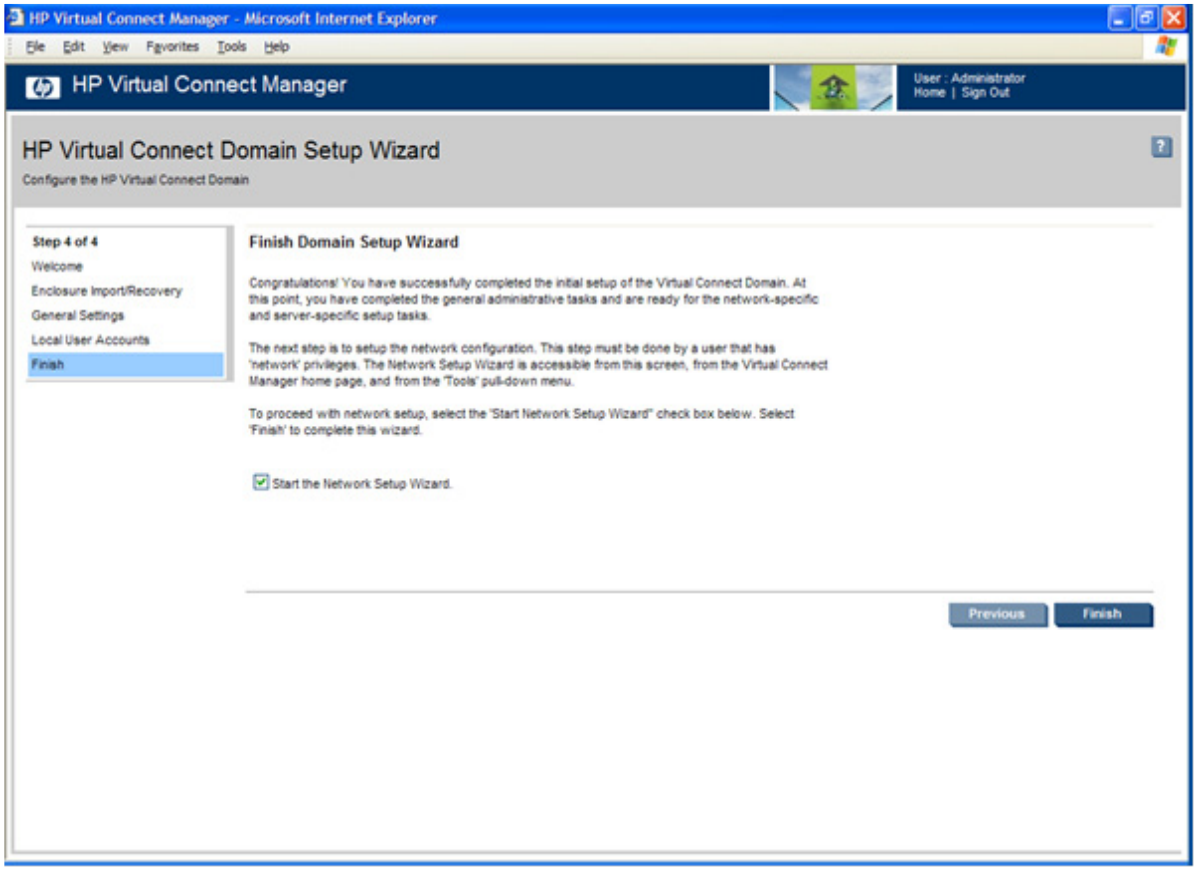
Observe the following user settings guidelines:

- Username is a required field.
- The Username field must contain an alpha-numeric value with 1 to 31 characters.
- The Password field must contain an alpha-numeric value with 3 to 40 characters. The default password length is 8 characters.
- If strong passwords are enabled, the password must contain the administrator-designated number of characters and at least one character from three of the following four categories:
  - Upper-case character
  - Lower-case character
  - Numeric character
  - Non-alphanumeric character
- The Full Name field can contain a value with a maximum value of 63 characters.
- The Contact field can contain a value with a maximum value of 127 characters.

Up to 32 local user accounts can be created. Each account can be set up to have a combination of up to four access roles: Domain, Network, Server, Storage. When a role is selected, the operations for that role are listed with a checkmark.

The operations assigned to each role can be edited on the Role Management (Role Operations) screen.

Finish domain wizard



Click **Finish** to complete this wizard, and then run the Network Setup Wizard ("HP Virtual Connect Network Setup Wizard" on page 73) to define the Ethernet networks that will be available within the Virtual Connect domain.

Deselect the Start the Network Setup Wizard checkbox, and then click **Finish** to go to the Home page without running additional setup wizards.

HP Virtual Connect Network Setup Wizard

This wizard establishes external Ethernet network connectivity for the HP BladeSystem c-Class enclosure using HP Virtual Connect. A user account with network privileges is required to perform these operations. Use this wizard to do the following:

- Identify the MAC addresses to be used on the servers deployed within this Virtual Connect domain.
- Choose the method of handling VLAN tagged packets from servers.
- Configure multiple networks link speed settings.
- Set up connections from the HP c-Class enclosure to the external Ethernet networks.

  These connections can be uplinks dedicated to a specific Ethernet network or shared uplinks that carry multiple Ethernet networks with the use of VLAN tags.
- Define external network connections with shared uplinks that carry multiple Ethernet networks or FCoE networks

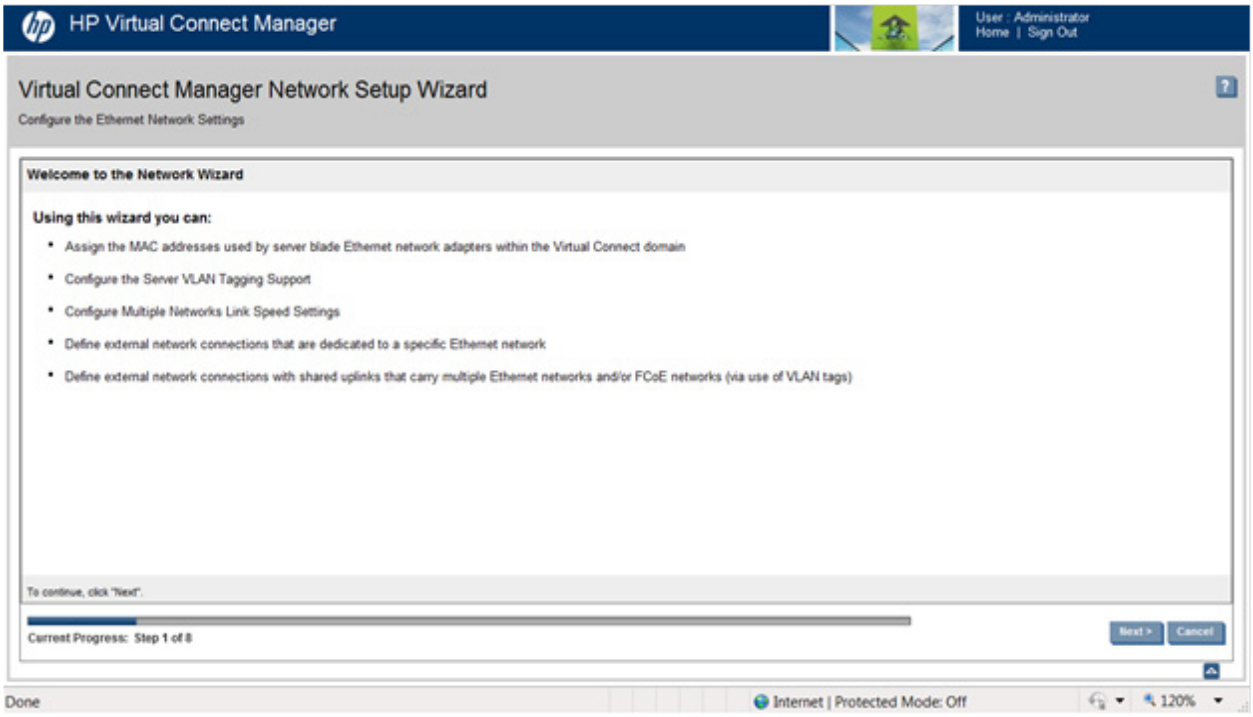
Be sure to connect any Ethernet module stacking cables before running the setup wizard.

IMPORTANT: For a Virtual Connect environment to operate properly, all HP Virtual Connect Ethernet modules within the Virtual Connect domain must be interconnected with stacking links. HP strongly recommends that redundancy be maintained in stacking links to ensure continued connectivity of servers to the external networks.

For more information, see “Supported configurations (on page 16)" and “Recommended stacking connections (on page 24)."

NOTE: Virtual Connect does not support stacking for FC modules, so each VC-FC module requires uplink connections to the external FC SAN environment.

To initiate this wizard, click the Network Setup Wizard link on the homepage, or select **Network Setup Wizard** from the Tools pull-down menu. You must have network role permissions to access the Network Setup Wizard.



MAC Address Settings

At this point in the wizard, you are asked to select the type of Ethernet MAC addresses to be used on the server blades within the enclosure. Choose either the server factory default Ethernet MAC address that came with the server or the Ethernet MAC addresses assigned by Virtual Connect. Be sure to fully understand the following information before making this selection.

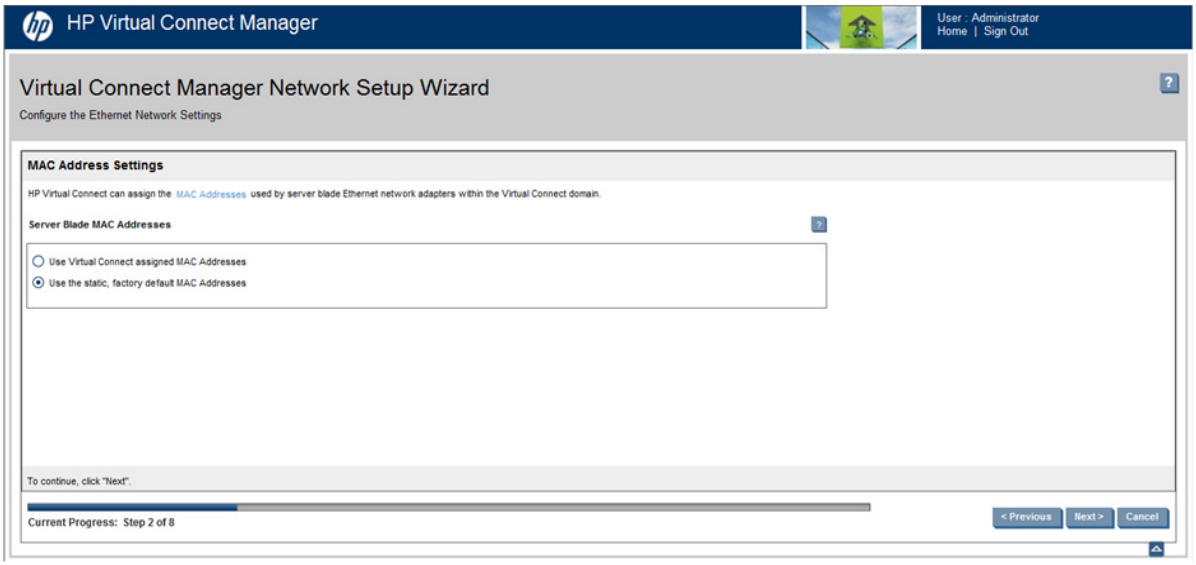
IMPORTANT: Configuring Virtual Connect to assign server blade MAC addresses requires careful planning to ensure that the configured range of MAC addresses is used once within the environment. Duplicate MAC addresses on an Ethernet network can result in a server network outage.

Each server blade Ethernet NIC ships with a factory default MAC address. The MAC address is a 48-bit number that uniquely identifies the Ethernet interface to other devices on the network. While the hardware ships with default MAC addresses, Virtual Connect can assign MAC addresses that override the factory default MAC addresses while the server remains in that Virtual Connect enclosure.

Always establish control processes to ensure that a unique MAC address range is used in each Virtual Connect domain in the environment. Reusing address ranges could result in server network outages caused by multiple servers having the same MAC addresses.

If using Virtual Connect assigned MAC addresses, the following notes apply:

- Virtual Connect automatically assigns two MAC addresses to each VC-Enet connection in the server profile, a primary address for the Ethernet NIC, and an iSCSI MAC address for use by multifunction gigabit server adapters, such as the HP NC373m PCI Express Dual Port Multifunction Gigabit Server Adapter. Only the primary MAC address is used by standard (not multifunction) Ethernet devices.
- If a server blade is moved from a Virtual Connect managed enclosure to a non-Virtual Connect enclosure, the local MAC addresses on that server blade are automatically returned to the original factory defaults.
- If a server blade is removed from a bay within a Virtual Connect domain and installed in another bay in the same Virtual Connect domain or in a bay in a different domain, it is assigned the new set of addresses appropriate for that server location.
- When FlexFabric adapters are in use, Virtual Connect assigns a MAC address to each FCoE connection in the server profile.

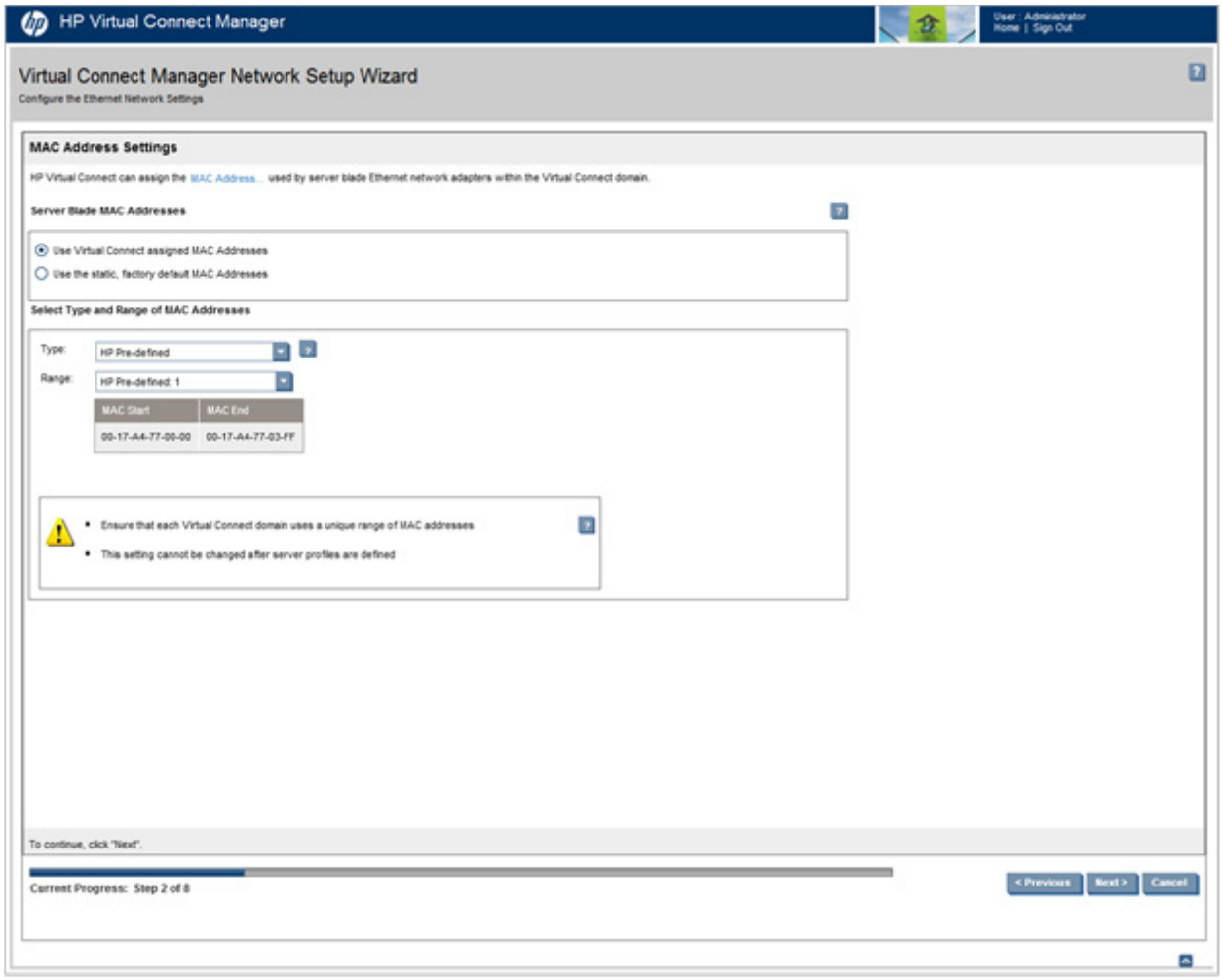


Assigned MAC addresses

The MAC address range used by the Virtual Connect domain must be unique within the environment. HP provides a set of pre-defined ranges that are for use by VCM and do not conflict with server factory default MAC addresses.

When using the HP-defined MAC address ranges, be sure that each range is used only once within the environment.

Select the type and range of MAC address, and then click **Next**.



Selecting VC-assigned MAC address ranges

When using VC-assigned MAC addresses, you can choose between using an HP pre-defined MAC address range or using a user-defined MAC address range.

- HP pre-defined MAC address range (recommended). These pre-defined ranges are reserved and are not the factory default on any hardware. There are 64 ranges of 1024 unique addresses to choose from. Be sure to use each range only once within a data center.

  1024 unique addresses might not be enough for a large configuration (multiple enclosures with many Flex-10 NICs). If you plan a domain of this type, determine the number of MAC addresses you are likely to use, and then select an option that provides the domain with sufficient MAC addresses.

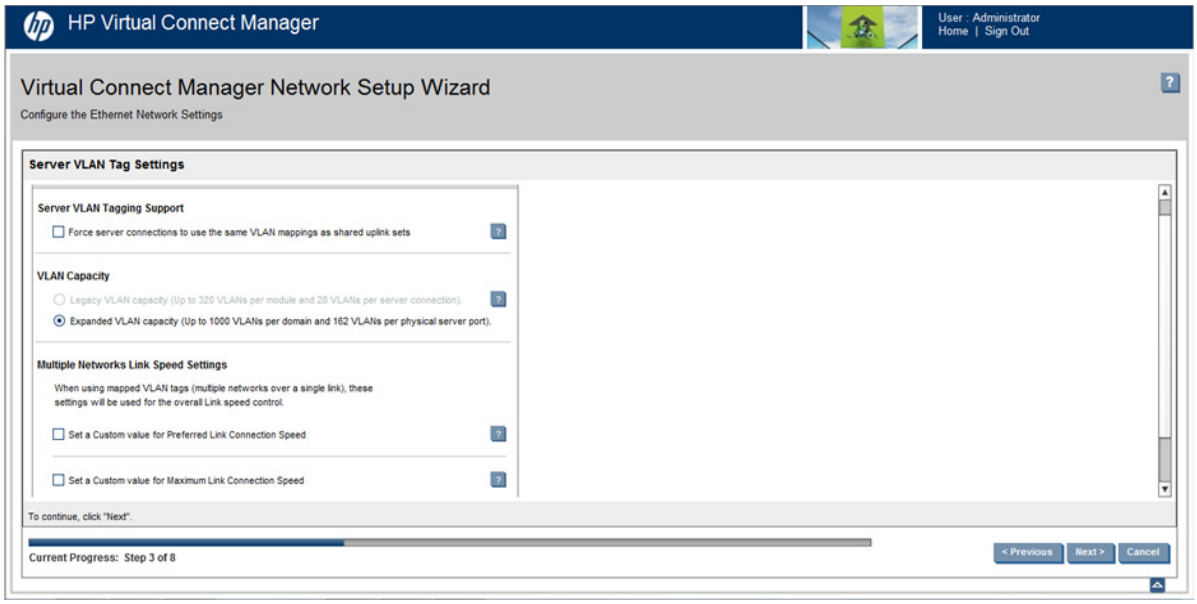
- User-defined MAC address range. To avoid potential conflict with other hardware MAC addresses in the environment, consider using a subrange of MAC addresses reserved by the IEEE for locally-administered MAC addresses. Ensure that the range does not conflict with any Ethernet device already deployed within the enterprise.

IMPORTANT: If you plan to use Insight Control Server Deployment for RedHat Linux installation and also plan to use User- or HP-defined MAC addresses, you must import the enclosure and assign profiles before running Insight Control Server Deployment.

NOTE: After any server profiles are deployed using a selected MAC address range, that range cannot be changed until all server profiles are deleted.

Select the type and range of MAC address, and then click **Next**.

Server VLAN Tag Settings



VLAN tunneling support

You can tunnel VLAN tags and map VLAN tags in the same domain. As of VC 3.30, tunneling and mapping is configured at the network level, not at the domain level. Server VLAN tunneling is supported only on networks with dedicated uplinks and cannot be used with shared uplink sets.

Server VLAN tagging support

When the 'Force server connections to use same VLAN mappings as shared uplink sets' check box is selected, server ports connected to multiple VC Ethernet networks are forced to use the same VLAN mappings as those used for the corresponding shared uplink sets. This action forces all server connections mapped to multiple networks to be linked to a shared uplink set. Server administrators cannot override this selection when creating or editing a profile. When this check box is selected, server network connections can only be selected from a single shared uplink set.

When the 'Force server connections to use same VLAN mappings as shared uplink sets' check box is not selected, server network connections can be selected from any VC Ethernet network and the external VLAN ID mappings can be manually edited. However, administrators must ensure that no server connection VLAN ID conflict exists.

The 'Force server connections to use the same VLAN mappings as shared uplink sets' check box can be selected if no server profile connections are assigned to multiple networks that are not linked to a shared uplink set.

VLAN capacity

When the domain is configured with the Expanded VLAN capacity mode, observe the following:

- 1,000 networks can be in-use at any time.

  An In-use network is defined as either:

- An Ethernet network that is assigned to a profile or an sFlow configuration
- An FCoE network that is associated with a shared uplink set

  VCEM enforces consistent in-use definitions across all domains in each domain group. If a domain is in maintenance mode and changes are made which would increase the number of in-use networks beyond 1000 for any domain in the domain group, the complete maintenance operation fails, and the domain stays in maintenance mode.

  HP recommends limiting the total number of FCoE VLANs on any individual VC ENET module to 32.

- 8,192 Ethernet and FCoE VLANs can be defined per domain.
- 4,094 Ethernet and FCoE VLANs can be defined per shared uplink set.

  Shared uplink sets support a maximum of 32 FCoE networks.

- 162 VLANs can be defined per physical server port.

  For example, if you configure 150 VLAN mappings to FlexNIC-a, then only 12 VLANs can be configured for the remaining FlexNICs (FlexNIC-b, FlexNIC-c, and FlexNIC-d).

  - Duplicate VLANs cannot be configured on the same physical port.
  - Do not map more than 162 VLANs to one physical server port. If you exceed the 162 VLAN limit, the physical server port is disabled and the four server connections are marked as failed.

When the domain is configured with the Legacy VLAN Capacity mode, observe the following:

- The option to select Legacy VLAN Capacity mode is disabled when creating new domains with VC firmware 3.70 or higher. Reverting from Expanded VLAN Capacity mode back to Legacy VLAN Capacity mode is not allowed.
- To maintain compatibility for VC domains configured with Legacy VLAN Capacity mode and upgrading firmware from VC 3.30 to VC3.70 or higher, the VCM CLI maintains the functionality of the Legacy VLAN capacity setting. This allows the use of existing scripts that configure the VLAN capacity mode.

Multiple Networks Link Speed Settings

When using mapped VLAN tags (multiple networks over a single link), these settings are used for the overall link speed control. Select the checkbox next to each item to set the value.

These settings affect only newly created profiles.

Versions of VC prior to v4.01 used the "preferred speed" to control bandwidth allocation. When existing profiles are upgraded to VC v4.01 or later, the "maximum speed" from the network is set automatically on the connection. If no maximum speed was configured prior to the upgrade, then the maximum speed is 20 Gb for Ethernet connections. The 20Gb maximum speed is dependent on 20Gb NICs and the HP VC FlexFabric-20/40 F8 Module being present in the domain. The pre-4.01 behavior can be retained by setting "maximum speed" to the same value as "preferred speed". When the maximum speed and preferred speed for a network are set to the same bandwidth, then the profile connection bandwidth does not exceed the custom speed set on the connection.

IMPORTANT: Depending on the NIC firmware versions in use, you might need to upgrade the NIC firmware for these speed enforcement settings to work correctly.

To change these settings:

1. Click the selection box, and then select a setting (100Mb to 20Gb):

- Set preferred connection speed. This value is the default speed for server profile connections mapped to this network. The server administrator can increase or decrease this setting on an individual profile connection. This setting is used for the minimum bandwidth.
- Set maximum connection speed. This value is the maximum speed for server profile connections mapped to this network. This setting limits the maximum port speed from the server to the network connection associated with the multiple networks. Maximum bandwidth is determined by the maximum connection speed of the network. All multiple networks share the same maximum connection speed.

The availability of the 20Gb setting is dependent on 20Gb NICs and HP VC FlexFabric-20/40 F8 Modules being present in the domain.

2. Click **Apply**.

Virtual Connect can control link speed for FlexNICs only when they are connected to an HP Virtual Connect Enet Module. Virtual Connect cannot control the link speed of traditional NICs.

IMPORTANT: Each FlexNIC and FlexHBA is recognized by the server as a PCIe physical function device with adjustable speeds from 100 Mb to 10 Gb in 100 Mb increments when connected to an NC553i/m 10Gb 2-port FlexFabric FlexFabric Adapter or any Flex-10 NIC. For NC551i/m Dual Port FlexFabric 20 Gb FlexFabric Adapters, the range is limited to 1 Gb to 20 Gb in 100 Mb increments.

For more information on FlexNICs, see the *HP Virtual Connect for c-Class BladeSystem User Guide* on the HP website (http://www.hp.com/go/vc/manuals).

Select Network Connection Type

To begin, select one of the following external network connections:

- Connection with uplink(s) dedicated to a single network ("Define Single Network" on page 80)

  Select this option to define a network within the Virtual Connect environment and identify any module uplink ports used to connect to that network in the data center. Internal-only networks (without external uplinks) can also be defined.

  These single networks pass through any VLAN tags added by the server or added externally.

- Connection with uplink(s) carrying multiple Ethernet networks and/or FCoE networks (using VLAN tagging) ("Define Shared Uplink Set Connection" on page 83)

  Select this option to define multiple networks, FCoE networks, or both that all share a common set of module uplink ports within the Virtual Connect environment. Network traffic from each network within the Virtual Connect environment receives a VLAN tag as it exits on a shared uplink port. Virtual Connect uses the VLAN tag on incoming network traffic to place it on the appropriate internal network. Ethernet VLAN tags are added on egress and stripped on ingress.

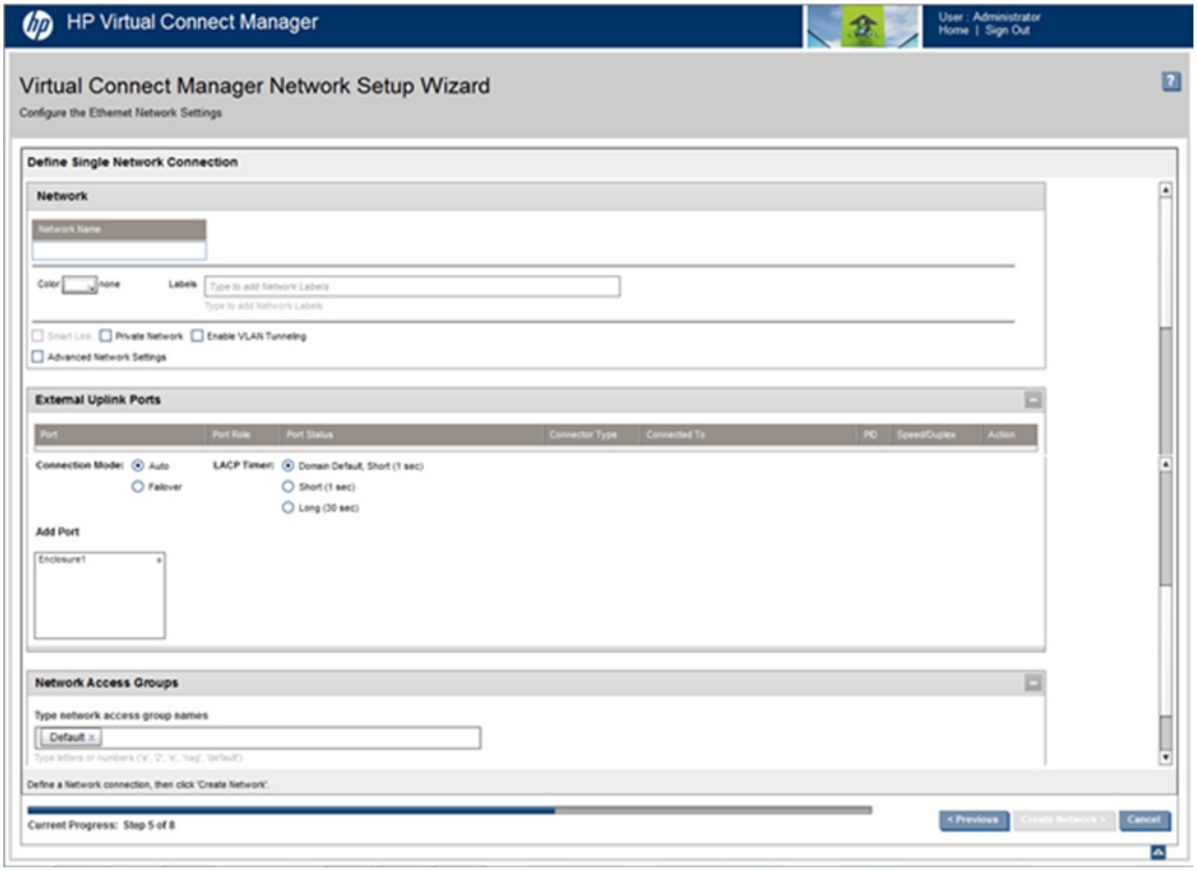
  Avoid using this type of network connection when the server inserts VLAN tags.

  One network can be designated as a native VLAN, causing all untagged incoming Ethernet packets to be placed on this network. For more information, see "Shared uplink sets and VLAN tagging" in the user guide.

After each network is defined, you have the option to define additional networks or finish the wizard.

To determine the types of network connections to use, see "Connecting Virtual Connect Ethernet module uplinks (on page 47)."

Define Single Network



To define a network:

1. Enter a name for the network that will be easily understood and recognized by the server administrators defining and deploying server profiles. The network name can be up to 64 characters in length (no spaces).
2. To add a color to the network, select a color from the Color pull-down menu. The network color is used as a visual identifier for the network within VCM.
3. To add labels to the network, type a label in the Labels field, and then press **Enter**. Labels are used as text-based identifiers for the network within VCM. Each label can contain up to 24 characters, excluding spaces. Each network can have up to 16 labels.
4. To enable Smart Link, select the **Smart Link** checkbox.

   The checkbox is not available until an uplink is added to the network.
5. To designate as a private network, select the **Private Network** checkbox.
6. To enable VLAN tunneling, select the **Enable VLAN Tunneling** checkbox.
7. To set a custom value for the preferred link connection speed or maximum link connection speed, select the **Advanced Network Settings** checkbox. For more information, see "Advanced Network Settings (on page 81)."
8. Set the connection mode to **Auto** or **Failover**.
9. If the connection mode is set to Auto, set the length of the LACP Timer.
10. Select the specific VC-Enet module external uplink ports that will connect the network to the data center. The available external ports are listed in the multi-level Add Port selector. Each port is labeled as linked or not linked. This status refers to whether or not a current connection to an external switch exists.

    If the network will be local to the servers within the VC domain (enclosure), then no uplinks need to be selected.

    To delete a port, click the **Delete** link in the Action column of the row to be deleted.
11. In the Network Access Groups field, begin typing the name of a Network Access Group that should include this network. When the Network Access Group name appears, select the name.
12. Click **Create Network**.

For more information on defining networks, see the *HP Virtual Connect for c-Class BladeSystem User Guide* on the HP website (http://www.hp.com/go/vc/manuals).

Advanced Network Settings

These settings affect only newly created profiles.

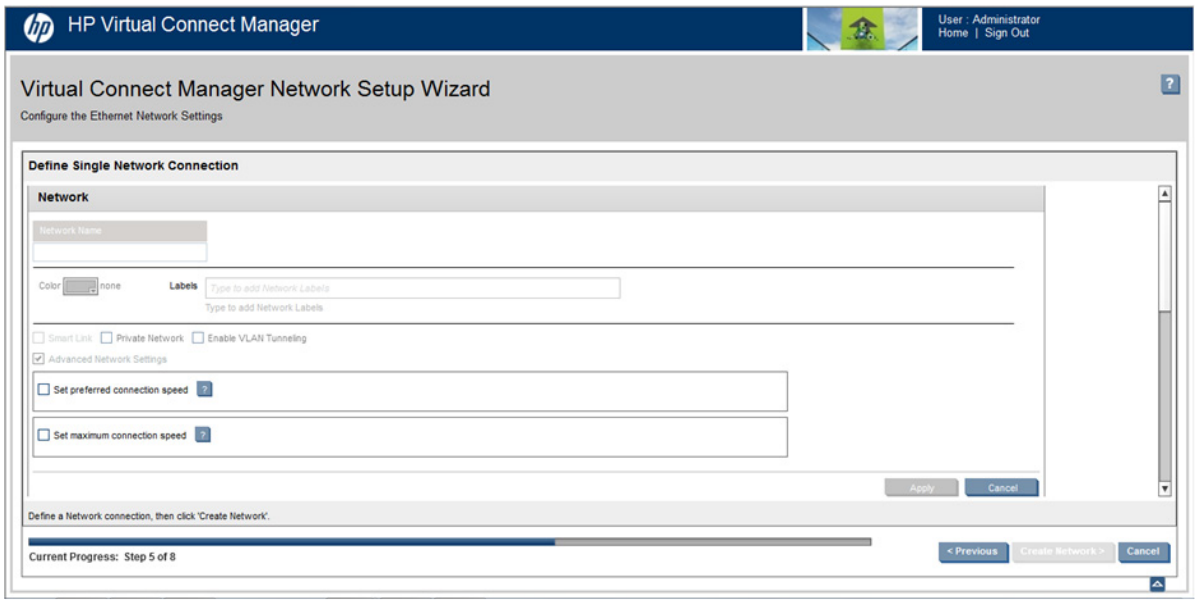
Versions of VC prior to v4.01 used the "preferred speed" to control bandwidth allocation. When existing profiles are upgraded to VC v4.01 or later, the "maximum speed" from the network is set automatically on the connection. If no maximum speed was configured prior to the upgrade, then the maximum speed is 20 Gb for Ethernet connections. The 20Gb maximum speed is dependent on 20Gb NICs and the HP VC FlexFabric-20/40 F8 Module being present in the domain. The pre-4.01 behavior can be retained by setting "maximum speed" to the same value as "preferred speed". When the maximum speed and preferred speed for a network are set to the same bandwidth, then the profile connection bandwidth does not exceed the custom speed set on the connection.

IMPORTANT: Depending on the NIC firmware versions in use, you might need to upgrade the NIC firmware for these speed enforcement settings to work correctly.

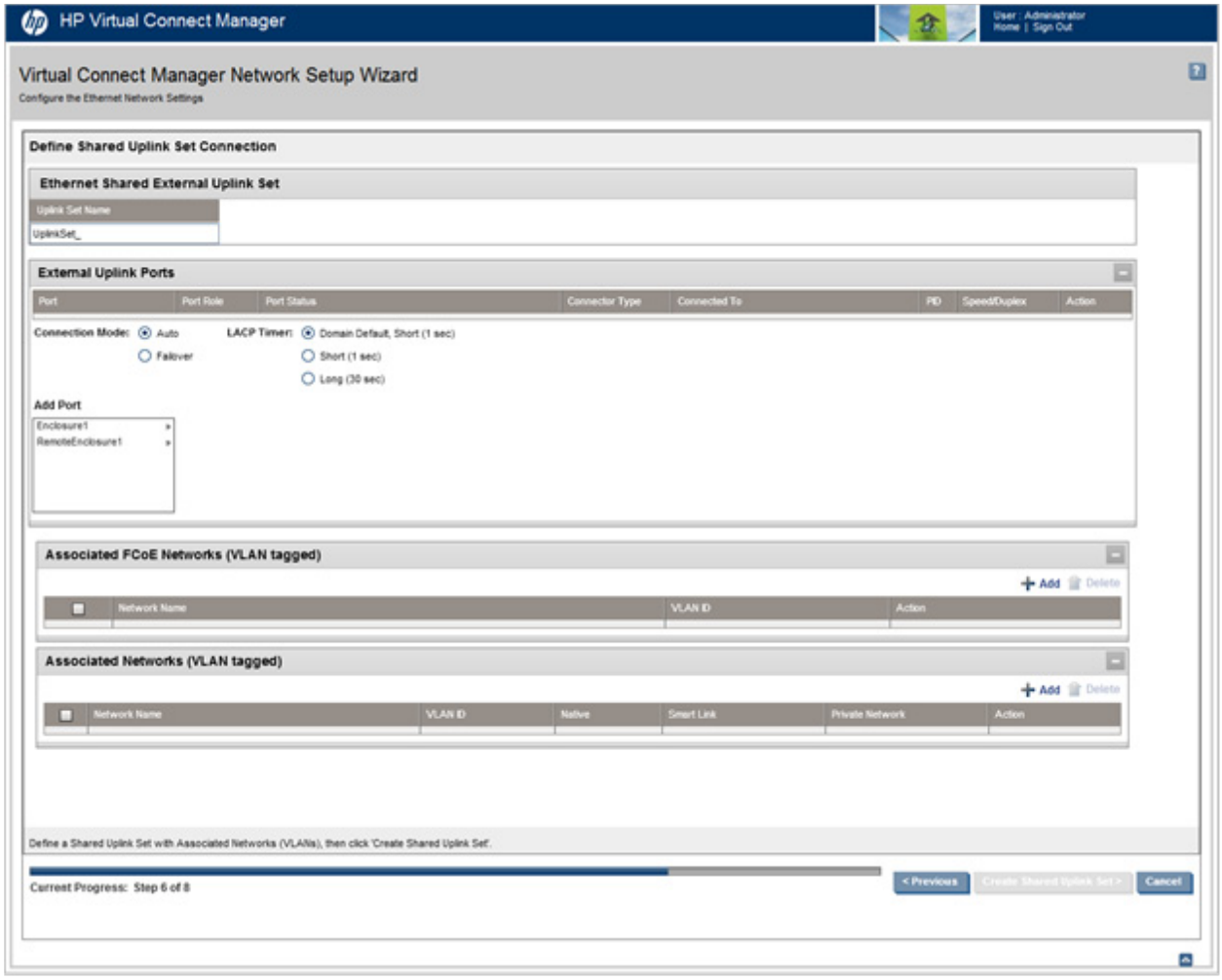
To change these settings:

1. Click the selection box, and then select a setting (100Mb to 20Gb):
   - Set preferred connection speed. This value is the default speed for server profile connections mapped to this network. The server administrator can increase or decrease this setting on an individual profile connection. This setting is used for the minimum bandwidth.
   - Set maximum connection speed. This value is the maximum speed for server profile connections mapped to this network. This setting limits the maximum port speed from the server to the network connection associated with the multiple networks. Maximum bandwidth is determined by the maximum connection speed of the network. All multiple networks share the same maximum connection speed.

   The availability of the 20Gb setting is dependent on 20Gb NICs and HP VC FlexFabric-20/40 F8 Modules being present in the domain.
2. Click **Apply**.



Define Shared Uplink Set Connection



To define multiple networks that share a common set of external uplink ports:

1. Enter an overall name for the set of shared uplinks (up to 64 characters, no spaces).
2. Set the connection mode to **Auto** or **Failover**.
3. If the connection mode is set to Auto, set the length of the LACP Timer.
4. From the Add Port list, select the external uplink ports that will carry these networks.

   To delete a port, click the **Delete** link in the Action column of the row to delete.
5. Click **Add** to define an associated FCoE Network.

   When associating an FCoE network, the shared uplink set must contain uplink ports from a single VC module. In a multi-enclosure domain, the matching ports must be available in all enclosures in the domain. For VC 4.10, only one FCoE network can be associated with a given shared uplink set. In VC 4.20 and later, up to 32 FCoE networks can be associated with a given shared uplink set.

   a. Enter a network name.

   b. Enter a VLAN identifier.

   c. To add a color to the network, select a color from the Color pull-down menu. The network color is used as visual identifier for the network within VCM.

d. To add labels to the network, type a label in the Labels field, and then press **Enter**. Labels are used as text-based identifiers for the network within VCM. Each label can contain up to 24 characters, excluding spaces. Each network can have up to 16 labels.

e. To set a custom value for the preferred link connection speed or maximum link speed, click **Advanced Network Settings**. For more information, see "Advanced Network Settings (on page 81)".

f. Click **Apply**.

6. Click **Add** to define the name and VLAN identifier of each network to use these shared uplinks.

a. You can add a single associated network or multiple associated networks. Selecting multiple associated networks enables you to enter a comma-separated list of individual VLANs and ranges of VLANs that share a common name.

   The name is composed of the prefix, VLAN ID, and suffix. An example name is provided after the VLAN IDs are specified.

b. To add a color to the network, select a color from the Color pull-down menu. The network color is used as visual identifier for the network within VCM.

c. To add labels to the network, type a label in the Labels field, and then press **Enter**. Labels are used as text-based identifiers for the network within VCM. Each label can contain up to 24 characters, excluding spaces. Each network can have up to 16 labels.

d. To use native VLAN, select the **Native** check box. Only one VLAN can be designated as the native VLAN.

e. To use Smart Link, select the **Smart Link** check box. The check box is not available until an uplink is added to the shared uplink set.

f. To designate the network as private, select the **Private Network** check box.

g. To set a custom value for the preferred link connection speed or maximum link speed, click **Advanced Network Settings**. For more information, see "Advanced Network Settings (on page 81)".

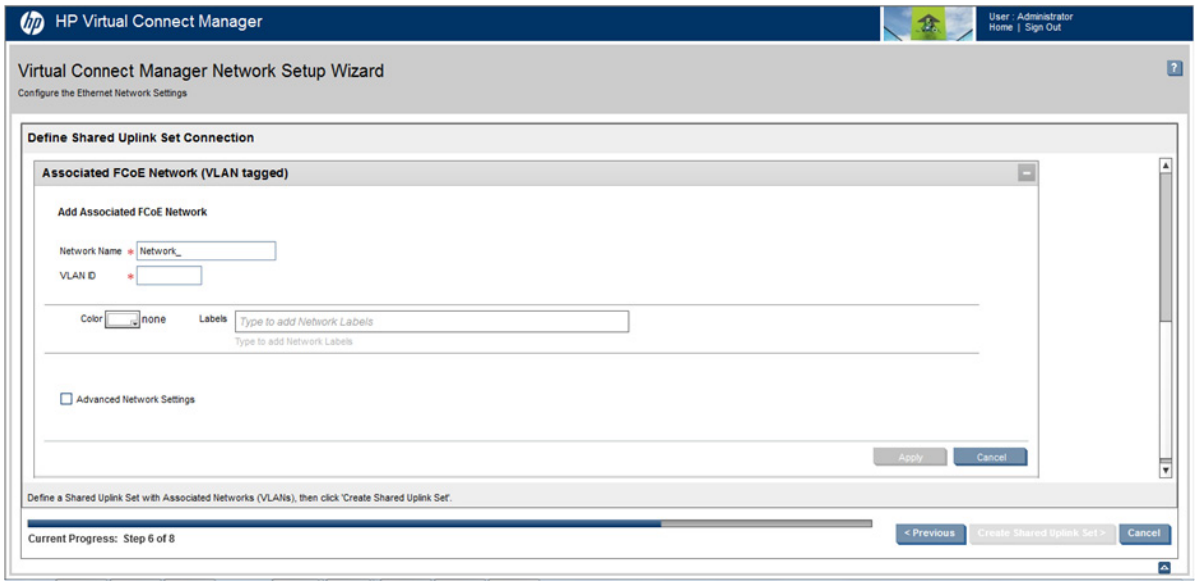
h. Click **Apply**.

7. To create the associated networks, click **Create Shared Uplink Set**.

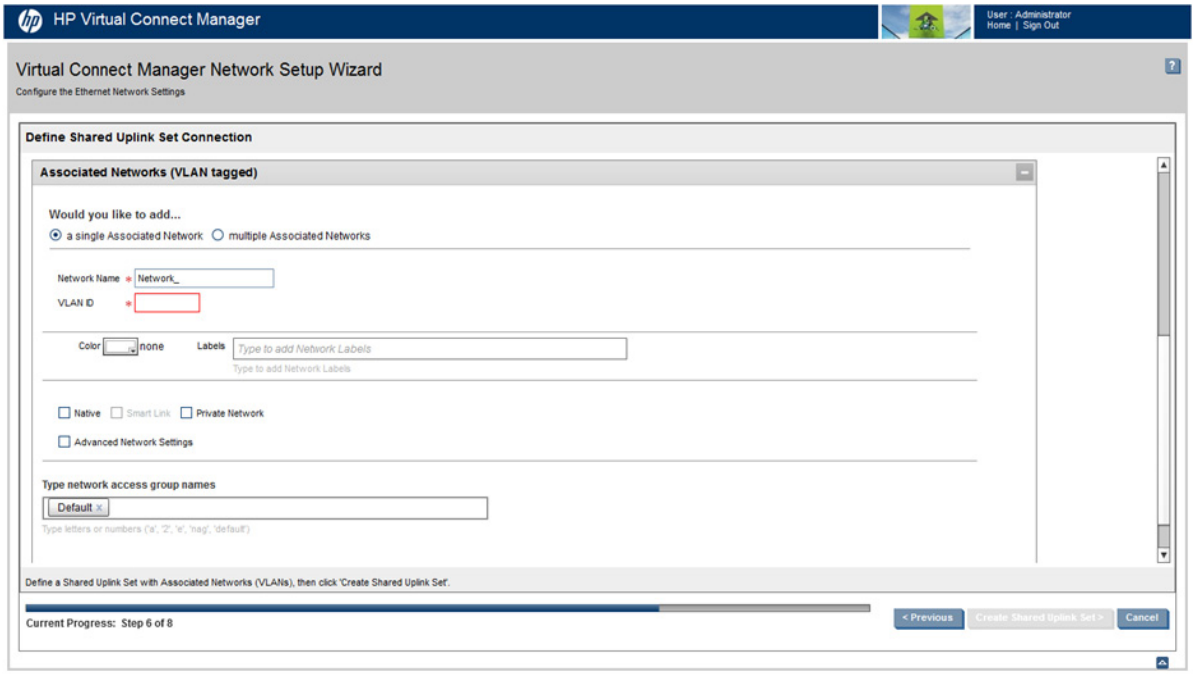
To delete associated networks, select the check box for one or more networks, and then click **Delete**.

For more information on defining a new shared uplink set and VLAN tagging, see the *HP Virtual Connect for c-Class BladeSystem User Guide* on the HP website (http://www.hp.com/go/vc/manuals).

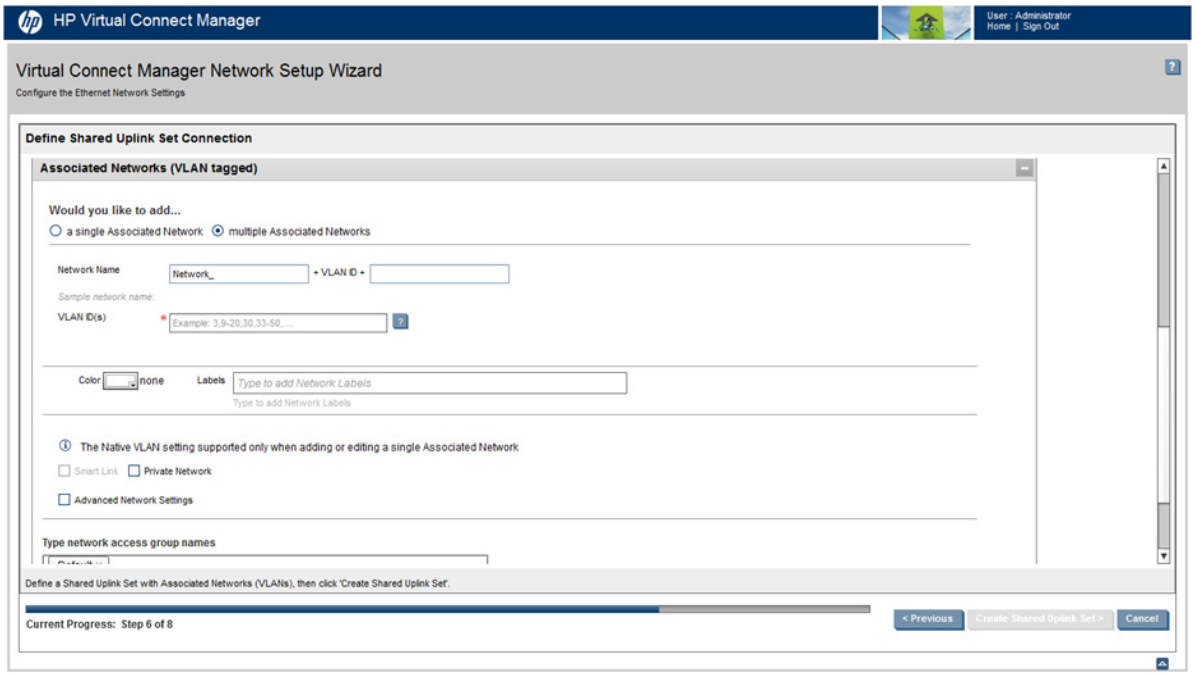
Add an Associated FCoE Network.



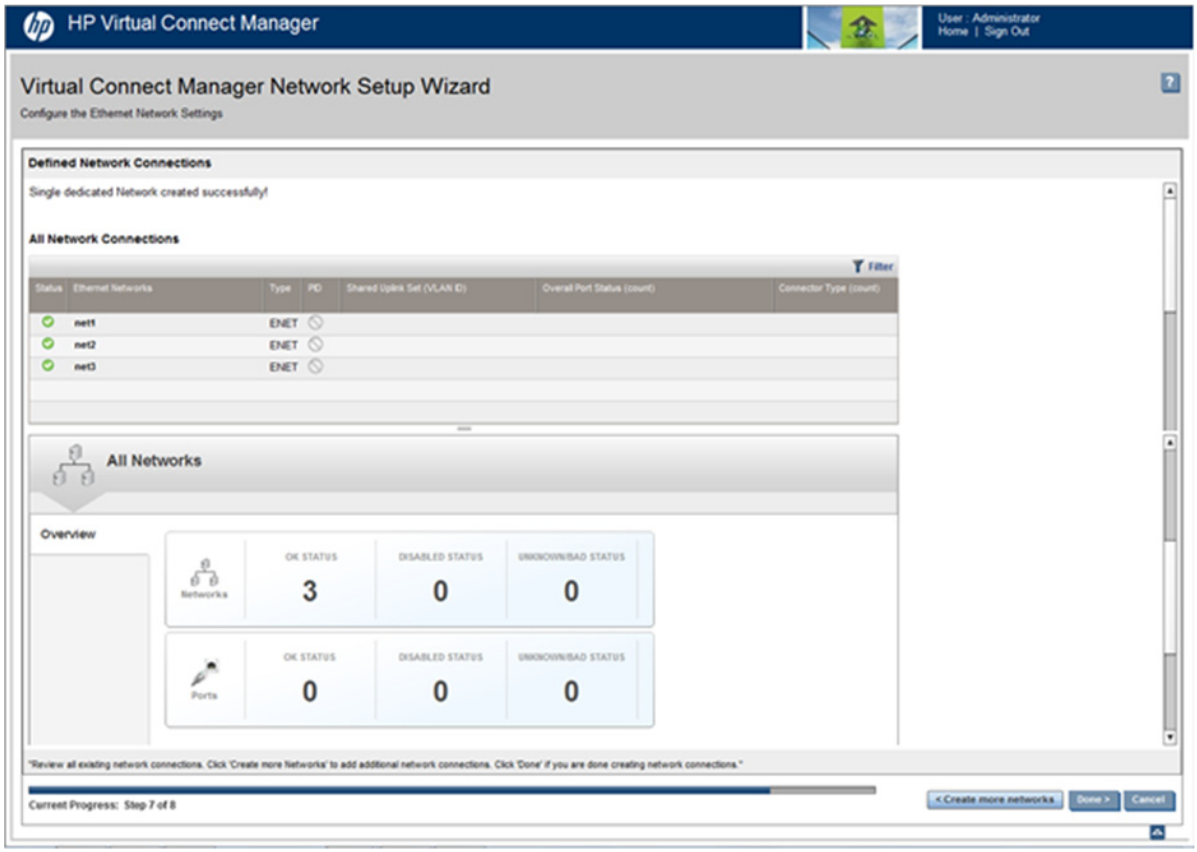
Add a single Associated Network.



Add multiple Associated Networks.



Defined Network Connections



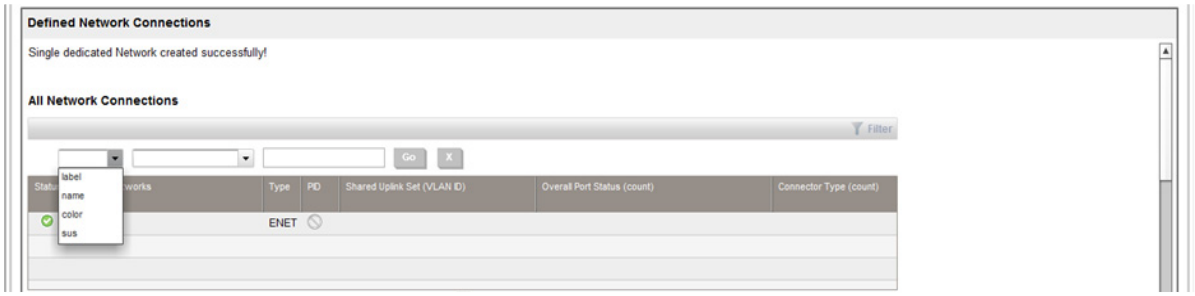
This summary screen displays the external connections for each defined network.

For more information about the data displayed on this screen, see "Ethernet Networks (External Connections) screen" in the user guide.

To define additional networks in the domain, click **Create more networks**.

To complete the Network Setup Wizard, click **Done**.

To view a filtered list of created networks, click **Filter**, select the criteria, and then click **Go**. To return to the full list, click **X**.



Finish network wizard

When the Network Setup Wizard completes, external Fibre Channel connectivity can be configured (if applicable) or server profiles can be defined and associated with server blades.

To establish external Fibre Channel connectivity:

1. Be sure the Start the Fibre Channel Wizard checkbox is selected.
2. Click **Finish**. The Fibre Channel Wizard Welcome screen is displayed.

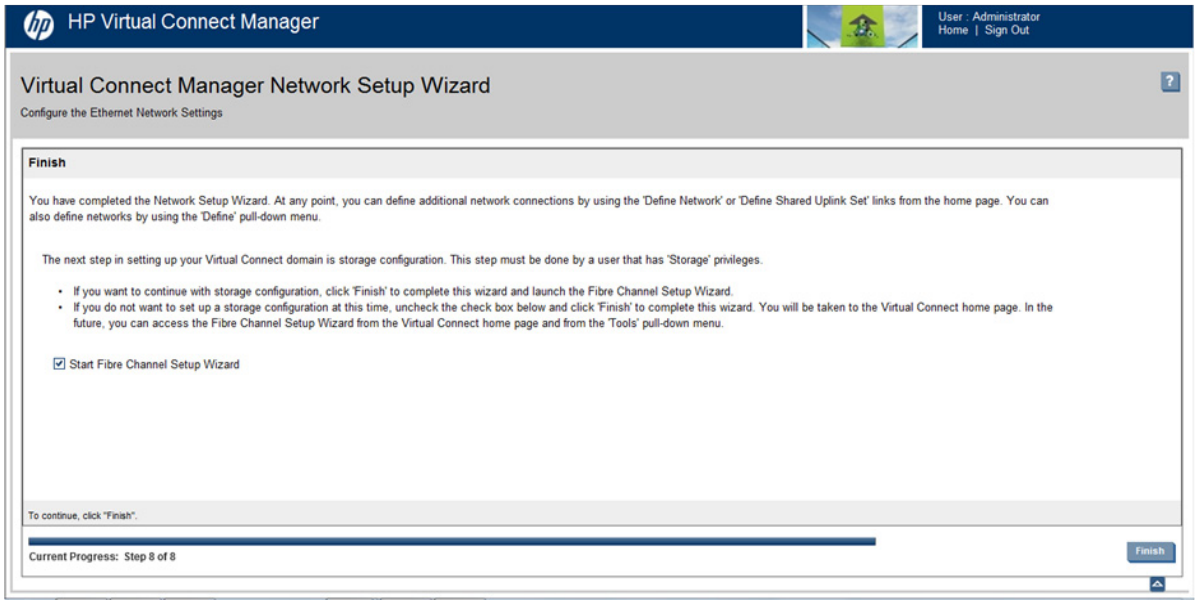
To begin deploying server blades:

1. Be sure the Start Fibre Channel Wizard checkbox is not selected.
2. Click **Finish**.
3. Select **Define Server Profile** from the homepage.

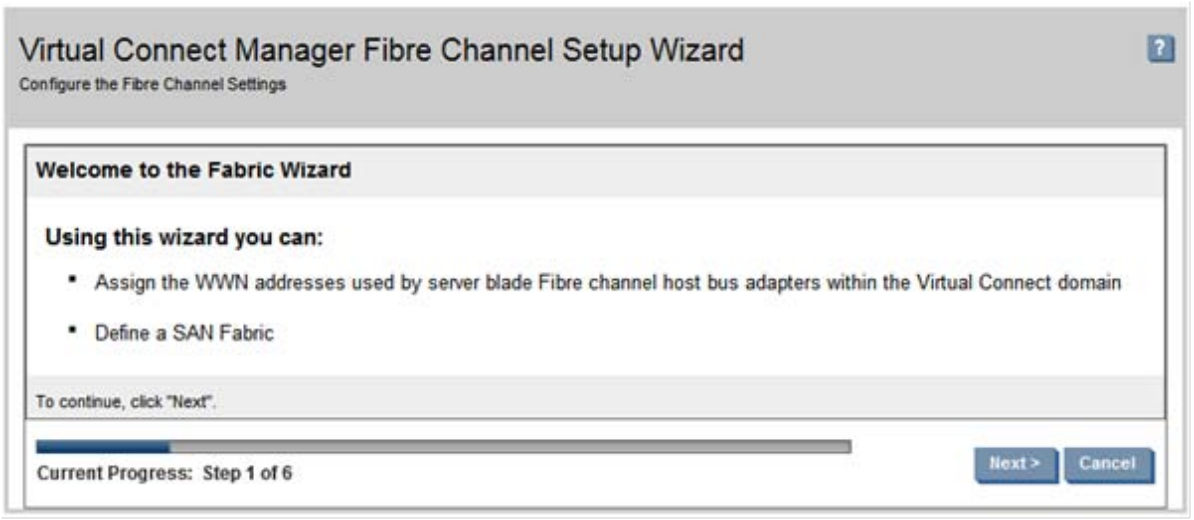
Additional network connections can be defined at any time by using one of the following methods:

- Select the **Define a Network** link on the homepage.
- Select the **Define a Shared Uplink Set** link on the homepage.

Select **Ethernet Network** from the **Define** pull-down menu.



HP Virtual Connect Fibre Channel Setup Wizard



This wizard configures external Fibre Channel connectivity for the HP BladeSystem c-Class enclosure using HP Virtual Connect. A user account with storage privileges is required to perform these operations. Use this wizard to do the following:

- Identify WWNs to be used on the server blades deployed within this Virtual Connect domain.
- Define fabrics.

To initiate this wizard, click the Fibre Channel Wizard link on the homepage, or select **Fibre Channel Setup Wizard** from the Tools pull-down menu. You must have storage privileges to access the Fibre Channel Setup Wizard.

WWN settings

At this point in the wizard, you are asked to select the type of FC WWNs to be used on the server blades within the enclosure. You can choose to use the server factory default WWNs provided with the FC HBA mezzanine card or to use FC WWNs assigned by Virtual Connect. Be sure to fully understand the following information before making this selection.

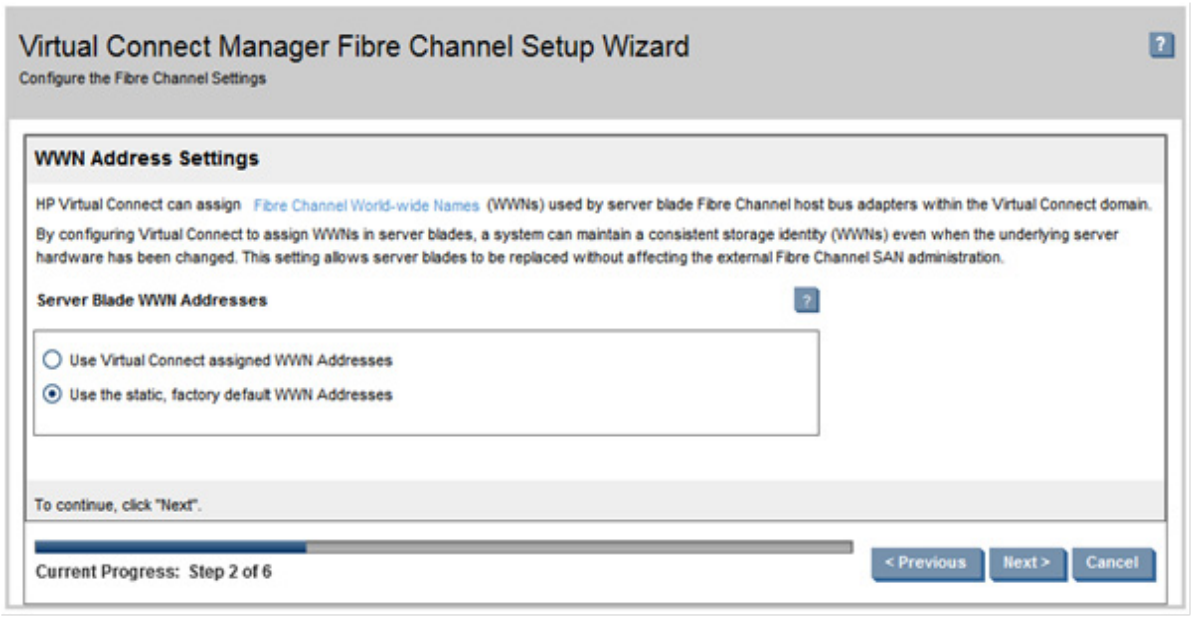
Each server blade FC HBA mezzanine card ships with factory default port and node WWNs for each FC HBA port. Each WWN is a 64-bit number that uniquely identifies the FC HBA port/node to other devices on the network. While the hardware ships with default WWNs, Virtual Connect has the ability to assign WWNs that override the factory default WWNs while the server remains in that Virtual Connect enclosure. When configured to assign WWNs, Virtual Connect securely manages the WWNs by accessing the physical FC HBA through the enclosure Onboard Administrator and the iLO interfaces on the individual server blades.

When assigning WWNs to FC HBA ports, Virtual Connect assigns both a port WWN and a node WWN. Because the port WWN is typically used for configuring fabric zoning, it is the WWN displayed throughout the Virtual Connect user interface. The assigned node WWN is always the same as the port WWN incremented by one.

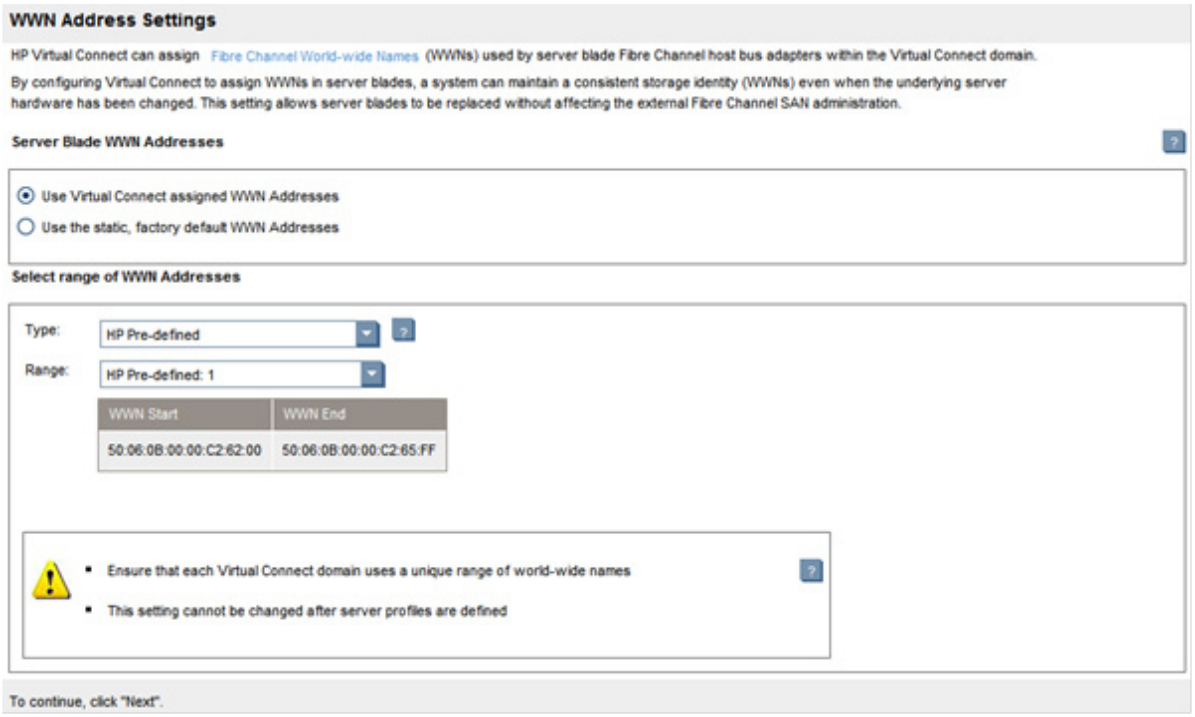
Virtual Connect assigns or migrates WWNs for server FC ports connected to HP Virtual Connect modules. Virtual Connect also assigns WWNs to FC ports that are not connected to an I/O module because Virtual Connect modules can be added later. Server FC ports connected to non-Virtual Connect modules retain the server factory default WWNs.

Configuring Virtual Connect to assign WWNs in server blades maintains a consistent storage identity (WWN) even when the underlying server hardware is changed. This method allows server blades to be replaced without affecting the external Fibre Channel SAN administration.

△ **CAUTION:** To avoid storage networking issues and potential loss of data associated with duplicate WWNs on a FC SAN fabric, plan carefully when allowing Virtual Connect to assign server blade WWNs so that the configured range of WWNs is used only once within the environment.



Assigned WWNs



The WWN range used by the Virtual Connect domain must be unique within the environment. HP provides a set of pre-defined ranges that are reserved for use by Virtual Connect and do not conflict with server factory default WWNs.

When using the HP-defined WWN ranges, be sure that each range is used only once within the environment.

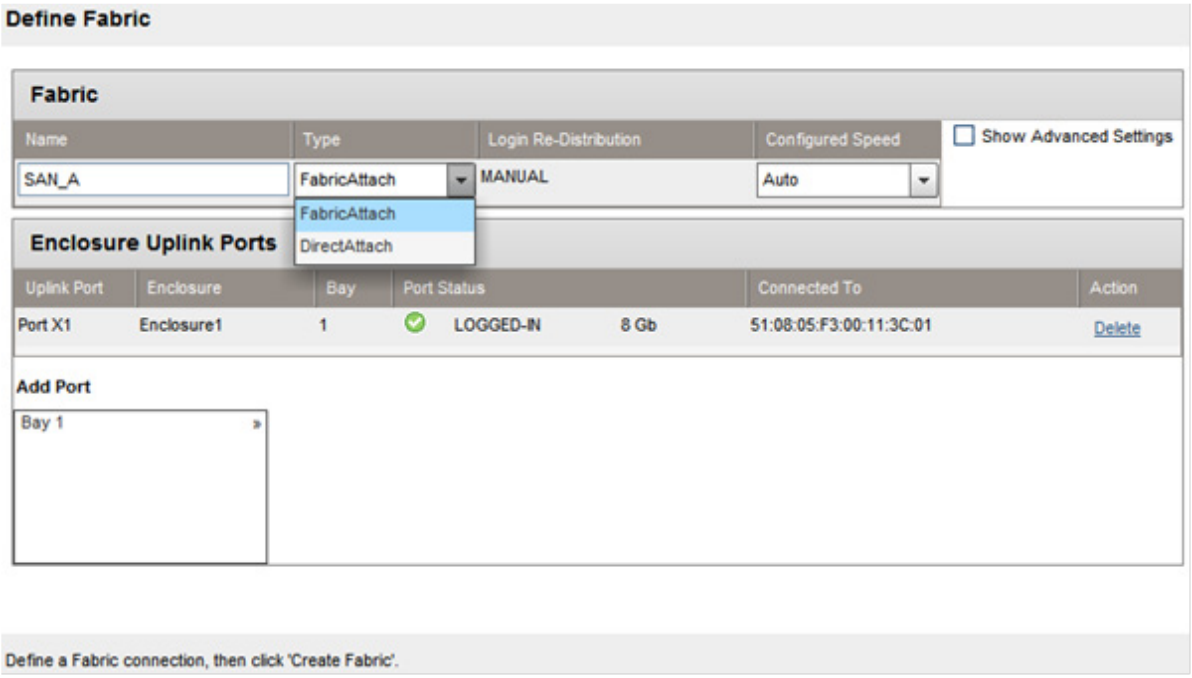
Select the type and range of WWNs, and then click **Next**.

Define Fabric

To define a fabric, select the **Define Fabric** checkbox, and then click **Next**.

If you do not want to define a fabric at this time, select **I do not want to create a Fabric**, and then click **Next**.

Define SAN Fabric



To define the SAN fabric:

1. Name the fabric. Do not use spaces.

2. Select the uplink ports to be used. Only uplinks on the same bay can be in the same SAN fabric.
3. If the uplink ports selected are FlexFabric module ports, select the fabric type. Supported fabric types are FabricAttach and DirectAttach.
   - Select FabricAttach if the FlexFabric module is connected using traditional SAN switches. For this fabric type, the advanced settings appear, allowing you to change the login re-distribution and set the preferred and maximum connection speed.
   - Select DirectAttach if the FlexFabric module is directly connected to a supported storage target. Login re-distribution is not applicable for a DirectAttach fabric; however, advanced settings are available for the preferred and maximum FCoE connection speed.

   After a fabric is defined, its type cannot be changed. The default fabric type is FabricAttach.
4. If you are linking to an HP VC FlexFabric module and the fabric type is FabricAttach, click **Advanced** to set the login re-distribution. For more information, see "Advanced SAN Fabric Settings (on page 92)."
5. Change the configuration speed, if preferred.
6. Click **Apply**.

In FabricAttach mode, connect only HP VC 4Gb FC Module, HP VC 8Gb 24-Port FC Module, HP VC 8Gb 20-Port FC Module, HP VC FlexFabric-20/40 F8 Module, or HP VC FlexFabric 10Gb/24-port Module uplinks to Fibre Channel switch ports that are NPIV-enabled. If using a Brocade FC switch, verify that NPIV is enabled properly by using the `portshow` command. If NPIV is not enabled properly, you might need to downgrade the Brocade switch firmware, and then upgrade the firmware again.

For VC 8Gb 24-Port FC Modules, if uplink port 8 is present in the VC SAN fabric definition, this port is treated as the lowest-numbered port and receives server logins before any other uplink ports.

In DirectAttach mode, connect the FC-capable uplink ports of the HP VC FlexFabric module to target ports on the 3PAR array controller node.

Advanced SAN Fabric Settings

Login Re-Distribution

When creating or editing a SAN fabric using HP VC FlexFabric Modules in a FabricAttach fabric, select the **Show Advanced Settings** checkbox to select the login re-distribution:

- Manual Login Re-Distribution—Default for all FC modules. You must initiate a Login Re-Distribution request through the VC GUI or CLI interfaces. You might re-distribute logins if an uplink that was previously down is now available, if you added an uplink to a fabric, or if the number of logins through each available uplink has become unbalanced for any reason.
- Automatic Login Re-Distribution—When selected, the VC FlexFabric module initiates Login Re-Distribution automatically when the specified time interval expires. For more information about setting the time interval, see "Fibre Channel Settings (Misc.) screen" in the user guide.

The automatic option is only available on FlexFabric modules in a FabricAttach fabric and enables you to specify an interval, in seconds, for the length of time the previously offline links must be stable before the module can re-distribute logins. Login re-distribution is not supported for DirectAttach fabrics.

FCoE Connection Speed

To change these settings, click the selection box, and then select a setting (100Mb to 8Gb):

- Set a custom value for the Preferred FCoE Connection Speed. This value is the default speed for server profile connections mapped to this fabric. The server administrator can override this setting on an individual profile connection.

Set a custom value for the Maximum FCoE Connection Speed. This value is the maximum speed for server profile connections mapped to this fabric.

To see how logins are currently distributed on the VC-FC module, navigate to the Interconnect Bays Status and Summary screen and select the desired VC-FC module. A new Uplink Port column is added to the Server Ports section of the screen.

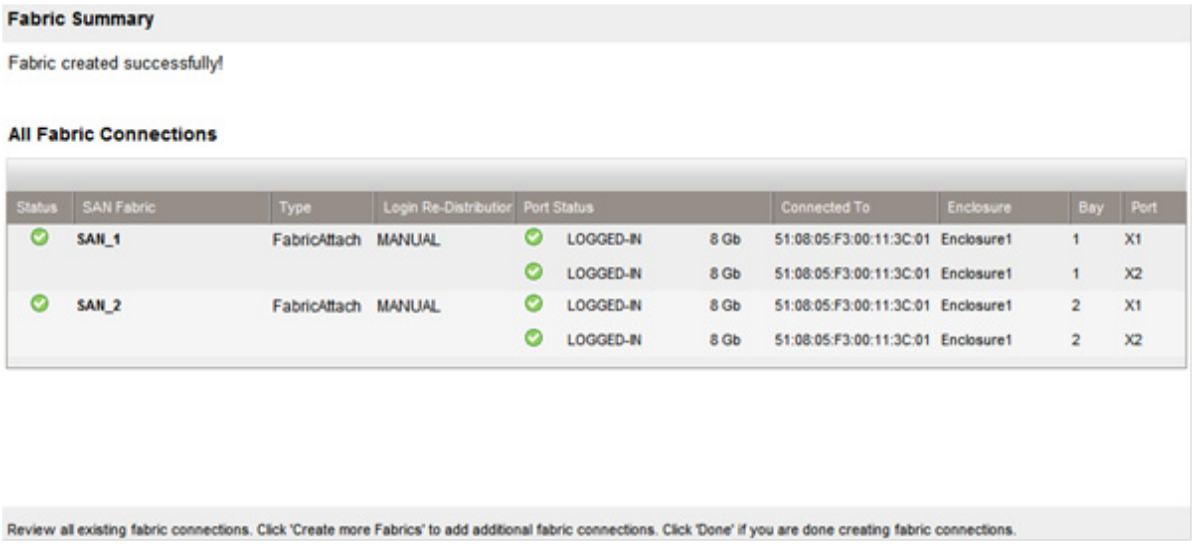
To see how logins are currently distributed on the VC FlexFabric module, navigate to the Interconnect Bays Status and Summary screen and select the desired VC FlexFabric module. A new SAN Uplink Port column is added to the Server Ports tab.

You can also see how logins are currently distributed on the VC-FC or FlexFabric modules by logging in to the upstream FC SAN fabric switch.

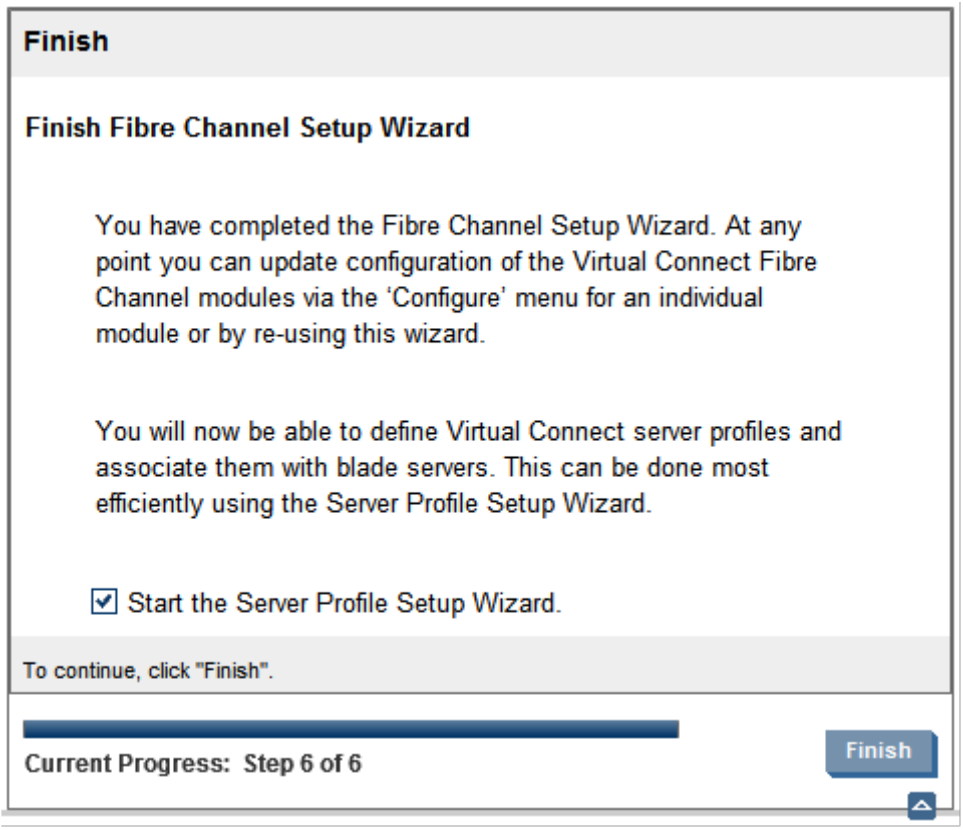
Fabric summary

This screen lists the summary of fabrics that are created.

Select **Create more fabrics** to define additional fabrics, or **Done** if you have defined all available fabrics.



Finish Fibre Channel wizard



When the Fibre Channel Setup Wizard completes, server profiles can be defined and associated with server blades.

To begin deploying server blades:

1. Be sure the Start the Server Profile Wizard check box is selected.
2. Click **Finish**. The Server Profile Wizard Welcome screen appears.

The FC SAN configuration can be changed at any time by using one of the following methods:

- Click **WWN Settings** under Fibre Channel Settings in the left navigation tree of the homepage.
- Select **Fibre Channel Settings** from the Configure pull-down menu.

HP Virtual Connect Manager Server Profile Setup Wizard

This wizard enables you to setup and configure network/SAN connections for the server blades within the enclosure.

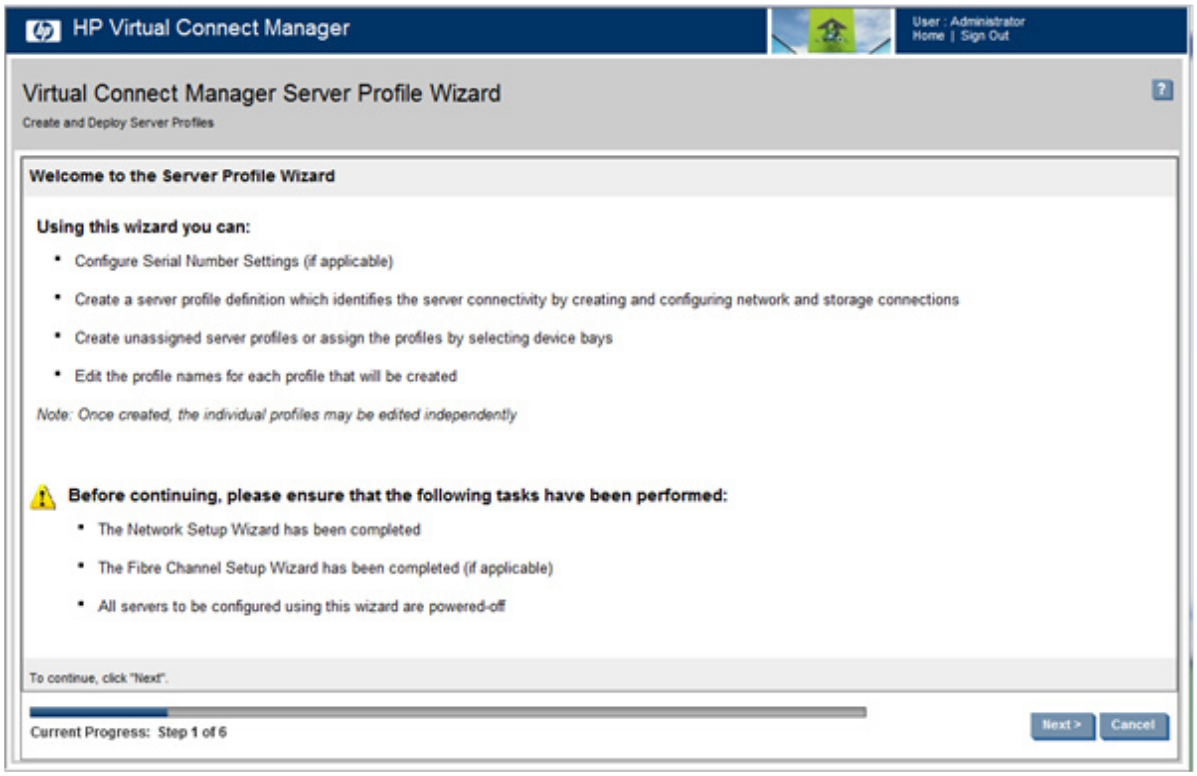
Use the wizard to define a server profile template that identifies the server connectivity to use on server blades within the enclosure. Then use the template to create and apply server profiles to up to 16 server blades automatically. Once created, the individual server profiles can be edited independently.

Before beginning the server profile wizard, do the following:

- Complete the Network Setup Wizard.
- Complete the Fibre Channel Setup Wizard (if applicable).
- Be sure that any server blades to be configured using this wizard are powered off.

This wizard walks you through the following tasks:

- Designate serial numbers (logical) (optional)
- Define a server profile template
- Assign server profiles
- Name server profiles
- Create server profiles



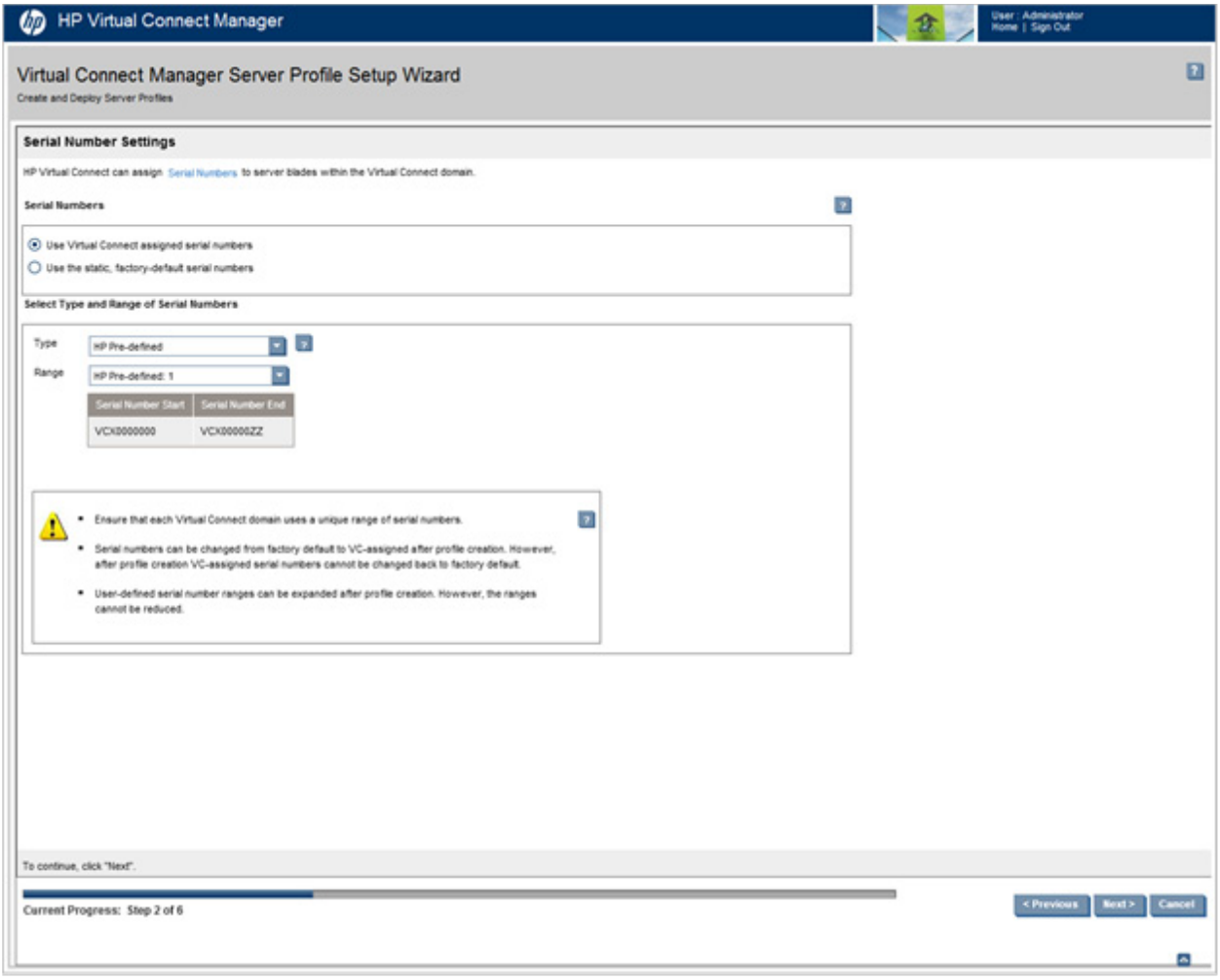
Serial Number Settings

Use this screen to assign serial numbers to server blades within the domain.

By configuring VCM to assign serial numbers, a profile can present a single serial number regardless of the physical server. With these configuration values added to server profiles, software that is licensed to a particular server, based on one or both of these values, can be migrated to new server hardware without re-licensing the software for the new server hardware. This feature prevents you from having to reinstall serial number sensitive software after a system recovery.

△ **CAUTION:** The use of Serial Number Settings might prevent the proper operation of software designed to track servers by serial number or UUID. Do not enable this feature until you consider and understand the impact to the entire software environment in which the servers operate. This impact includes, but is not limited to, warranty service, asset tracking, server deployment, and software licensing.

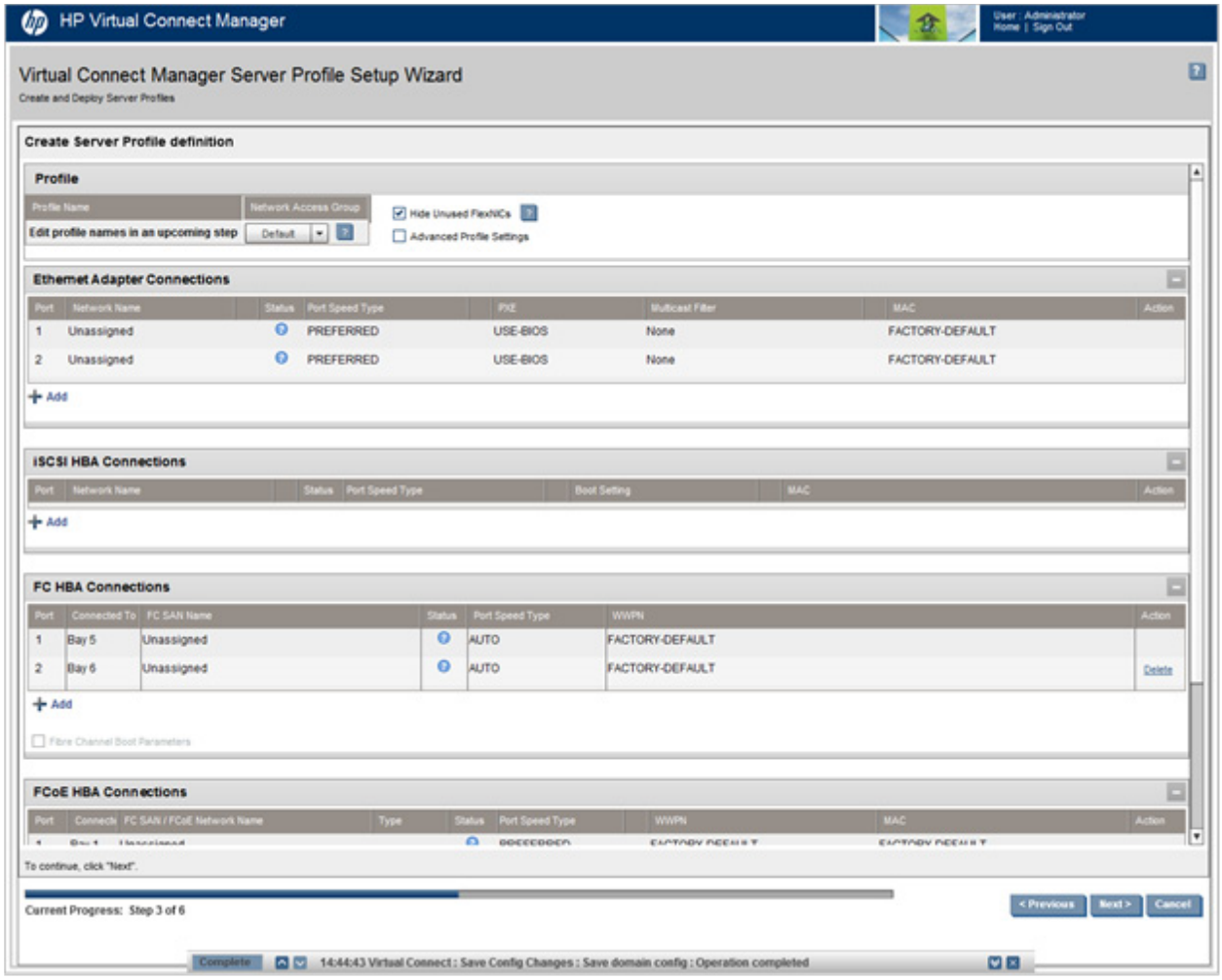
For more information on serial number settings, see the *HP Virtual Connect for c-Class BladeSystem User Guide* on the HP website (http://www.hp.com/go/vc/manuals).



Create Server Profile Definition

Use this screen to create a new server profile definition, which defines and configures Ethernet and Fibre Channel connectivity for the server.

For more information on defining a server profile and advanced profile settings, see the *HP Virtual Connect for c-Class BladeSystem User Guide* on the HP website (http://www.hp.com/go/vc/manuals).



Server profile troubleshooting

In some cases, server profiles can be assigned to server blades when certain mismatches exist between the server profile definition and the server blade. The following list summarizes Virtual Connect behavior under these circumstances:

- If the number of network connections in the profile is more than the number of physical Ethernet ports, the profile is assigned. When you view the profile, the connections display a status of "Not mapped."
- If a switch other than a Virtual Connect Ethernet switch is connected to any port in the profile, the profile is assigned, but the MAC address is not changed on the NIC. The connections display a status of “Not mapped” when your view the profile.
- If the number of Fibre Channel connections in the profile is more than the number of physical Fibre Channel HBA ports, the profile is assigned, but the connections display a status of “Not mapped” when you view the profile.
- If the number of iSCSI connections in the profile is more than the number of available iSCSI ports on the server, the profile assignment succeeds, but the connections display a status of "Not mapped" when you view the profile.

- If the number of FCoE connections in the profile is more than the number of available FCoE ports on the server, the profile assignment succeeds, but the connections display a statue of "Not mapped" when you view the profile.

VCM supports a maximum of 256 profiles within the domain.

IMPORTANT: Disabling a server port by entering the iLO Remote Console, rebooting the server, and then using the F9 key to enter RBSU causes a "Profile pending" status for a server profile when a VCM failover occurs.

IMPORTANT: Virtual Connect versions 4.30 and later no longer support first-generation HP Integrity BL860c Server Blades and HP Integrity BL870c Server Blades. HP Integrity i2 and i4 model server blades are still supported.

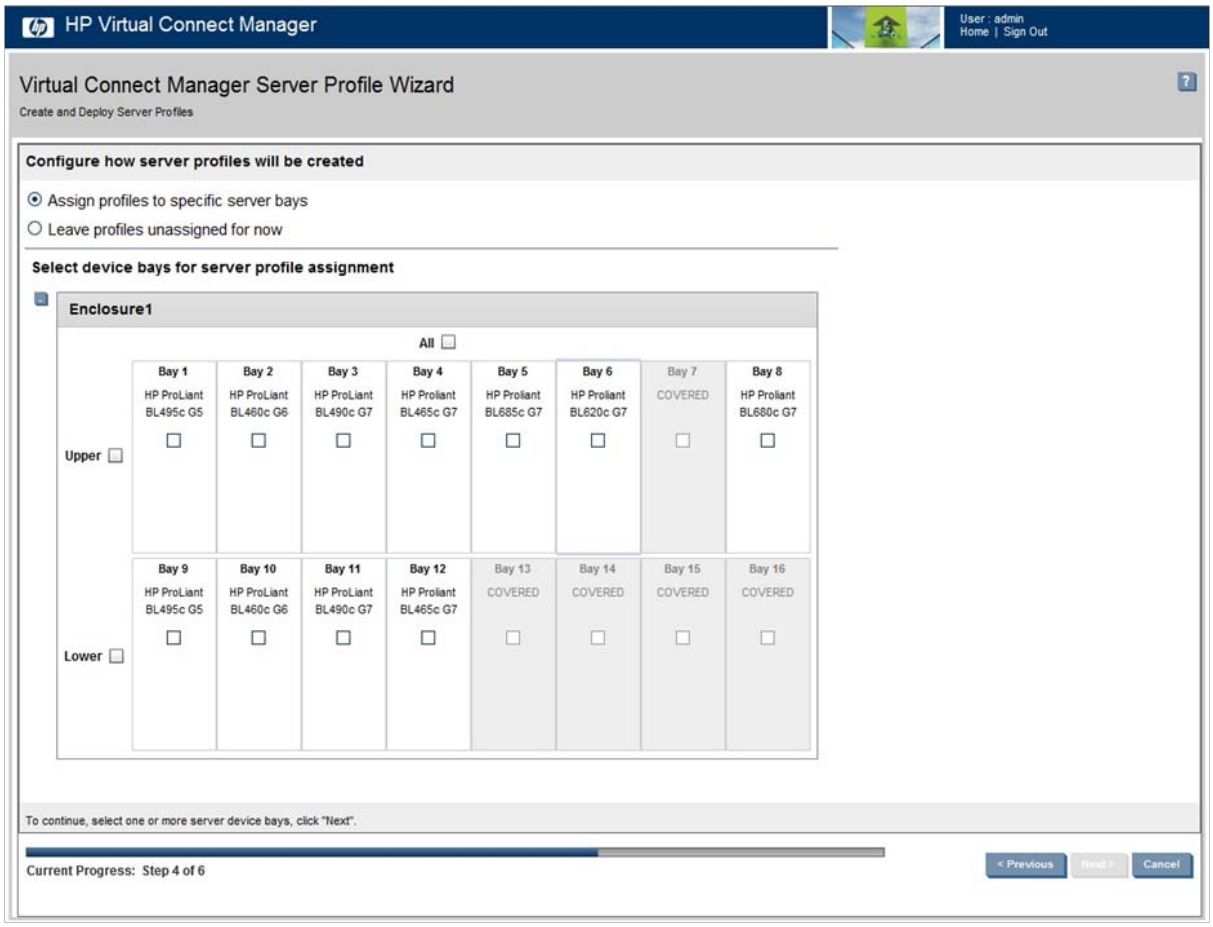
Assign Server Profiles

Server profiles are created from the definition. When these server profiles are created, you can choose to automatically assign them to device bays or to leave the server profiles unassigned.

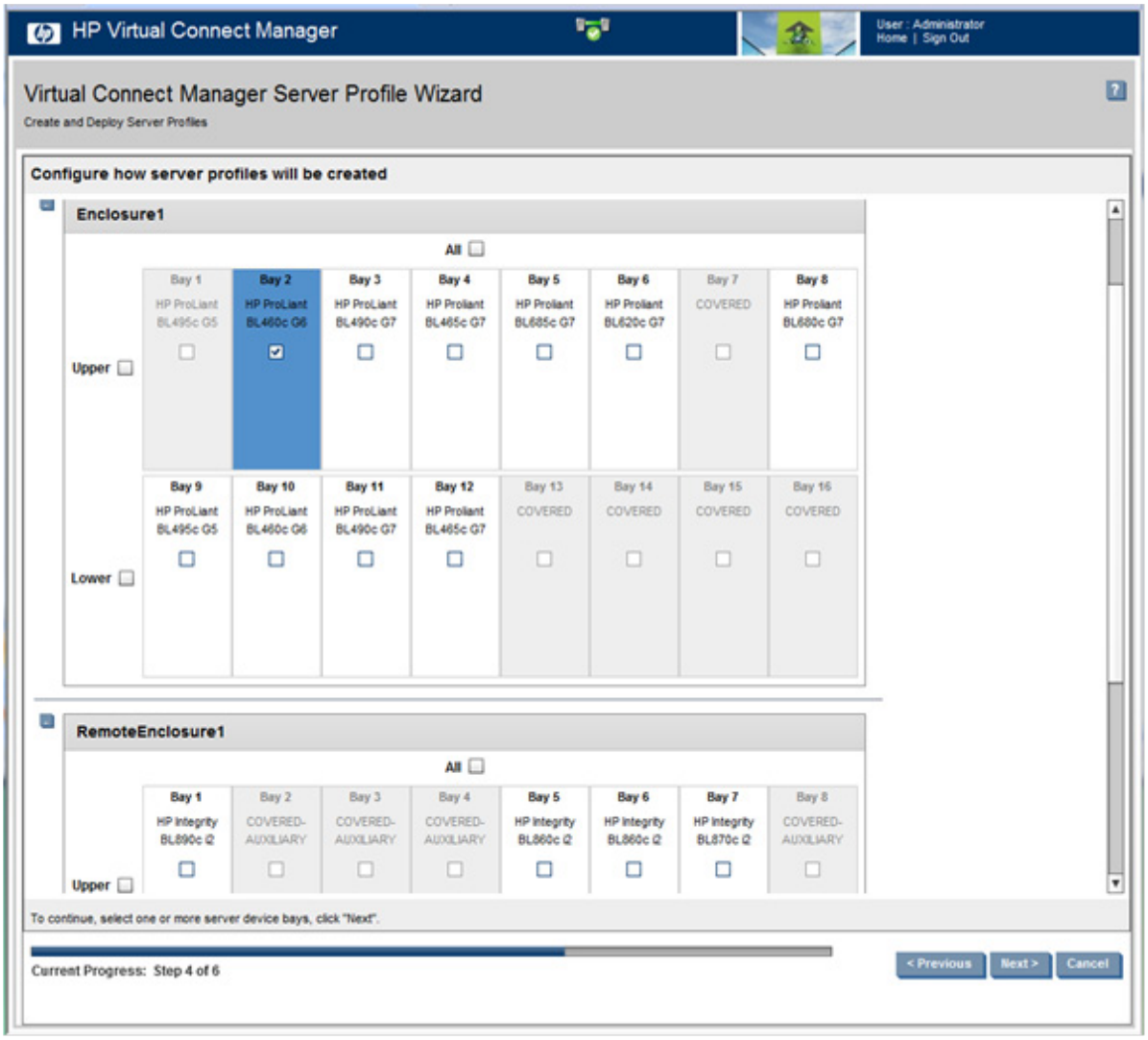
When defining server profiles in a multi-enclosure configuration, profiles can be assigned to server bays in any of the enclosures that have been added and imported into the domain.

When a profile is created and assigned to a multi-blade server, the profile is applied to all of the blades in the multi-blade server. Be sure that the profile contains enough Ethernet and Fibre Channel connection entries for all of the ports on all of the blades in the multi-blade server.

- Single enclosure domain



- Multi-enclosure domain

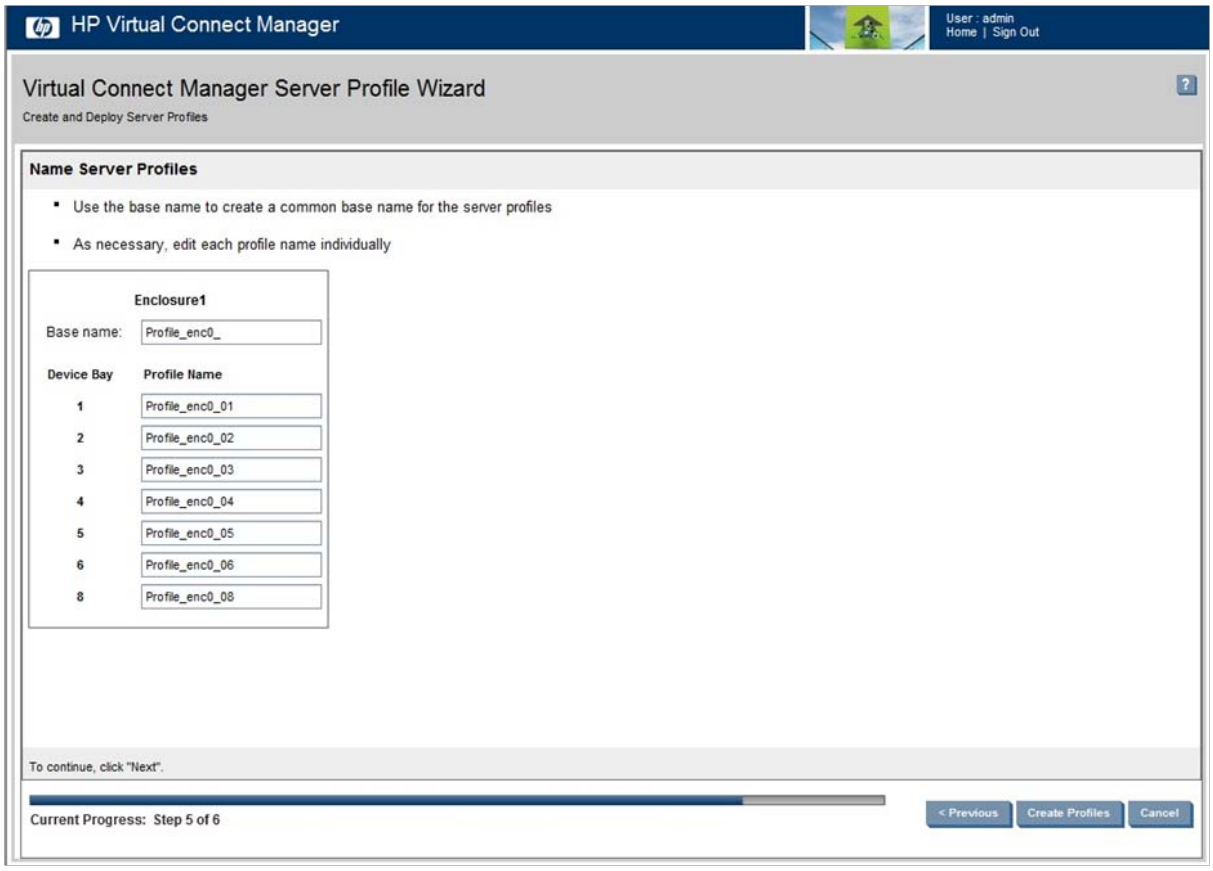


Name Server Profiles

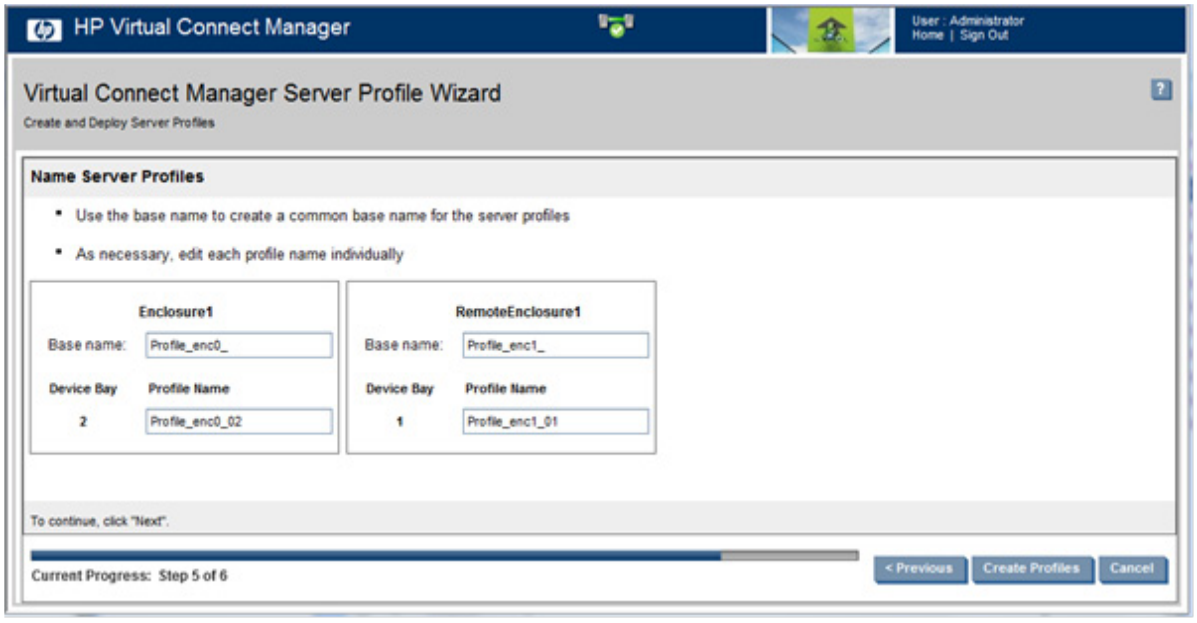
The table displays the automatically generated names that will be assigned to the new server profiles. The server profile name can be up to 64 characters in length (no spaces). Because the server profile can be assigned to different locations, HP recommends that the name reflect the server function. For each enclosure, a base name is provided. You can use this enclosure name to create names for the profiles assigned to the enclosure. The individual profile names can be edited as needed. Be sure that the names are unique and meaningful.

After reviewing the profiles to be created, click **Create Profiles**.

- Single enclosure domain



- Multi-enclosure domain



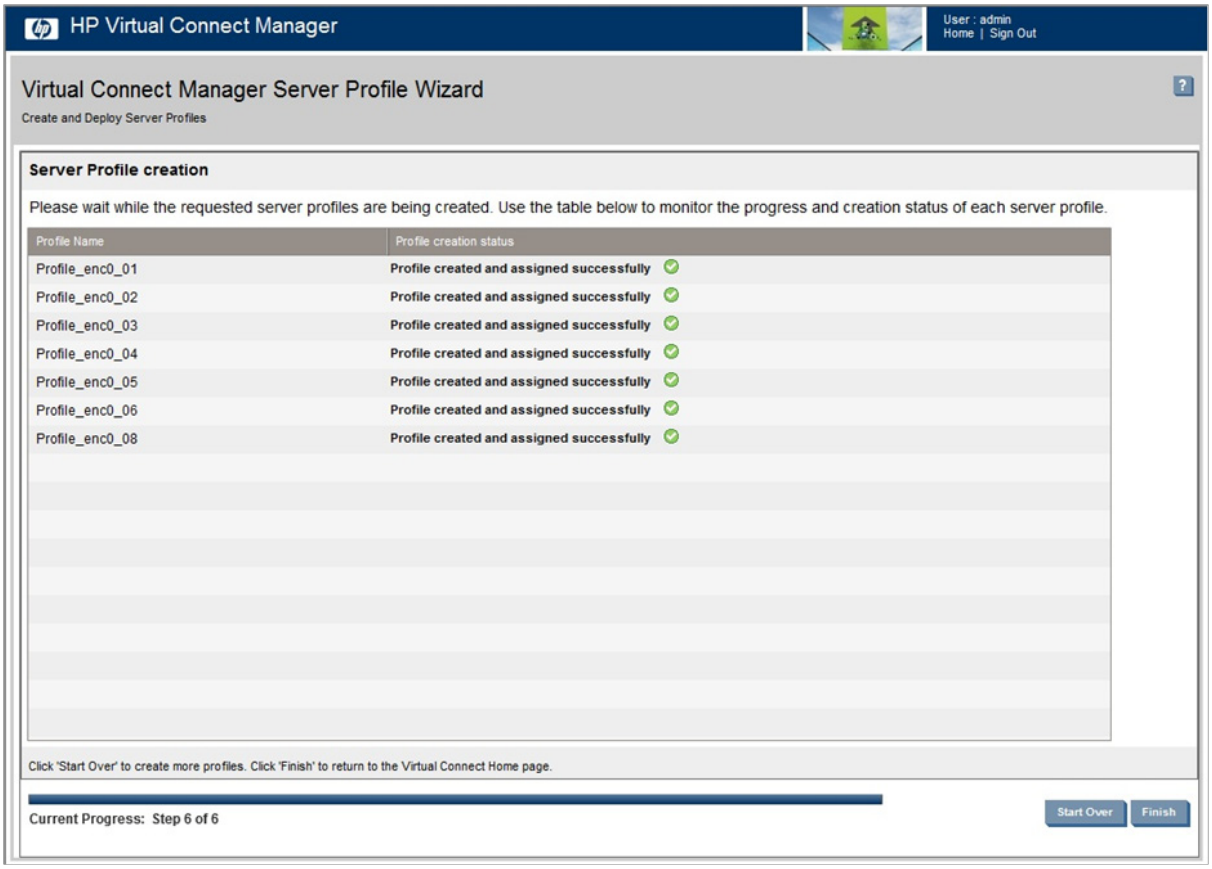
Create Server Profiles

This screen provides confirmation of each profile that was created and successfully assigned (if applicable).

Click **Start Over** to create additional profiles using the wizard. This option returns you to the appropriate step for creating more profiles.

Click **Finish** if you are finished creating profiles at this time. This option launches the Virtual Connect Home page.

If creation of a server profile failed, see "Server profile troubleshooting (on page 97)."



Verifying data center connections

After completing the cabling between the HP BladeSystem c-Class enclosure and the data center networks, use the following techniques to verify that the network connections are operating properly:

- Verify that all external connections are linked and operating at the right speed.
- Review the Virtual Connect Manager Network status screens ("Verify network status using VC Manager" on page 103).
- Use port IDs to verify network connections.
- Configure a server and verify network connectivity.

Verify link and speed

To verify that all external ports connected to the data center are linked and are operating at the appropriate speed:

1. Verify that all VC-Enet and FlexFabric modules are powered on and functioning properly. The module status LED should be green for all modules connected and configured in Virtual Connect for data center use.

   If the LED is not green, use the HP Onboard Administrator user interface to diagnose the problem and verify that the module is powered on.
2. Verify that all VC-FC modules are powered on and functioning properly. The module status LED should be green for all modules connected and configured in Virtual Connect for data center use.

   If the LED is not green, use the HP Onboard Administrator user interface to diagnose the problem and verify that the module is powered on.
3. Verify that the data center switches are powered on.
4. Verify that each external port is linked and operating at the appropriate speed using link/speed activity LEDs for that port.

   If ports are not linked, verify that the cables being used are not defective, and verify that both ends of the link are configured for the same speed/duplex settings. Both sides of the configuration must match for the link to be established. For autonegotiation, both ports must be configured to run autonegotiation. To use a forced speed, (for example, 100 Mb full-duplex), both ports must be configured to be the same forced speed. Mismatched configuration can result in ports not linking up or not functioning properly. VC-Enet and FlexFabric modules do not support half-duplex operations.
5. Verify that the port status indicator (port number) of each configured external port is illuminated green, assuming no port IDs are enabled. This status indicates that the port is actively configured as part of an external connection.

Verify network status using VC Manager

VCM provides many status and summary screens that can be used to verify that the networks were defined properly and mapped to the appropriate network.

One useful summary screen is the Ethernet Networks (Summary) screen. To access this screen, click the Ethernet Networks link in the left navigation tree.

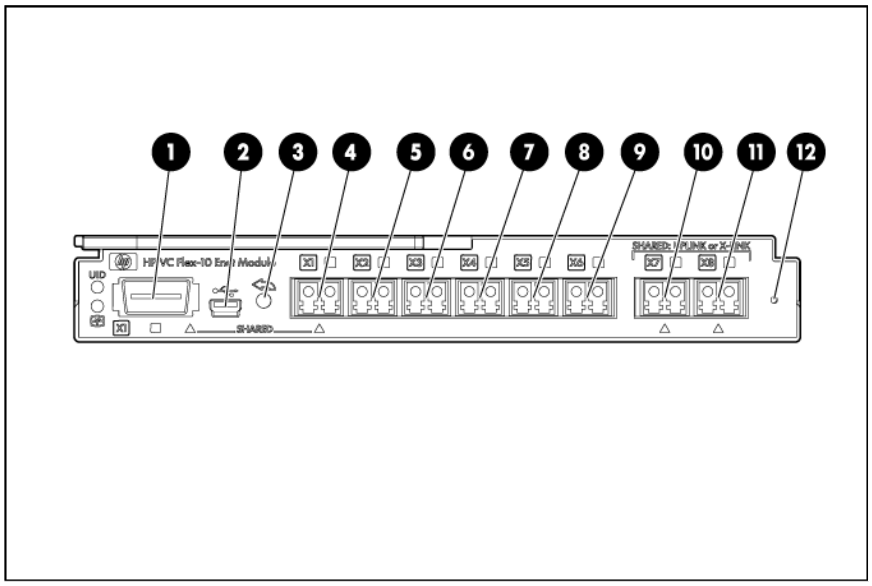
The following actions are available from this screen:

- Identify the external ports associated with each Ethernet network.
- View the current port status (link, speed) of each external port.
- View the current active/standby state of each external port.
- Access information about attached switches (if the external switch supports LLDP).
- Highlight the port IDs for all external ports associated with a specific network.

Component identification

HP Virtual Connect Flex-10 10Gb Ethernet Module components and LEDs

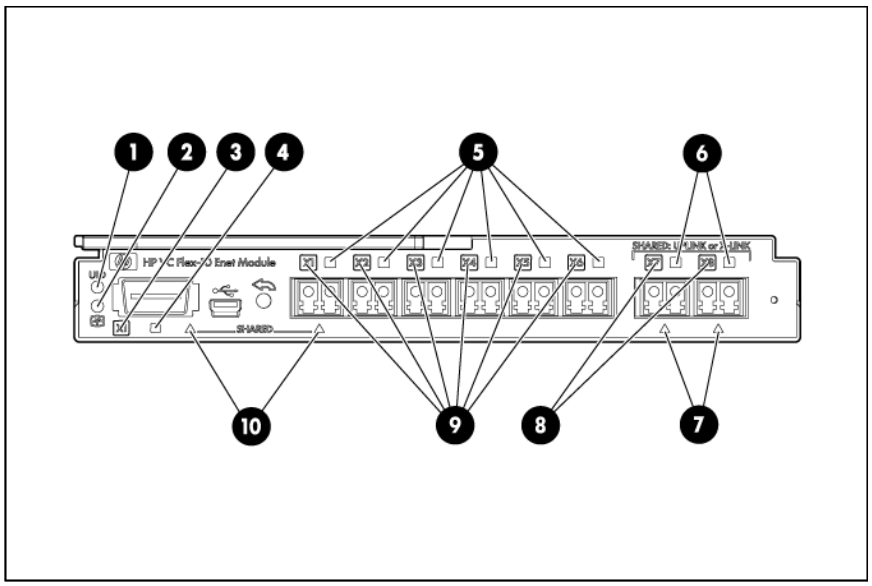
HP Virtual Connect Flex-10 10Gb Ethernet Module components



Item	Description
1	Port X1 (10GBASE-CX4), multiplexed with item 4
2	USB 2.0 mini AB connector (covered)
3	Next button
4	Port X1 SFP+ connector*, multiplexed with item 1
5	Port X2 SFP+ connector*
6	Port X3 SFP+ connector*
7	Port X4 SFP+ connector*
8	Port X5 SFP+ connector*
9	Port X6 SFP+ connector*
10	Port X7 SFP+ connector*, multiplexed with internal 10Gb interface cross-link
11	Port X8 SFP+ connector*, multiplexed with internal 10Gb interface cross-link
12	Reset button (recessed)

*Supports 1000BASE-T-SFP, 1000BASE-SX-SFP, 10GBASE-LR SFP+, 10GBASE-SR SFP+, and 10GBASE-LRM SFP+ pluggable transceiver modules

HP Virtual Connect Flex-10 10Gb Ethernet Module LEDs



Item	LED description	Status
1	Module locator (UID)	Blue = Module ID is selected. Off = Module ID is not selected.
2	Module status	Green = Normal operation Amber = Degraded condition Amber flashing = Fault condition Off = Power off
3	X1 port status (10GBASE-CX4)	Green = Port is configured and operating as an uplink port connected to a data center fabric. Amber = Port is operating as a stacking link interconnecting Virtual Connect modules. Blue = Port locator (PID) Off = Unconfigured
4	X1 link/port activity	Green = Link Green flashing = Activity Off = No link
5	X1-X6 link/port activity	Green = 10G link Green flashing = 10G activity Amber = 1G link Amber flashing = 1G activity Off = No link
6	X7/X8 link/port activity	Green = 10G link Green flashing = 10G activity Amber = 1G link Amber flashing = 1G activity Off = No link
7	X7/X8 shared port activity	Green = Port is active. Off = Port is inactive.

Item	LED description	Status
8	X7/X8 port status	Green = Port is configured and operating as an uplink port connected to a data center fabric. Amber = Port is operating as a stacking link interconnecting Virtual Connect modules. Blue = Port locator (PID) Off = Unconfigured
9	X1/X6 port status	Green = Port is configured and operating as an uplink port connected to a data center fabric. Amber = Port is operating as a stacking link interconnecting Virtual Connect modules. Blue = Port locator (PID) Off = Unconfigured
10	X1 shared port activity	Green = Port is active. Off = Port is inactive.

Shared port operation

Port X1 (10BASE-CX4) and Port X1 (SFP+)

Port X1 (10BASE-CX4) is multiplexed with Port X1 (SFP+). Either the CX-4 port is active or the SFP+ port is active, but not both. The triangle LED underneath each port indicates which port is active. The SFP+ port always has precedence over the CX4 port.

- If there is a module installed in the SFP+ port, the SFP+ port is the active port.
  - The LED under the SFP+ port is on.
  - The LED under the CX4 port is off.
- If there is no module installed in the SFP+ port, the CX4 port is the active port.
  - The LED under the CX4 port is on.
  - The LED under the SFP+ port is off.

Port X7 and port X8

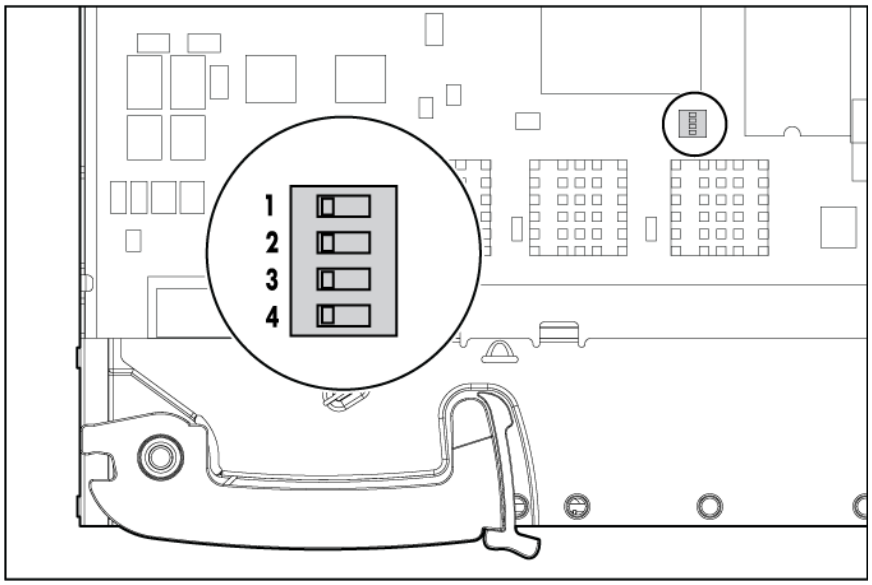
- Port X7 (SFP+) and port X8 (SFP+) are each multiplexed with an internal 10Gb interface cross-link, which is provided on the enclosure midplane between two horizontally adjacent VC modules to establish stacking links. Either the port is active or the internal cross-link is active, but not both. The triangle LEDs underneath ports X7 and X8 indicate whether the SFP+ port is active or the internal cross-link is active. The SFP+ port always has precedence over the internal cross-link port. Port X7 is shared with internal cross-link 1, and Port X8 is shared with internal cross-link 2.
- If there is a module installed in the SFP+ port, the SFP+ port is the active port.

  The LED under the SFP+ port is on.
- If there is no module installed in the SFP+ port, and the port has not been configured as an uplink in a VC Ethernet network, then the corresponding internal cross-link is the active port.

  The LED under the SFP+ port is off.
- If there is no module installed in the SFP+ port, and the port has been configured as an uplink in a VC Ethernet network, then the SFP+ port is the active port.

  The LED under the SFP+ port is on.

HP Virtual Connect Flex-10 10Gb Ethernet Module system maintenance switch



Function	Switch positions*
Default setting	OFF OFF OFF OFF (0000)
Password/DNS reset	ON OFF OFF OFF (1000)
FIPS mode	OFF OFF ON OFF (0010)

*Switch positions are from 1 to 4.

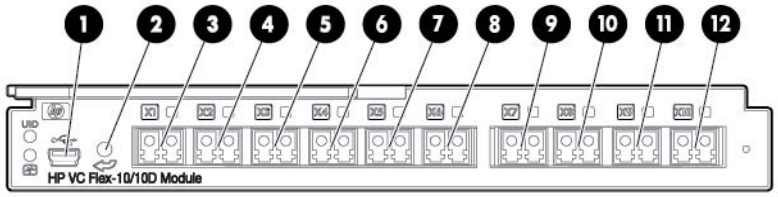
See the following sections for function procedures:

- "Resetting the Administrator password and DNS settings (on page 128)"
- "Virtual Connect FIPS mode of operation (on page 34)"

HP Virtual Connect Flex-10/10D Module components and LEDs

HP Virtual Connect Flex10/10D Module components

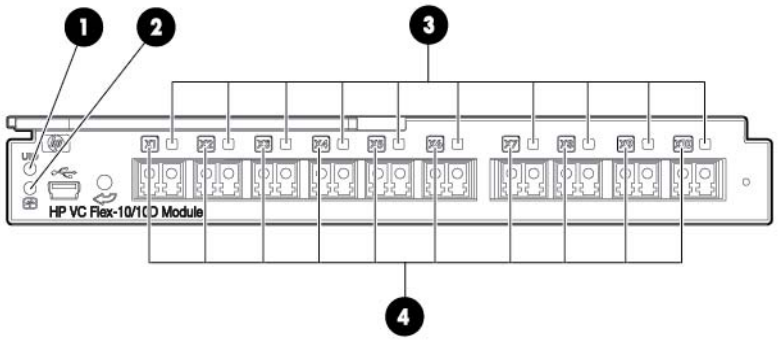
Ports X1 through X10 support Ethernet traffic only.



Item	Component	Description
1	USB 2.0 mini AB connector (covered)	For support purposes only
2	Next button	For support purposes only
3	Port X1 SFP+ connector	1Gb or 10Gb Ethernet
4	Port X2 SFP+ connector	1Gb or 10Gb Ethernet
5	Port X3 SFP+ connector	1Gb or 10Gb Ethernet
6	Port X4 SFP+ connector	1Gb or 10Gb Ethernet
7	Port X5 SFP+ connector	1Gb or 10Gb Ethernet
8	Port X6 SFP+ connector	1Gb or 10Gb Ethernet
9	Port X7 SFP+ connector	1Gb or 10Gb Ethernet
10	Port X8 SFP+ connector	1Gb or 10Gb Ethernet
11	Port X9 SFP+ connector	1Gb or 10Gb Ethernet
12	Port X10 SFP+ connector	1Gb or 10Gb Ethernet

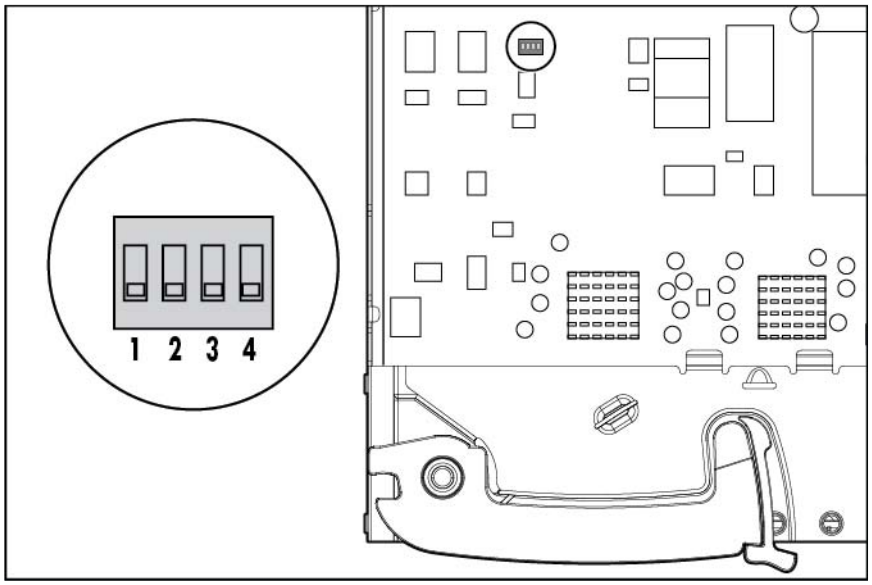
The connectors support 1000BASE-T SFP, 1000BASE-SX SFP, 10GBASE-LR SFP+, 10GBASE-SR SFP+, 10GBASE-LRM SFP+, and 10GBASE-DAC SFP+ pluggable Ethernet transceiver modules. For more information, see the Virtual Connect QuickSpecs on the HP website (http://www.hp.com/go/vc/manuals).

HP Virtual Connect Flex10/10D Module LEDs



Item	LED description	Status
1	Module locator (UID)	Blue = Module ID is selected. Off = Module ID is not selected.
2	Module status	Green = Normal operation Amber = Degraded condition Amber flashing = Fault condition Off = Power off
3	X1–X10 link/port activity	Green = 10G link Green flashing = 10G activity Amber = 1G link Amber flashing = 1G activity Off = No link
4	X1–X10 port status	Green = Port is configured and operating as an uplink port connected to a data center fabric. Amber = Port is operating as a stacking link interconnecting Virtual Connect modules. Blue = Port locator (PID) Off = Unconfigured

HP Virtual Connect Flex10/10D Module system maintenance switch



Function	Switch positions*
Default setting	OFF OFF OFF OFF (0000)
Password/DNS reset	ON OFF OFF OFF (1000)
FIPS mode	OFF OFF ON OFF (0010)

*Switch positions are from 1 to 4.

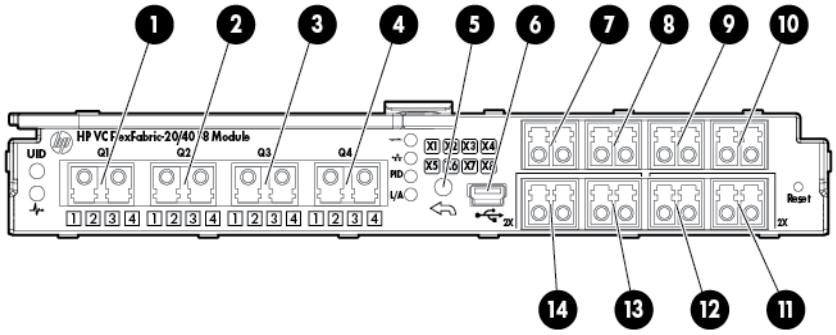
See the following sections for function procedures:

- "Resetting the Administrator password and DNS settings (on page 128)"
- "Virtual Connect FIPS mode of operation (on page 34)"

HP Virtual Connect FlexFabric-20/40 F8 Module components and LEDs

HP Virtual Connect FlexFabric-20/40 F8 Module components

Ports Q1 through Q4 support Ethernet. Ports X1 through X8 support Ethernet and Fibre Channel traffic. Port pairs X5/X6 and X7/X8 carry a single type of network traffic, either Ethernet or Fibre Channel.



Item	Description	Capable speed
1	Port Q1 QSFP+ connector*	10Gb, 40Gb or 4x10Gb
2	Port Q2 QSFP+ connector*	10Gb, 40Gb or 4x10Gb
3	Port Q3 QSFP+ connector*	10Gb, 40Gb or 4x10Gb
4	Port Q4 QSFP+ connector*	10Gb, 40Gb or 4x10Gb
5	Next button	Toggles port LED mode through PID, L/A, FC and Ethernet. See "Port LED modes when toggled using the Next button (on page 112)."
6	USB 2.0 mini AB connector (covered)	—
7	Port X1 SFP+ connector**	1Gb, 10Gb Ethernet 2Gb, 4Gb, or 8Gb FC
8	Port X2 SFP+ connector**	1Gb, 10Gb Ethernet 2Gb, 4Gb, or 8Gb FC
9	Port X3 SFP+ connector**	1Gb, 10Gb Ethernet 2Gb, 4Gb, or 8Gb FC
10	Port X4 SFP+ connector**	1Gb, 10Gb Ethernet 2Gb, 4Gb, or 8Gb FC
11	Port X8 SFP+ connector** †	1Gb, 10Gb Ethernet 2Gb, 4Gb, or 8Gb FC
12	Port X7 SFP+ connector** †	1Gb, 10Gb Ethernet 2Gb, 4Gb, or 8Gb FC
13	Port X6 SFP+ connector** †	1Gb, 10Gb Ethernet 2Gb, 4Gb, or 8Gb FC

Item	Description	Capable speed
14	Port X5 SFP+ connector** †	1Gb, 10Gb Ethernet 2Gb, 4Gb, or 8Gb FC

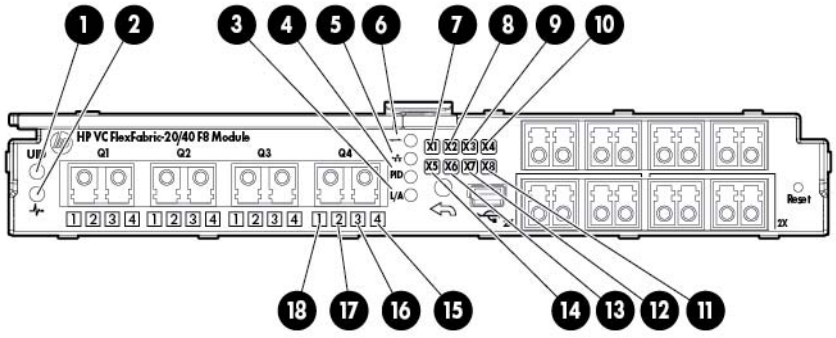
*QSFP+ Supports 1x40Gb QSFP+ SR4, 1x40Gb QSFP+ SR4 300m, 1x40Gb QSFP+ LR4, 1x40Gb QSFP+ AOC SR4, 1x40Gb QSFP+ DAC CR4, and 40Gb QSFP+ to 4xSFP+ Splitter. 10Gb SFP+ pluggable Ethernet transceiver modules can be used in QSFP+ ports by using the HP BLc QSFP+ to SFP+ Adapter. LRM, 1Gb, FC, 15m active DAC, and 7m passive DAC SFP+ pluggable modules are not supported with the adapter in QSFP+ ports.
**SFP+ supports 1000BASE-T-SFP, 1000BASE-SX-SFP, 1000BASE-RJ45-SFP, 10GBASE-LR SFP+, 10GBASE-SR SFP+, 10GBASE-LRM SFP+, and 10GBASE-DAC SFP+ pluggable Ethernet transceiver modules and 2/4/8Gb SFP+ pluggable Fibre Channel transceiver modules.
† Ports X5/X6 and X7/X8 are paired with each pair carrying a single type of network traffic, either FC or Ethernet. Each pair must have the same speed for Ethernet, both 1Gb or both 10Gb.
For more information, see the HP Virtual Connect QuickSpecs on the HP QuickSpecs website (http://www.hp.com/go/qs).

Port LED modes when toggled using the Next button

The port status LEDs are in one of four modes, indicated by the mode LED that is lit green. Use the Next button to toggle between these modes.

- **PID mode**—The PID mode LED is lit green and the port LEDs are amber for Enet stacking links or an FC port is not online or logged in, green for Enet uplinks or an FC port is connected to a switch, light purple for Ethernet mirror-to-port, and red if the port has an error.
- **L/A mode**—The L/A mode LED is lit green and the color of the port LEDs indicates speed, and activity when flashing.
- **Ethernet mode**—The Ethernet mode LED is lit green. The port LEDs are solid green on ports configured for Ethernet. All other port LEDs are off.
- **FC mode**—The FC mode LED is lit green. The port LEDs are solid green on ports configured for FC. All other port LEDs are off.

HP Virtual Connect FlexFabric-20/40 F8 Module LEDs

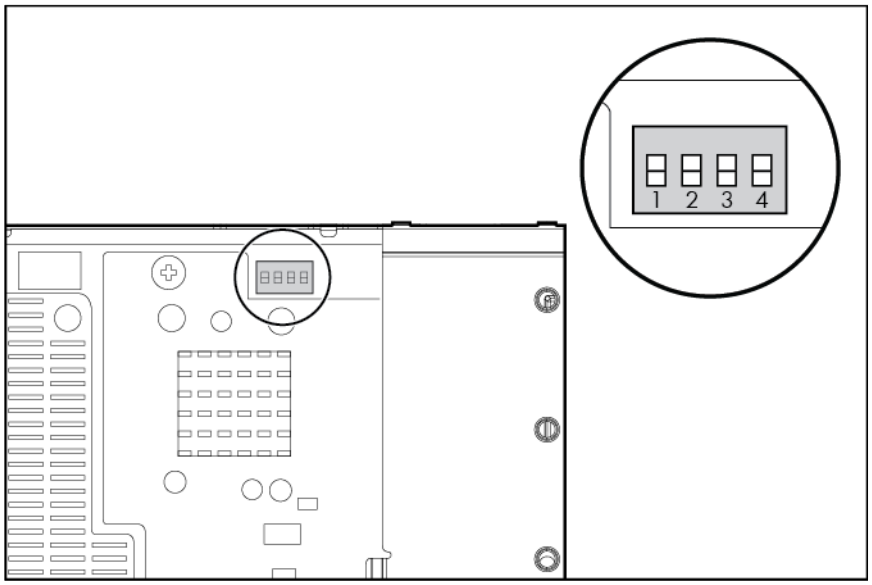


Item	LED description	Status
1	Module locator (UID)	Blue = Module ID is selected. Off = Module ID is not selected.

Item	LED description	Status
2	Module status	Green = Normal operation Amber = Degraded condition Amber flashing = Fault condition Off = Power off
3	L/A	Green = Port LEDs are in Link/Activity mode
4	PID	Green = Port LEDs are in Port Identifier mode
5	FC Mode	Green = Port LEDs are in FC mode
6	Ethernet	Green = Port LEDs are in Ethernet mode
7 8 9 10 11 12 13 14	X1-X8 port status	**PID mode** The PID mode LED is lit green. Port LEDs: Amber = The port is configured as an Enet stacking link or an FC port is not on-line or logged in. Green = The port is configured as an Enet uplink port or an FC port connected to a switch Light Purple = The port is configured as an Enet mirror-to-port. Red = The port has an error such as an invalid or unsupported pluggable module detected Blue = Port identification (locator) **L/A mode** The L/A mode LED is lit green. Port LEDs: Green = The port is configured and operating as an uplink port connected to a data center fabric at either 10GbE or 4Gb FC. Green flashing = Port activity at either 10GbE or 4Gb FC. Amber = The port is configured and operating as an uplink port connected to a data center fabric at either 1GbE or 8Gb FC. Amber flashing = Port activity at either 1GbE or 8Gb FC. Orange = The port is configured and operating as an uplink port connected to a data center fabric at 2Gb FC. Orange flashing = Port activity at 2Gb FC. Red = Port error, invalid or unsupported pluggable module detected. Off = No link **Fibre Channel mode** Green = Port is configured for FC. Off = Port is not configured for FC. **Ethernet mode** Green = Port is configured for Ethernet. Off = Port is not configured for Ethernet.
15 16 17 18	Qx port status	For each QSFP+ port configured in 1x40G mode, the first of the four ports (Qn1) is used and Qn2 through Qn4 are inactive. For each QSFP+ port configured in 4x10G mode, each of the four LEDs represents one 10Gb

Item	LED description	Status
		link (Qn.1–Qn.4). **PID mode** The PID mode LED is lit green. Port LEDs: Amber = Port is configured as an Enet stacking link. Green = Port is configured as an Enet uplink port Light Purple = port is configured as an Enet mirror-to-port Red = Port has an error such as an invalid or unsupported pluggable module detected Blue = Port identification (locator) **L/A mode** The L/A mode LED is lit green. Port LEDs: Green = The port is configured and operating as an uplink port connected to a data center fabric at 10GbE. Green flashing = Port activity at 10GbE. Purple = The port is configured and operating as an uplink port connected to a data center fabric at 40GbE. Purple flashing = Port activity at 40GbE. Red = Port error, invalid or unsupported pluggable module detected. Off = No link **Fibre Channel mode** Off = Port does not support FC. **Ethernet mode** Green = Port is configured for Ethernet. Off = Port is not configured for Ethernet.

HP Virtual Connect FlexFabric-20/40 F8 Module system maintenance switch



Function	Switch positions*
Default setting	OFF OFF OFF OFF (0000)
Password/DNS reset	ON OFF OFF OFF (1000)
FIPS mode	OFF OFF ON OFF (0010)

*Switch positions are from 1 to 4.

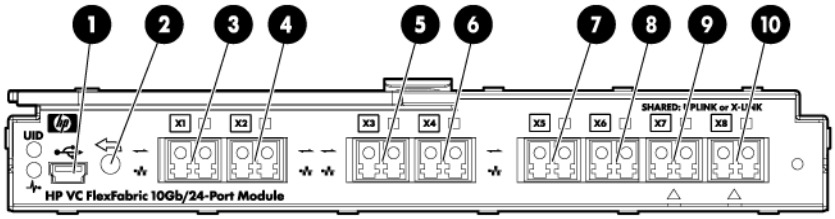
See the following sections for function procedures:

- "Resetting the Administrator password and DNS settings (on page 128)"
- "Virtual Connect FIPS mode of operation (on page 34)"

HP Virtual Connect FlexFabric 10Gb/24-port Module components and LEDs

HP Virtual Connect FlexFabric 10Gb/24-port Module components

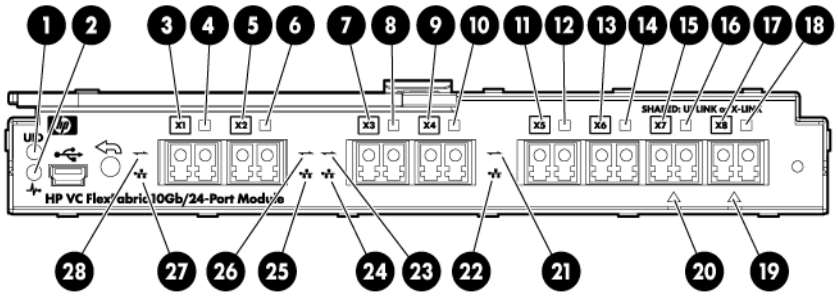
Ports X1 through X4 support Ethernet or Fibre Channel traffic. Ports X5 through X8 support Ethernet traffic only. Ports X7 and X8 are multiplexed with the internal 10Gb interface cross-link.



Item	Description	Capable speed
1	USB 2.0 mini AB connector (covered)	—
2	Next button	—
3	Port X1 SFP+ connector*	10Gb Ethernet 2Gb, 4Gb, or 8Gb FC
4	Port X2 SFP+ connector*	10Gb Ethernet 2Gb, 4Gb, or 8Gb FC
5	Port X3 SFP+ connector*	10Gb Ethernet 2Gb, 4Gb, or 8Gb FC
6	Port X4 SFP+ connector*	10Gb Ethernet 2Gb, 4Gb, or 8Gb FC
7	Port X5 SFP+ connector**	1Gb or 10Gb Ethernet
8	Port X6 SFP+ connector**	1Gb or 10Gb Ethernet
9	Port X7 SFP+ connector**	1Gb or 10Gb Ethernet
10	Port X8 SFP+ connector**	1Gb or 10Gb Ethernet

*Supports 10GBASE-LR SFP+, 10GBASE-SR SFP+, or 10GBASE-DAC SFP+ pluggable Ethernet transceiver modules and 2/4/8Gb SFP+ pluggable Fibre Channel transceiver modules
**Supports 1000BASE-T-SFP, 1000BASE-SX-SFP, 1000BASE-RJ45-SFP, 10GBASE-LR SFP+, 10GBASE-SR SFP+, 10GBASE-LRM SFP+, and 10GBASE-DAC SFP+ pluggable Ethernet transceiver modules

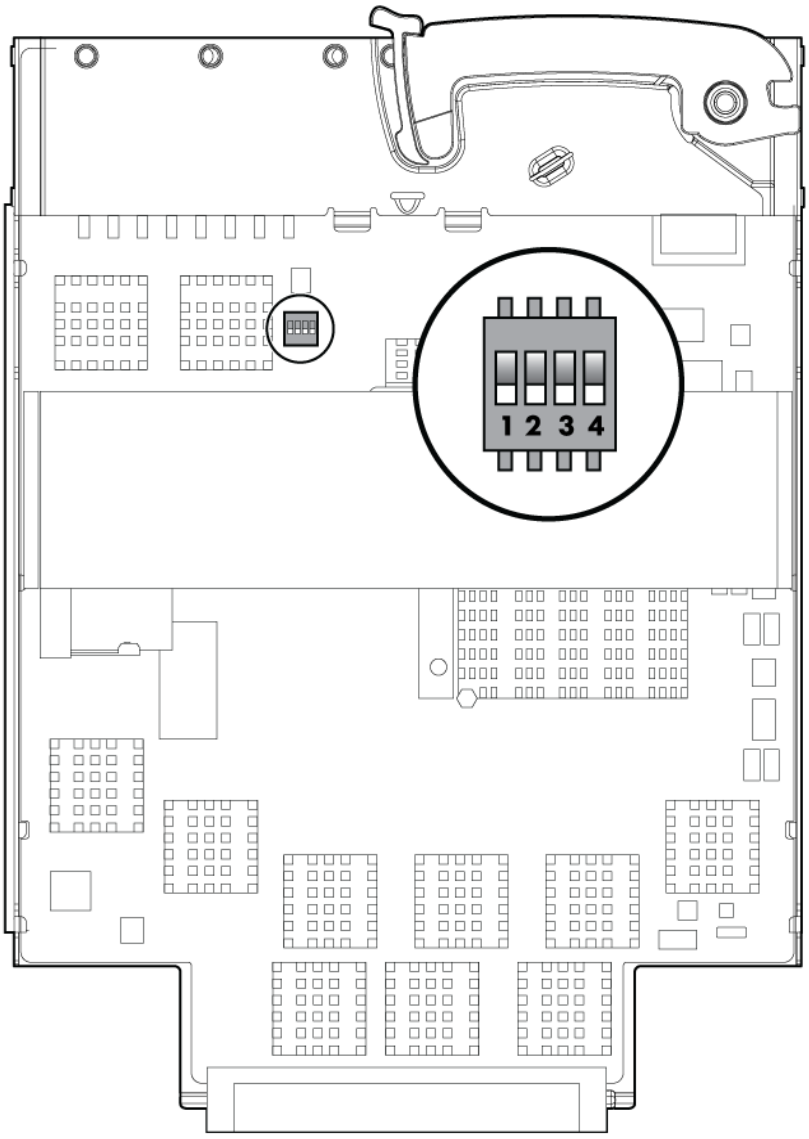
HP Virtual Connect FlexFabric 10Gb/24-port Module LEDs



Item	LED description	Status
1	Module locator (UID)	Blue = Module ID is selected. Off = Module ID is not selected.
2	Module status	Green = Normal operation Amber = Degraded condition Amber flashing = Fault condition Off = Power off
3 5 7 9	X1-X4 port status	**Ethernet mode** Green = Port is configured and operating as an uplink port connected to a data center fabric. Amber = Port is operating as a stacking link interconnecting Virtual Connect modules. Amber flashing = SFP module is invalid for Ethernet mode. Purple flashing = Port is configured as a mirror to port. Blue = Port locator (PID) Off = Unconfigured **Fibre Channel mode** Green = Port is online and logged in to an attached switch. Green flashing = Port is either not online or not logged in. Amber flashing = SFP module is invalid for Fibre Channel mode. Blue = Port locator (PID) Off = Unconfigured
4 6 8 10	X1-X4 link/port activity	**Ethernet mode** Green = 10GbE link Green flashing = 10GbE activity Off = No link **Fibre Channel mode** Orange = 2Gb link Orange flashing = 2Gb activity Green = 4Gb link Green flashing = 4Gb activity Amber = 8Gb link Amber flashing = 8Gb activity Off = No link

Item	LED description	Status
11 13 15 17	X5-X8 port status	Green = Port is configured and operating as an uplink port connected to a data center fabric. Amber = Port is operating as a stacking link interconnecting Virtual Connect modules. Amber flashing = SFP module is invalid for Ethernet mode. Purple flashing = Port is configured as a mirror to port. Blue = Port locator (PID) Off = Unconfigured
12 14 16 18	X5-X8 link/port activity	Green = 10GbE link Green flashing = 10GbE activity Amber = 1GbE link Amber flashing = 1GbE activity Off = No link
19	X8 shared port indicator	Green = Port is multiplexed to the external SFP+ connector. Off = Port is multiplexed to the internal 10Gb interface crosslink.
20	X7 shared port indicator	Green = Port is multiplexed to the external SFP+ connector. Off = Port is multiplexed to the internal 10Gb interface crosslink.
21 23 26 28	Fibre Channel mode indicators	Green = The port is configured for Fibre Channel traffic. Off = The port is not configured for this mode.
22 24 25 27	Ethernet mode indicators	Green = The port is configured for Ethernet traffic. Off = The port is not configured for this mode.

HP Virtual Connect FlexFabric 10Gb/24-port Module system maintenance switch



Function	Switch positions*
Default setting	OFF OFF OFF OFF (0000)
Password/DNS reset	ON OFF OFF OFF (1000)
FIPS mode	OFF OFF ON OFF (0010)

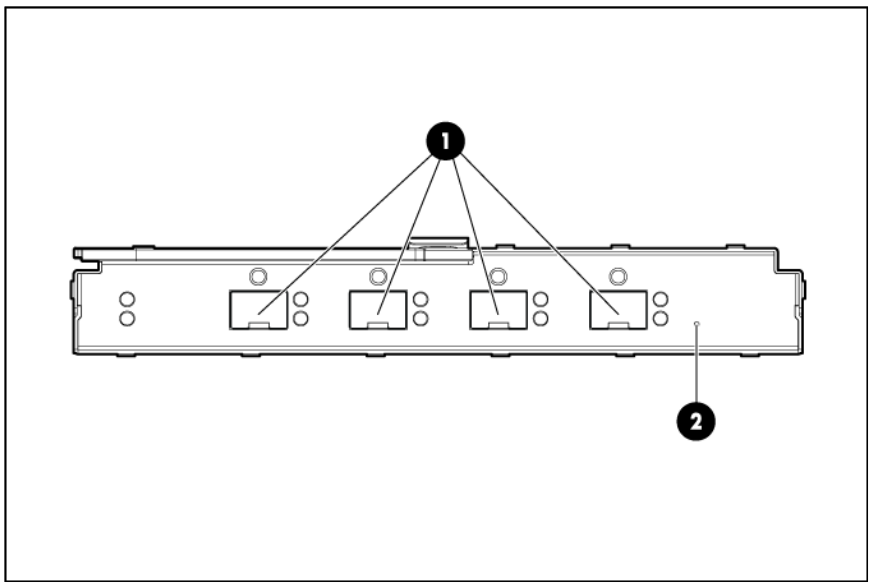
*Switch positions are from 1 to 4.

See the following sections for function procedures:

- "Resetting the Administrator password and DNS settings (on page 128)"
- "Virtual Connect FIPS mode of operation (on page 34)"

HP Virtual Connect 4Gb FC Module (with enhanced NPIV) components and LEDs

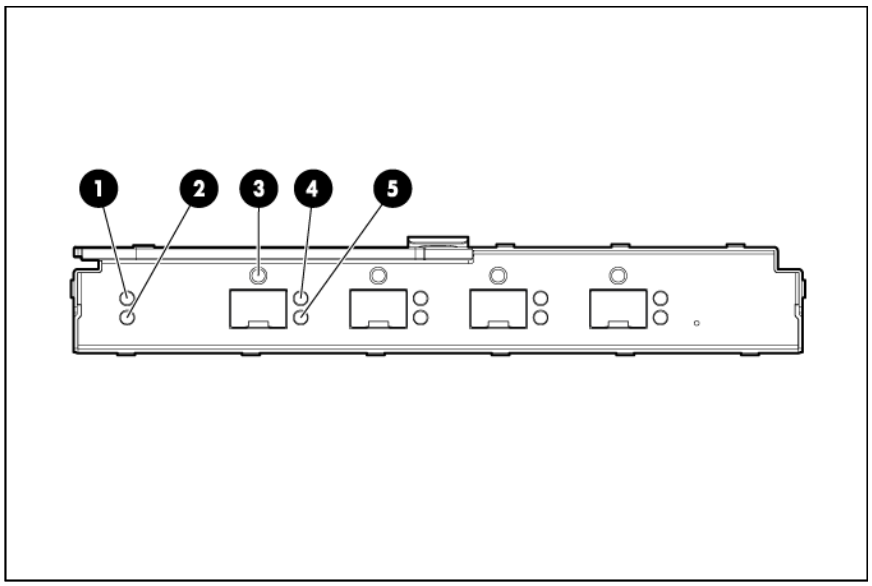
HP Virtual Connect 4Gb FC Module components



Item	Description	Device bays supported in default configuration
1	2/4 Gb capable SFP connectors	1-16 (c7000) 1-8 (c3000)
2	Reset button (recessed)	—

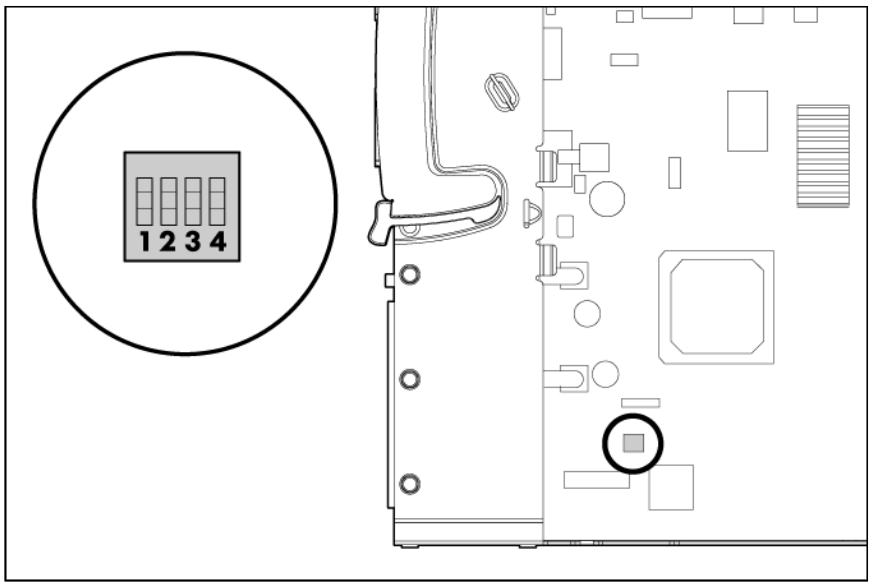
In the default configuration (before a Virtual Connect domain is created), all 2/4 Gb capable uplink ports are grouped into an Uplink Port Group and dynamically distribute connectivity from all server blades.

HP Virtual Connect 4Gb FC Module LEDs



Item	LED description	Status
1	Module locator (UID)	Blue = Module ID selected Off = Module ID not selected
2	Module status	Green = Normal operation Amber = Degraded condition Off = Power off
3	Port	Green = Port is configured as the uplink for one or more server HBAs. Amber = Port is not configured. Blue = Port is selected.
4	Logged in	Green = Logged in to an external Fibre Channel switch port Off = Port down, offline, no sync, or error
5	Activity	Green flashing (variable) = Link activity Green flashing (1 Hz) = External fabric switch does not support NPIV. Off = No activity

HP Virtual Connect 4Gb FC Module system maintenance switch

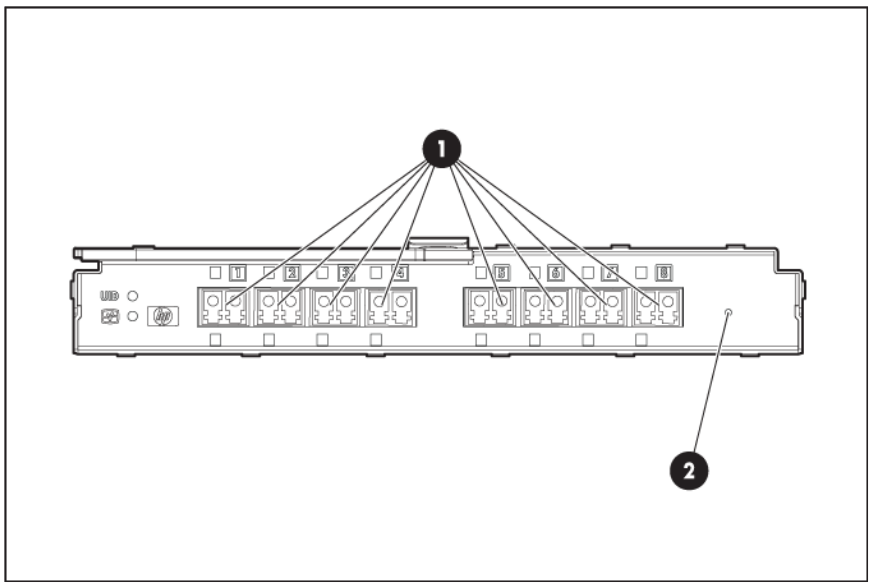


Switch	Default	Function
1	Off	Reserved
2	Off	Reserved
3	Off	Reserved
4	Off	Reserved

When part of a Virtual Connect domain, Virtual Connect Manager overrides any system maintenance switch settings.

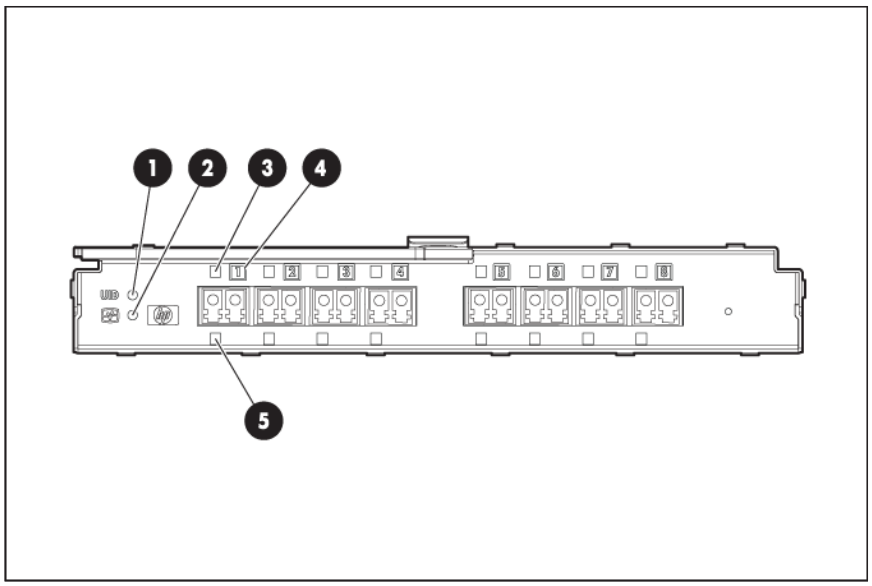
HP Virtual Connect 8Gb 24-Port Fibre Channel Module components and LEDs

HP VC 8Gb 24-Port FC Module components



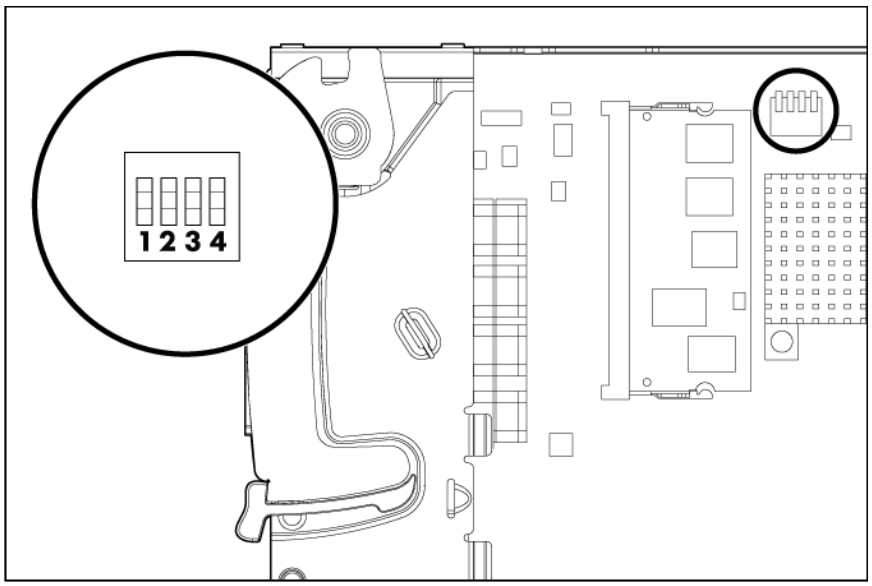
Item	Description	Device bays supported when in default configuration
1	SFP/SFP+ ports supporting 8Gb SFP+ and 4Gb SFP transceivers	1-16
2	Reset button (recessed)	—

HP VC 8Gb 24-Port FC Module LEDs



Item	LED description	Status
1	Module locator (UID)	Blue = Module ID selected Off = Module ID not selected
2	Module status	Green = Normal operation Amber = Degraded condition Off = Power off
3	Port link/activity	Green = Port is online, but not passing traffic Green slow flashing = Port is online and not logged in Green flickering = Port is online passing traffic Amber = Port has light or signal, but not yet online Amber slow flashing = Port is disabled (NPIV not enabled or supported on external devices) Amber fast flashing = Port is faulty Off = No power or signal on the port
4	Port indicator	Green = Logged in to an external Fibre Channel switch port Off = Port down, offline, no sync, or error
5	Port speed indicator	Off = 2 Gb Green = 4 Gb Amber = 8 Gb

HP VC 8Gb 24-Port FC Module system maintenance switch

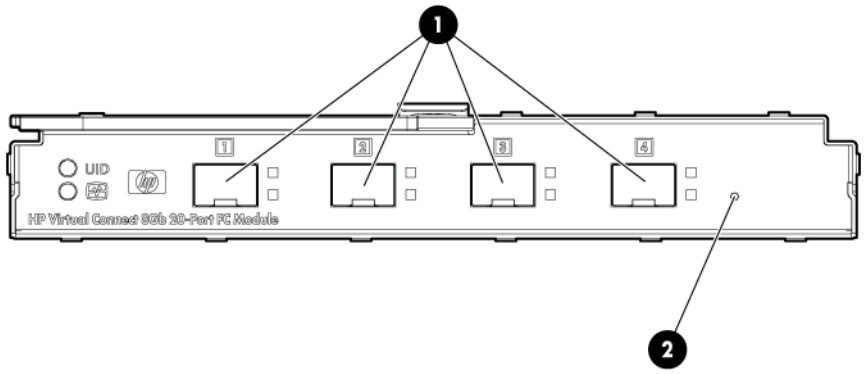


Switch	Default	Function
1	Off	Reserved (must be in "Off" position)
2	Off	Reserved (must be in "Off" position)
3	Off	Reserved (must be in "Off" position)
4	Off	Off = Module debug and test interface is inaccessible. On = Module debug and test interface is accessible.

When part of a Virtual Connect domain, Virtual Connect Manager overrides any system maintenance switch settings.

HP Virtual Connect 8Gb 20-Port Fibre Channel Module components and LEDs

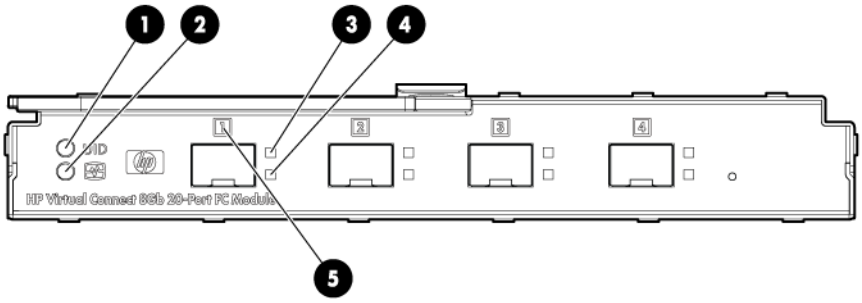
HP VC 8Gb 20-Port FC Module components



Item	Description	Device bays supported in default configuration
1	SFP/SFP+ ports supporting 8Gb SFP+ and 4Gb SFP transceivers	1-16 (c7000) 1-8 (c3000)
2	Reset button (recessed)	—

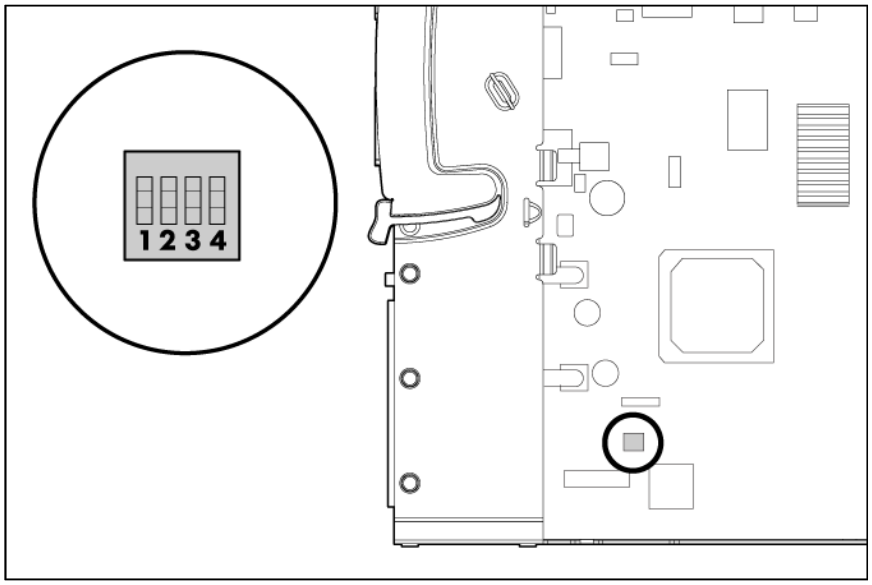
In the default configuration, before a Virtual Connect domain is created, all uplink ports are grouped into an uplink port group and dynamically distribute connectivity from all server blades.

HP VC 8Gb 20-Port FC Module LEDs



Item	LED description	Status
1	Module locator (UID)	Blue = Module ID is selected. Off = Module ID is not selected.
2	Module status	Green = Normal operation Amber = Degraded condition Off = Power off
3	Logged in	Green = Logged in to an external Fibre Channel switch port Off = Port down, offline, no sync, or error
4	Activity	Green flashing (variable) = Link activity Green flashing (1 Hz) = External fabric switch does not support NPIV. Off = No activity
5	Port indicator	Green = Port is configured as the uplink for one or more server HBAs. Amber = Port is not configured. Blue = Port is selected.

HP VC 8Gb 20-Port FC Module system maintenance switch



Switch	Default	Function
1	Off	Reserved
2	Off	Reserved
3	Off	Reserved
4	Off	Reserved

When part of a Virtual Connect domain, Virtual Connect Manager overrides any system maintenance switch settings.

Resetting the Administrator password and DNS settings

To return the VC-Enet module to factory default settings for the Administrator password and DNS settings, you must access the system maintenance switch. For switch locations, see the appropriate module system maintenance switch information.

When the VC-Enet module system maintenance switch 1 is in the ON position, the following actions occur:

- The firmware restores the Administrator account password and DNS Settings to the factory defaults listed on the module label (without disturbing any other local user accounts).
- The VC-Enet module management console displays the Administrator account password. To access the console, see the *HP BladeSystem Onboard Administrator User Guide* (*http://h20000.www2.hp.com/bc/docs/support/SupportManual/c00705292/c00705292.pdf*).

While switch 1 is in the ON position and reserved switches are in the OFF position, passwords are restored during each power-up sequence, but changes are not allowed.

After switch 1 is returned to the OFF position, the following conditions exist:

- Users with appropriate privileges can change the Administrator password.
- The VC-Enet module management console no longer displays the Administrator password.

To recover a password:

1. Remove the Virtual Connect Ethernet module from interconnect bay 1.
2. Remove the access panel from the Virtual Connect Ethernet module.
3. Set switch 1 to the ON position. Be sure that all other switches remain in the OFF position.
4. Install the access panel.
5. Install the Virtual Connect Ethernet module into bay 1 and allow the module to power up and reach a fully booted and operational state (approximately 1 minute).
6. Remove the Virtual Connect Ethernet module from interconnect bay 2.

   This action forces the module in interconnect bay 1 to run the active VC Manager. Because switch 1 is set, the Administrator password remains at the factory default for interconnect bay 1 (not overwritten by the change of state because of the failover).
7. Wait to ensure that the VC Manager has had time to become active on the module in interconnect bay 1. Log in to the VC Manager to confirm it is active.
8. Insert the Virtual Connect Ethernet module into interconnect bay 2 and allow the module to power on and reach a fully booted and operational state (approximately 1 minute).
9. Remove the Virtual Connect Ethernet module from interconnect bay 1.
10. Remove the access panel from the Virtual Connect Ethernet module.
11. Set switch 1 to the OFF position. Ensure that all other switches remain in the OFF position.
12. Install the access panel.
13. Install the Virtual Connect Ethernet module into interconnect bay 1 and allow the module to power up and reach a fully booted and operation state (approximately 1 minute).
14. Log in to the active VC Manager. Use the factory default user name and password to log in to the module, regardless of its location in interconnect bay 1 or interconnect bay 2.

15. Change the Administrator password.

Regulatory information

Safety and regulatory compliance

For safety, environmental, and regulatory information, see *Safety and Compliance Information for Server, Storage, Power, Networking, and Rack Products*, available at the HP website (http://www.hp.com/support/Safety-Compliance-EnterpriseProducts).

Belarus Kazakhstan Russia marking

Manufacturer

Hewlett-Packard Company, Address: 3000 Hanover Street, Palo Alto, California 94304, U.S.

Local representative information (Russian)

- HP Russia

  ЗАО "Хьюлетт-Паккард А.О.", 125171, Россия, г. Москва, Ленинградское шоссе, 16А, стр.3, тел/факс: +7 (495) 797 35 00, +7 (495) 287 89 05

- HP Belarus

  ИООО «Хьюлетт-Паккард Бел», 220030, Беларусь, г. Минск, ул. Интернациональная, 36-1, офис 722-723, тел.: +375 (17) 392 28 18, факс: +375 (17) 392 28 21

- HP Kazakhstan

  ТОО «Хьюлетт-Паккард (К), 050040, Казахстан, г. Алматы, Бостандыкский район, ул. Тимирязева, 28В, 1 этаж, тел./факс: +7 (727) 355 35 50, +7 (727) 355 35 51

Local representative information (Kazakh)

ЖШС «Хьюлетт-Паккард (К)», Қазақстан, Алматы қ., Бостандық ауданы, Тимирязев к-сі, 28В, тел./факс: +7 (727) 355 35 50, +7 (727) 355 35 51

Manufacturing date

The manufacturing date is defined by the serial number (HP serial number format for this product):

`CCSYWWZZZZ`

Valid date formats include the following:

- `YWW`, where `Y` indicates the year counting from within each new decade, with 2000 as the starting point. For example, 238: 2 for 2002 and 38 for the week of September 9. In addition, 2010 is indicated by 0, 2011 by 1, 2012 by 2, 2013 by 3, and so forth.
- `YYWW`, where `YY` indicates the year, using a base year of 2000. For example, 0238: 02 for 2002 and 38 for the week of September 9.

Turkey RoHS material content declaration

Türkiye Cumhuriyeti: EEE Yönetmeliğine Uygundur

Ukraine RoHS material content declaration

Обладнання відповідає вимогам Технічного регламенту щодо обмеження використання деяких небезпечних речовин в електричному та електронному обладнанні, затвердженого постановою Кабінету Міністрів України від 3 грудня 2008 № 1057

Warranty information

HP ProLiant and X86 Servers and Options (http://www.hp.com/support/ProLiantServers-Warranties)

HP Enterprise Servers (http://www.hp.com/support/EnterpriseServers-Warranties)

HP Storage Products (http://www.hp.com/support/Storage-Warranties)

HP Networking Products (http://www.hp.com/support/Networking-Warranties)

Electrostatic discharge

Preventing electrostatic discharge

To prevent damaging the system, be aware of the precautions you need to follow when setting up the system or handling parts. A discharge of static electricity from a finger or other conductor may damage system boards or other static-sensitive devices. This type of damage may reduce the life expectancy of the device.

To prevent electrostatic damage:

- Avoid hand contact by transporting and storing products in static-safe containers.
- Keep electrostatic-sensitive parts in their containers until they arrive at static-free workstations.
- Place parts on a grounded surface before removing them from their containers.
- Avoid touching pins, leads, or circuitry.
- Always be properly grounded when touching a static-sensitive component or assembly.

Grounding methods to prevent electrostatic discharge

Several methods are used for grounding. Use one or more of the following methods when handling or installing electrostatic-sensitive parts:

- Use a wrist strap connected by a ground cord to a grounded workstation or computer chassis. Wrist straps are flexible straps with a minimum of 1 megohm ±10 percent resistance in the ground cords. To provide proper ground, wear the strap snug against the skin.
- Use heel straps, toe straps, or boot straps at standing workstations. Wear the straps on both feet when standing on conductive floors or dissipating floor mats.
- Use conductive field service tools.
- Use a portable field service kit with a folding static-dissipating work mat.

If you do not have any of the suggested equipment for proper grounding, have an authorized reseller install the part.

For more information on static electricity or assistance with product installation, contact an authorized reseller.

Support and other resources

Before you contact HP

Be sure to have the following information available before you call HP:

- Active Health System log (HP ProLiant Gen8 or later products)

  Download and have available an Active Health System log for 7 days before the failure was detected. For more information, see the *HP iLO 4 User Guide* or *HP Intelligent Provisioning User Guide* on the HP website (http://www.hp.com/go/ilo/docs).
- Onboard Administrator SHOW ALL report (for HP BladeSystem products only)

  For more information on obtaining the Onboard Administrator SHOW ALL report, see the HP website (http://www.hp.com/go/OAlog).
- Technical support registration number (if applicable)
- Product serial number
- Product model name and number
- Product identification number
- Applicable error messages
- Add-on boards or hardware
- Third-party hardware or software
- Operating system type and revision level

HP contact information

For United States and worldwide contact information, see the Contact HP website (http://www.hp.com/go/assistance).

In the United States:

- To contact HP by phone, call 1-800-334-5144. For continuous quality improvement, calls may be recorded or monitored.
- If you have purchased a Care Pack (service upgrade), see the Support & Drivers website (http://www8.hp.com/us/en/support-drivers.html). If the problem cannot be resolved at the website, call 1-800-633-3600. For more information about Care Packs, see the HP website (http://pro-aq-sama.houston.hp.com/services/cache/10950-0-0-225-121.html).

Customer Self Repair

HP products are designed with many Customer Self Repair (CSR) parts to minimize repair time and allow for greater flexibility in performing defective parts replacement. If during the diagnosis period HP (or HP service

providers or service partners) identifies that the repair can be accomplished by the use of a CSR part, HP will ship that part directly to you for replacement. There are two categories of CSR parts:

- **Mandatory**—Parts for which customer self repair is mandatory. If you request HP to replace these parts, you will be charged for the travel and labor costs of this service.
- **Optional**—Parts for which customer self repair is optional. These parts are also designed for customer self repair. If, however, you require that HP replace them for you, there may or may not be additional charges, depending on the type of warranty service designated for your product.

NOTE: Some HP parts are not designed for customer self repair. In order to satisfy the customer warranty, HP requires that an authorized service provider replace the part. These parts are identified as "No" in the Illustrated Parts Catalog.

Based on availability and where geography permits, CSR parts will be shipped for next business day delivery. Same day or four-hour delivery may be offered at an additional charge where geography permits. If assistance is required, you can call the HP Technical Support Center and a technician will help you over the telephone. HP specifies in the materials shipped with a replacement CSR part whether a defective part must be returned to HP. In cases where it is required to return the defective part to HP, you must ship the defective part back to HP within a defined period of time, normally five (5) business days. The defective part must be returned with the associated documentation in the provided shipping material. Failure to return the defective part may result in HP billing you for the replacement. With a customer self repair, HP will pay all shipping and part return costs and determine the courier/carrier to be used.

For more information about HP's Customer Self Repair program, contact your local service provider. For the North American program, refer to the HP website (http://www.hp.com/go/selfrepair).

Réparation par le client (CSR)

Les produits HP comportent de nombreuses pièces CSR (Customer Self Repair = réparation par le client) afin de minimiser les délais de réparation et faciliter le remplacement des pièces défectueuses. Si pendant la période de diagnostic, HP (ou ses partenaires ou mainteneurs agréés) détermine que la réparation peut être effectuée à l'aide d'une pièce CSR, HP vous l'envoie directement. Il existe deux catégories de pièces CSR:

Obligatoire - Pièces pour lesquelles la réparation par le client est obligatoire. Si vous demandez à HP de remplacer ces pièces, les coûts de déplacement et main d'œuvre du service vous seront facturés.

Facultatif - Pièces pour lesquelles la réparation par le client est facultative. Ces pièces sont également conçues pour permettre au client d'effectuer lui-même la réparation. Toutefois, si vous demandez à HP de remplacer ces pièces, l'intervention peut ou non vous être facturée, selon le type de garantie applicable à votre produit.

REMARQUE: Certaines pièces HP ne sont pas conçues pour permettre au client d'effectuer lui-même la réparation. Pour que la garantie puisse s'appliquer, HP exige que le remplacement de la pièce soit effectué par un Mainteneur Agréé. Ces pièces sont identifiées par la mention "Non" dans le Catalogue illustré.

Les pièces CSR sont livrées le jour ouvré suivant, dans la limite des stocks disponibles et selon votre situation géographique. Si votre situation géographique le permet et que vous demandez une livraison le jour même ou dans les 4 heures, celle-ci vous sera facturée. Pour bénéficier d'une assistance téléphonique, appelez le Centre d'assistance technique HP. Dans les documents envoyés avec la pièce de rechange CSR, HP précise s'il est nécessaire de lui retourner la pièce défectueuse. Si c'est le cas, vous devez le faire dans le délai indiqué, généralement cinq (5) jours ouvrés. La pièce et sa documentation doivent être retournées dans l'emballage fourni. Si vous ne retournez pas la pièce défectueuse, HP se réserve le droit de vous facturer les coûts de remplacement. Dans le cas d'une pièce CSR, HP supporte l'ensemble des frais d'expédition et de retour, et détermine la société de courses ou le transporteur à utiliser.

Pour plus d'informations sur le programme CSR de HP, contactez votre Mainteneur Agrée local. Pour plus d'informations sur ce programme en Amérique du Nord, consultez le site Web HP (http://www.hp.com/go/selfrepair).

Riparazione da parte del cliente

Per abbreviare i tempi di riparazione e garantire una maggiore flessibilità nella sostituzione di parti difettose, i prodotti HP sono realizzati con numerosi componenti che possono essere riparati direttamente dal cliente (CSR, Customer Self Repair). Se in fase di diagnostica HP (o un centro di servizi o di assistenza HP) identifica il guasto come riparabile mediante un ricambio CSR, HP lo spedirà direttamente al cliente per la sostituzione. Vi sono due categorie di parti CSR:

Obbligatorie – Parti che devono essere necessariamente riparate dal cliente. Se il cliente ne affida la riparazione ad HP, deve sostenere le spese di spedizione e di manodopera per il servizio.

Opzionali – Parti la cui riparazione da parte del cliente è facoltativa. Si tratta comunque di componenti progettati per questo scopo. Se tuttavia il cliente ne richiede la sostituzione ad HP, potrebbe dover sostenere spese addizionali a seconda del tipo di garanzia previsto per il prodotto.

NOTA: alcuni componenti HP non sono progettati per la riparazione da parte del cliente. Per rispettare la garanzia, HP richiede che queste parti siano sostituite da un centro di assistenza autorizzato. Tali parti sono identificate da un "No" nel Catalogo illustrato dei componenti.

In base alla disponibilità e alla località geografica, le parti CSR vengono spedite con consegna entro il giorno lavorativo seguente. La consegna nel giorno stesso o entro quattro ore è offerta con un supplemento di costo solo in alcune zone. In caso di necessità si può richiedere l'assistenza telefonica di un addetto del centro di supporto tecnico HP. Nel materiale fornito con una parte di ricambio CSR, HP specifica se il cliente deve restituire dei componenti. Qualora sia richiesta la resa ad HP del componente difettoso, lo si deve spedire ad HP entro un determinato periodo di tempo, generalmente cinque (5) giorni lavorativi. Il componente difettoso deve essere restituito con la documentazione associata nell'imballo di spedizione fornito. La mancata restituzione del componente può comportare la fatturazione del ricambio da parte di HP. Nel caso di riparazione da parte del cliente, HP sostiene tutte le spese di spedizione e resa e sceglie il corriere/vettore da utilizzare.

Per ulteriori informazioni sul programma CSR di HP contattare il centro di assistenza di zona. Per il programma in Nord America fare riferimento al sito Web HP (http://www.hp.com/go/selfrepair).

Customer Self Repair

HP Produkte enthalten viele CSR-Teile (Customer Self Repair), um Reparaturzeiten zu minimieren und höhere Flexibilität beim Austausch defekter Bauteile zu ermöglichen. Wenn HP (oder ein HP Servicepartner) bei der Diagnose feststellt, dass das Produkt mithilfe eines CSR-Teils repariert werden kann, sendet Ihnen HP dieses Bauteil zum Austausch direkt zu. CSR-Teile werden in zwei Kategorien unterteilt:

Zwingend – Teile, für die das Customer Self Repair-Verfahren zwingend vorgegeben ist. Wenn Sie den Austausch dieser Teile von HP vornehmen lassen, werden Ihnen die Anfahrt- und Arbeitskosten für diesen Service berechnet.

Optional – Teile, für die das Customer Self Repair-Verfahren optional ist. Diese Teile sind auch für Customer Self Repair ausgelegt. Wenn Sie jedoch den Austausch dieser Teile von HP vornehmen lassen möchten, können bei diesem Service je nach den für Ihr Produkt vorgesehenen Garantiebedingungen zusätzliche Kosten anfallen.

HINWEIS: Einige Teile sind nicht für Customer Self Repair ausgelegt. Um den Garantieanspruch des Kunden zu erfüllen, muss das Teil von einem HP Servicepartner ersetzt werden. Im illustrierten Teilekatalog sind diese Teile mit „No“ bzw. „Nein“ gekennzeichnet.

CSR-Teile werden abhängig von der Verfügbarkeit und vom Lieferziel am folgenden Geschäftstag geliefert. Für bestimmte Standorte ist eine Lieferung am selben Tag oder innerhalb von vier Stunden gegen einen Aufpreis verfügbar. Wenn Sie Hilfe benötigen, können Sie das HP technische Support Center anrufen und sich von einem Mitarbeiter per Telefon helfen lassen. Den Materialien, die mit einem CSR-Ersatzteil geliefert werden, können Sie entnehmen, ob das defekte Teil an HP zurückgeschickt werden muss. Wenn es erforderlich ist, das defekte Teil an HP zurückzuschicken, müssen Sie dies innerhalb eines vorgegebenen Zeitraums tun, in der Regel innerhalb von fünf (5) Geschäftstagen. Das defekte Teil muss mit der zugehörigen Dokumentation in der Verpackung zurückgeschickt werden, die im Lieferumfang enthalten ist. Wenn Sie das defekte Teil nicht zurückschicken, kann HP Ihnen das Ersatzteil in Rechnung stellen. Im Falle von Customer Self Repair kommt HP für alle Kosten für die Lieferung und Rücksendung auf und bestimmt den Kurier-/Frachtdienst.

Weitere Informationen über das HP Customer Self Repair Programm erhalten Sie von Ihrem Servicepartner vor Ort. Informationen über das CSR-Programm in Nordamerika finden Sie auf der HP Website unter (http://www.hp.com/go/selfrepair).

Reparaciones del propio cliente

Los productos de HP incluyen muchos componentes que el propio usuario puede reemplazar (*Customer Self Repair*, CSR) para minimizar el tiempo de reparación y ofrecer una mayor flexibilidad a la hora de realizar sustituciones de componentes defectuosos. Si, durante la fase de diagnóstico, HP (o los proveedores o socios de servicio de HP) identifica que una reparación puede llevarse a cabo mediante el uso de un componente CSR, HP le enviará dicho componente directamente para que realice su sustitución. Los componentes CSR se clasifican en dos categorías:

- **Obligatorio:** componentes para los que la reparación por parte del usuario es obligatoria. Si solicita a HP que realice la sustitución de estos componentes, tendrá que hacerse cargo de los gastos de desplazamiento y de mano de obra de dicho servicio.
- **Opcional:** componentes para los que la reparación por parte del usuario es opcional. Estos componentes también están diseñados para que puedan ser reparados por el usuario. Sin embargo, si precisa que HP realice su sustitución, puede o no conllevar costes adicionales, dependiendo del tipo de servicio de garantía correspondiente al producto.

NOTA: Algunos componentes no están diseñados para que puedan ser reparados por el usuario. Para que el usuario haga valer su garantía, HP pone como condición que un proveedor de servicios autorizado realice la sustitución de estos componentes. Dichos componentes se identifican con la palabra "No" en el catálogo ilustrado de componentes.

Según la disponibilidad y la situación geográfica, los componentes CSR se enviarán para que lleguen a su destino al siguiente día laborable. Si la situación geográfica lo permite, se puede solicitar la entrega en el mismo día o en cuatro horas con un coste adicional. Si precisa asistencia técnica, puede llamar al Centro de asistencia técnica de HP y recibirá ayuda telefónica por parte de un técnico. Con el envío de materiales para la sustitución de componentes CSR, HP especificará si los componentes defectuosos deberán devolverse a HP. En aquellos casos en los que sea necesario devolver algún componente a HP, deberá hacerlo en el periodo de tiempo especificado, normalmente cinco días laborables. Los componentes defectuosos deberán devolverse con toda la documentación relacionada y con el embalaje de envío. Si no enviara el componente defectuoso requerido, HP podrá cobrarle por el de sustitución. En el caso de todas

sustituciones que lleve a cabo el cliente, HP se hará cargo de todos los gastos de envío y devolución de componentes y escogerá la empresa de transporte que se utilice para dicho servicio.

Para obtener más información acerca del programa de Reparaciones del propio cliente de HP, póngase en contacto con su proveedor de servicios local. Si está interesado en el programa para Norteamérica, visite la página web de HP siguiente (http://www.hp.com/go/selfrepair).

Customer Self Repair

Veel onderdelen in HP producten zijn door de klant zelf te repareren, waardoor de reparatieduur tot een minimum beperkt kan blijven en de flexibiliteit in het vervangen van defecte onderdelen groter is. Deze onderdelen worden CSR-onderdelen (Customer Self Repair) genoemd. Als HP (of een HP Service Partner) bij de diagnose vaststelt dat de reparatie kan worden uitgevoerd met een CSR-onderdeel, verzendt HP dat onderdeel rechtstreeks naar u, zodat u het defecte onderdeel daarmee kunt vervangen. Er zijn twee categorieën CSR-onderdelen:

Verplicht: Onderdelen waarvoor reparatie door de klant verplicht is. Als u HP verzoekt deze onderdelen voor u te vervangen, worden u voor deze service reiskosten en arbeidsloon in rekening gebracht.

Optioneel: Onderdelen waarvoor reparatie door de klant optioneel is. Ook deze onderdelen zijn ontworpen voor reparatie door de klant. Als u echter HP verzoekt deze onderdelen voor u te vervangen, kunnen daarvoor extra kosten in rekening worden gebracht, afhankelijk van het type garantieservice voor het product.

OPMERKING: Sommige HP onderdelen zijn niet ontwikkeld voor reparatie door de klant. In verband met de garantievoorwaarden moet het onderdeel door een geautoriseerde Service Partner worden vervangen. Deze onderdelen worden in de geïllustreerde onderdelencatalogus aangemerkt met "Nee".

Afhankelijk van de leverbaarheid en de locatie worden CSR-onderdelen verzonden voor levering op de eerstvolgende werkdag. Levering op dezelfde dag of binnen vier uur kan tegen meerkosten worden aangeboden, indien dit mogelijk is gezien de locatie. Indien assistentie gewenst is, belt u een HP Service Partner om via de telefoon technische ondersteuning te ontvangen. HP vermeldt in de documentatie bij het vervangende CSR-onderdeel of het defecte onderdeel aan HP moet worden geretourneerd. Als het defecte onderdeel aan HP moet worden teruggezonden, moet u het defecte onderdeel binnen een bepaalde periode, gewoonlijk vijf (5) werkdagen, retourneren aan HP. Het defecte onderdeel moet met de bijbehorende documentatie worden geretourneerd in het meegeleverde verpakkingsmateriaal. Als u het defecte onderdeel niet terugzendt, kan HP u voor het vervangende onderdeel kosten in rekening brengen. Bij reparatie door de klant betaalt HP alle verzendkosten voor het vervangende en geretourneerde onderdeel en kiest HP zelf welke koerier/transportonderneming hiervoor wordt gebruikt.

Neem contact op met een Service Partner voor meer informatie over het Customer Self Repair programma van HP. Informatie over Service Partners vindt u op de HP website (http://www.hp.com/go/selfrepair).

Reparo feito pelo cliente

Os produtos da HP são projetados com muitas peças para reparo feito pelo cliente (CSR) de modo a minimizar o tempo de reparo e permitir maior flexibilidade na substituição de peças com defeito. Se, durante o período de diagnóstico, a HP (ou fornecedores/parceiros de serviço da HP) concluir que o reparo pode ser efetuado pelo uso de uma peça CSR, a peça de reposição será enviada diretamente ao cliente. Existem duas categorias de peças CSR:

Obrigatória – Peças cujo reparo feito pelo cliente é obrigatório. Se desejar que a HP substitua essas peças, serão cobradas as despesas de transporte e mão-de-obra do serviço.

Opcional – Peças cujo reparo feito pelo cliente é opcional. Essas peças também são projetadas para o reparo feito pelo cliente. No entanto, se desejar que a HP as substitua, pode haver ou não a cobrança de taxa adicional, dependendo do tipo de serviço de garantia destinado ao produto.

OBSERVAÇÃO: Algumas peças da HP não são projetadas para o reparo feito pelo cliente. A fim de cumprir a garantia do cliente, a HP exige que um técnico autorizado substitua a peça. Essas peças estão identificadas com a marca "No" (Não), no catálogo de peças ilustrado.

Conforme a disponibilidade e o local geográfico, as peças CSR serão enviadas no primeiro dia útil após o pedido. Onde as condições geográficas permitirem, a entrega no mesmo dia ou em quatro horas pode ser feita mediante uma taxa adicional. Se precisar de auxílio, entre em contato com o Centro de suporte técnico da HP para que um técnico o ajude por telefone. A HP especifica nos materiais fornecidos com a peça CSR de reposição se a peça com defeito deve ser devolvida à HP. Nos casos em que isso for necessário, é preciso enviar a peça com defeito à HP dentro do período determinado, normalmente cinco (5) dias úteis. A peça com defeito deve ser enviada com a documentação correspondente no material de transporte fornecido. Caso não o faça, a HP poderá cobrar a reposição. Para as peças de reparo feito pelo cliente, a HP paga todas as despesas de transporte e de devolução da peça e determina a transportadora/serviço postal a ser utilizado.

Para obter mais informações sobre o programa de reparo feito pelo cliente da HP, entre em contato com o fornecedor de serviços local. Para o programa norte-americano, visite o site da HP (http://www.hp.com/go/selfrepair).

カスタマーセルフリペア

修理時間を短縮し、故障部品の交換における高い柔軟性を確保するために、HP製品には多数のCSR部品があります。診断の際に、CSR部品を使用すれば修理ができるとHP（HPまたはHP正規保守代理店）が判断した場合、HPはその部品を直接、お客様に発送し、お客様に交換していただきます。CSR部品には以下の2通りがあります。

- **必須 -** カスタマーセルフリペアが必須の部品。当該部品について、もしもお客様がHPに交換作業を依頼される場合には、その修理サービスに関する交通費および人件費がお客様に請求されます。
- **任意 -** カスタマーセルフリペアが任意である部品。この部品もカスタマーセルフリペア用です。当該部品について、もしもお客様がHPに交換作業を依頼される場合には、お買い上げの製品に適用される保証サービス内容の範囲内においては、別途費用を負担していただくことなく保証サービスを受けることができます。

注： HP製品の一部の部品は、カスタマーセルフリペア用ではありません。製品の保証を継続するためには、HPまたはHP正規保守代理店による交換作業が必須となります。部品カタログには、当該部品がカスタマーセルフリペア除外品である旨が記載されています。

部品供給が可能な場合、地域によっては、CSR部品を翌営業日に届くように発送します。また、地域によっては、追加費用を負担いただくことにより同日または4時間以内に届くように発送することも可能な場合があります。サポートが必要なときは、HPの修理受付窓口に電話していただければ、技術者が電話でアドバイスします。交換用のCSR部品または同梱物には、故障部品をHPに返送する必要があるかどうかが表示されています。故障部品をHPに返送する必要がある場合は、指定期限内（通常は5営業日以内）に故障部品をHPに返送してください。故障部品を返送する場合は、届いた時の梱包箱に関連書類とともに入れてください。故障部品を返送しない場合、HPから部品費用が請求されます。カスタマーセルフリペアの際には、HPは送料および部品返送費を全額負担し、使用する宅配便会社や運送会社を指定します。

客户自行维修

HP 产品提供许多客户自行维修 (CSR) 部件，以尽可能缩短维修时间和在更换缺陷部件方面提供更大的灵活性。如果在诊断期间 HP（或 HP 服务提供商或服务合作伙伴）确定可以通过使用 CSR 部件完成维修，HP 将直接把该部件发送给您进行更换。有两类 CSR 部件：

- **强制性的** — 要求客户必须自行维修的部件。如果您请求 HP 更换这些部件，则必须为该服务支付差旅费和人工费用。
- **可选的** — 客户可以选择是否自行维修的部件。这些部件也是为客户自行维修设计的。不过，如果您要求 HP 为您更换这些部件，则根据为您的产品指定的保修服务类型，HP 可能收取或不再收取任何附加费用。

注：某些 HP 部件的设计并未考虑客户自行维修。为了满足客户保修的需要，HP 要求授权服务提供商更换相关部件。这些部件在部件图解目录中标记为“否”。

CSR 部件将在下一个工作日发运（取决于备货情况和允许的地理范围）。在允许的地理范围内，可在当天或四小时内发运，但要收取额外费用。如果需要帮助，您可以致电 HP 技术支持中心，将会有技术人员通过电话为您提供帮助。HP 会在随更换的 CSR 部件发运的材料中指明是否必须将有缺陷的部件返还给 HP。如果要求您将有缺陷的部件返还给 HP，那么您必须在规定期限内（通常是五 (5) 个工作日）将缺陷部件发给 HP。有缺陷的部件必须随所提供的发运材料中的相关文件一起返还。如果未能送还有缺陷的部件，HP 可能会要求您支付更换费用。客户自行维修时，HP 将承担所有相关运输和部件返回费用，并指定快递商/承运商。

有关 HP 客户自行维修计划的详细信息，请与您当地的服务提供商联系。有关北美地区的计划，请访问 HP 网站 (http://www.hp.com/go/selfrepair)。

客戶自行維修

HP 產品設計了許多「客戶自行維修」(CSR) 的零件以減少維修時間，並且使得更換瑕疵零件時能有更大的彈性。如果在診斷期間 HP（或 HP 服務供應商或維修夥伴）辨認出此項維修工作可以藉由使用 CSR 零件來完成，則 HP 將直接寄送該零件給您作更換。CSR 零件分為兩種類別：

- **強制的** — 客戶自行維修所使用的零件是強制性的。如果您要求 HP 更換這些零件，HP 將會向您收取此服務所需的外出費用與勞動成本。
- **選購的** — 客戶自行維修所使用的零件是選購的。這些零件也設計用於客戶自行維修之用。不過，如果您要求 HP 為您更換，則可能需要也可能不需要負擔額外的費用，端視針對此產品指定的保固服務類型而定。

備註：某些 HP 零件沒有消費者可自行維修的設計。為符合客戶保固，HP 需要授權的服務供應商更換零件。這些零件在圖示的零件目錄中，被標示為「否」。

基於材料取得及環境允許的情況下，CSR 零件將於下一個工作日以快遞寄送。在環境的允許下當天或四小時內送達，則可能需要額外的費用。若您需要協助，可致電「HP 技術支援中心」，會有一位技術人員透過電話來協助您。不論損壞的零件是否必須退回，HP 皆會在與 CSR 替換零件一起運送的材料中註明。若要將損壞的零件退回 HP，您必須在指定的一段時間內（通常為五 (5) 個工作天），將損壞的零件寄回 HP。損壞的零件必須與寄送資料中隨附的相關技術文件一併退還。如果無法退還損壞的零件，HP 可能要向您收取替換費用。針對客戶自行維修情形，HP 將負責所有運費及零件退還費用並指定使用何家快遞/貨運公司。

如需 HP 的「客戶自行維修」方案詳細資訊，請連絡您當地的服務供應商。至於北美方案，請參閱 HP 網站 (http://www.hp.com/go/selfrepair)。

고객 셀프 수리

HP 제품은 수리 시간을 최소화하고 결함이 있는 부품 교체 시 더욱 융통성을 발휘할 수 있도록 하기 위해 고객 셀프 수리(CSR) 부품을 다량 사용하여 설계되었습니다. 진단 기간 동안 HP(또는 HP 서비스 공급업체 또는 서비스 협력업체)에서 CSR 부품을 사용하여 수리가 가능하다고 판단되면 HP는 해당 부품을 바로 사용자에게 보내어 사용자가 교체할 수 있도록 합니다. CSR 부품에는 두 가지 종류가 있습니다.

- **고객 셀프 수리가 의무 사항인 필수 부품.** 사용자가 HP에 이 부품의 교체를 요청할 경우 이 서비스에 대한 출장비 및 작업비가 청구됩니다.
- **고객 셀프 수리가 선택 사항인 부품.** 이 부품들도 고객 셀프 수리가 가능하도록 설계되었습니다. 하지만 사용자가 HP에 이 부품의 교체를 요청할 경우 사용자가 구입한 제품에 해당하는 보증 서비스 유형에 따라 추가 비용 없이 교체가 가능할 수 있습니다.

참고: 일부 HP 부품은 고객 셀프 수리가 불가능하도록 설계되었습니다. HP는 만족스러운 고객 보증을 위해 공인 서비스 제공업체를 통해 부품을 교체하도록 하고 있습니다. 이러한 부품들은 Illustrated Parts Catalog에 "No"라고 표시되어 있습니다.

CSR 부품은 재고 상태와 지리적 조건이 허용하는 경우 다음 영업일 납품이 가능하도록 배송이 이루어집니다. 지리적 조건이 허용하는 경우 추가 비용이 청구되는 조건으로 당일 또는 4시간 배송이 가능할 수도 있습니다. 도움이 필요하시면 HP 기술 지원 센터로 전화하십시오. 전문 기술자가 전화로 도움을 줄 것입니다. HP는 결함이 발생한 부품을 HP로 반환해야 하는지 여부를 CSR 교체 부품과 함께 배송된 자료에 지정합니다. 결함이 발생한 부품을 HP로 반환해야 하는 경우에는 지정된 기간 내(통상 영업일 기준 5일)에 HP로 반환해야 합니다. 이 때 결함이 발생한 부품은 제공된 포장 재료에 넣어 관련 설명서와 함께 반환해야 합니다. 결함이 발생한 부품을 반환하지 않는 경우 HP가 교체 부품에 대해 비용을 청구할 수 있습니다. 고객 셀프 수리의 경우, HP는 모든 운송 및 부품 반환 비용을 부담하며 이용할 운송업체 및 택배 서비스를 결정합니다.

HP 고객 셀프 수리 프로그램에 대한 자세한 내용은 가까운 서비스 제공업체에 문의하십시오. 북미 지역의 프로그램에 대해서는 HP 웹 사이트(http://www.hp.com/go/selfrepair)를 참조하십시오.

Acronyms and abbreviations

BPDU

Bridge Protocol Data Unit

DAC

direct attach cable

DHCP

Dynamic Host Configuration Protocol

DNS

domain name system

FC

Fibre Channel

FCoE

Fibre Channel over Ethernet

FIPS

Federal Information Processing Standard

HBA

host bus adapter

iSCSI

Internet Small Computer System Interface

ISL

Inter-Switch Link

LACP

Link Aggregation Control Protocol

LAG

link aggregation group

LLDP

Link Layer Discovery Protocol

MAC

Media Access Control

MIB

management information base

NPIV

N_Port ID Virtualization

OA

Onboard Administrator

POST

Power-On Self Test

RDP

Rapid Deployment Pack

SFP

small form-factor pluggable

SSL

Secure Sockets Layer

TFTP

Trivial File Transfer Protocol

USB

universal serial bus

VCDG

Virtual Connect Domain Group

VCEM

Virtual Connect Enterprise Manager

VCM

Virtual Connect Manager

VCSU

Virtual Connect Support Utility

VLAN

virtual local-area network

WWN

World Wide Name

XFP

10 Gb small form factor pluggable

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