FlexPod Validated with Microsoft Private Cloud

Reference Architecture and Deployment Guide for Microsoft Windows Server 2008 R2 and Microsoft System Center 2007

February 2012

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Overview

Industry trends indicate a vast data center transformation toward shared infrastructures. Enterprise customers are moving away from silos of information and toward shared infrastructures, to virtualized environments, and eventually to the cloud to increase agility and reduce costs.

FlexPod™ is a predesigned configuration that is built on the Cisco® Unified Computing System® (Cisco UCS™), Cisco Nexus® data center switches, NetApp® FAS storage components, and Microsoft Windows Server and System Center software. FlexPod is a base configuration, but can scale up for greater performance and capacity, or it can scale out for environments that need consistent, multiple deployments. It has the flexibility to be sized and optimized to accommodate many different use cases.

Flexpod is a platform that can address current virtualization needs and simplify the evolution to IT-as-a-service (ITaaS) infrastructure. FlexPod for Microsoft Private Cloud can help improve agility and responsiveness, reduce TCO, and increase business alignment and focus.

This document focuses on deploying an infrastructure capable of supporting Windows Server, Microsoft Hyper-V and Microsoft System Center as the foundation for private cloud infrastructure. For a detailed study of several practical solutions deployed on FlexPod, refer to NetApp Technical Report 3884, FlexPod Solutions Guide.

Benefits of Cisco Unified Computing System

Cisco Unified Computing System™ is the first converged data center platform that combines industry-standard, x86-architecture servers with networking and storage access into a single converged system. The system is entirely programmable using unified, model-based management to simplify and speed deployment of enterprise-class applications and services running in bare-metal, virtualized, and cloud computing environments.

The system's x86-architecture rack-mount and blade servers are powered by Intel® Xeon® processors. These industry-standard servers deliver world-record performance to power mission-critical workloads. Cisco servers, combined with a simplified, converged architecture, drive better IT productivity and superior price/performance for lower total cost of ownership (TCO). Building on Cisco's strength in enterprise networking, Cisco Unified Computing System is integrated with a standards-based, high-bandwidth, low-latency, virtualization-aware unified fabric . The system is wired once to support the desired bandwidth and carries all Internet protocol, storage, inter-process communication, and virtual machine traffic with security isolation, visibility, and control equivalent to physical networks. The system meets the bandwidth demands of today's multicore processors, eliminates costly redundancy, and increases workload agility, reliability, and performance.

Cisco Unified Computing System is designed from the ground up to be programmable and self integrating. A server's entire hardware stack, ranging from server firmware and settings to network profiles, is configured through model-based management. With Cisco virtual interface cards, even the number and type of I/O interfaces is programmed dynamically, making every server ready to power any workload at any time. With model-based management, administrators manipulate a model of a desired system configuration, associate a model's service profile with hardware resources, and the system configures itself to match the model. This automation speeds provisioning and workload migration with accurate and rapid scalability. The result is increased IT staff productivity, improved compliance, and reduced risk of failures due to inconsistent configurations.

Cisco Fabric Extender technology reduces the number of system components to purchase, configure, manage, and maintain by condensing three network layers into one. It eliminates both blade server and hypervisor-based switches by connecting fabric interconnect ports directly to individual blade servers and virtual machines. Virtual networks are now managed exactly as physical networks are, but with massive scalability. This represents a radical simplification over traditional systems, reducing capital and operating costs while increasing business agility, simplifying and speeding deployment, and improving performance.

Cisco Unified Computing System helps organizations go beyond efficiency: it helps them become more effective through technologies that breed simplicity rather than complexity. The result is flexible, agile, high-performance, self-integrating information technology, reduced staff costs with increased uptime through automation, and more rapid return on investment.

Benefits of Cisco Nexus 5548UP

The Cisco Nexus 5548UP Switch delivers innovative architectural flexibility, infrastructure simplicity, and business agility, with support for networking standards. For traditional, virtualized, unified, and high-performance computing (HPC) environments, it offers a long list of IT and business advantages, including:

- Architectural Flexibility
- Unified ports that support traditional Ethernet, Fibre Channel (FC),and Fibre Channel over Ethernet (FCoE)
- Synchronizes system clocks with accuracy of less than one microsecond, based on IEEE 1588
- Offers converged Fabric extensibility, based on emerging standard IEEE 802.1BR, with Fabric Extender (FEX) Technology portfolio, including:
- Cisco Nexus 2000 FEX
- Adapter FEX
- VM-FEX

Infrastructure Simplicity

- Common high-density, high-performance, data-center-class, fixed-form-factor platform
- Consolidates LAN and storage
- Supports any transport over an Ethernet-based fabric, including Layer 2 and Layer 3 traffic
- Supports storage traffic, including iSCSI, NAS, FC, RoE, and IBoE
- Reduces management points with FEX Technology

Business Agility

- Meets diverse data center deployments on one platform
- Provides rapid migration and transition for traditional and evolving technologies
- Offers performance and scalability to meet growing business needs

Specifications at-a Glance

- A 1 -rack-unit, 1/10 Gigabit Ethernet switch
- 32 fixed Unified Ports on base chassis and one expansion slot totaling 48 ports
- The slot can support any of the three modules: Unified Ports, 1/2/4/8 native Fibre Channel, and Ethernet or FCoE
- Throughput of up to 960 Gbps

Benefits of NetApp FAS Family of Storage Controllers

The NetApp Unified Storage Architecture provides customers with an agile and scalable storage platform. All NetApp storage systems use the Data ONTAP® operating system to provide SAN (FCoE, FC, iSCSI), NAS (CIFS, NFS), and primary and secondary storage within a single unified platform so that all virtual desktop data components can be hosted on the same storage array. A single process for activities such as installation, provisioning, mirroring, backup, and upgrading is used throughout the entire product line from the entry level to enterprise-class controllers. Having a single set of software and processes brings

great simplicity to even the most complex enterprise data management challenges. Unifying storage and data management software and processes reduces the complexity of data ownership, enables companies to adapt to their changing business needs without interruption, and results in a reduction in total cost of ownership.

In a shared infrastructure, the availability and performance of the storage infrastructure are critical because storage outages or performance issues can affect thousands of users. The storage architecture must provide a high level of availability and performance. For detailed documentation surrounding best practices, NetApp and its technology partners have developed a variety of best practice documents.

Recommended support documents:

- NetApp storage systems: www.netapp.com/us/products/storage-systems/
- NetApp TR-3437: Storage Best Practices and Resiliency Guide
- NetApp TR-3450: Active-Active Controller Overview and Best Practices Guidelines
- NetApp TR-3749: NetApp and VMware vSphere Storage Best Practices
- NetApp TR-3705: NetApp and VMware View Solution Guide
- NetApp TR-3824: MS Exchange 2010 Best Practices Guide
- NetApp TR-3633: Oracle 11g Best Practices Guide

Benefits of Microsoft Private Cloud Solution

Microsoft private cloud solutions, built on Microsoft Windows Server and System Center, dramatically change the way that enterprise customers produce and consume IT services by creating a layer of abstraction over pooled IT resources.

Hyper-V is Microsoft's hypervisor which provides a scalable, reliable, and highly available platform with unlimited virtualization rights included in the Windows Server Datacenter Edition. Features in Windows Server increase availability and performance, improves management, and simplifies methods for deployment including live migration.

When combined with System Center, customers benefit from enterprise class virtualization, end-to-end service management and deep insight to keep applications up and running more reliably.

Microsoft private cloud solutions enable application-level management and monitoring providing deep applications insights with the ability to automatically orchestrate resources enable you to deliver applications as services, rapidly resolve problems, increase application uptime and meet desired SLAs. In addition, it supports Microsoft and non-Microsoft hypervisors, operating systems, and support for open source tools allowing you to leverage your existing infrastructure investments and skills.

Microsoft Private Cloud solutions offer the best economics by integrating a highly available and easy to manage multi-server platform with breakthrough efficiency and ubiquitous automation. It also provides Dynamic, multi-tenant virtualization, storage and networking infrastructure providing maximum flexibility for delivering and connecting to cloud services.

Go to http://microsoft.com/privatecloud to learn more about Microsoft offerings..

Audience

This document describes the architecture and deployment procedures of an infrastructure comprised of Cisco, NetApp and Microsoft virtualization. The intended audience of this document includes, but is not limited to, sales engineers, field consultants, professional services, IT managers, partner engineering, and customers who want to deploy the core FlexPod architecture.

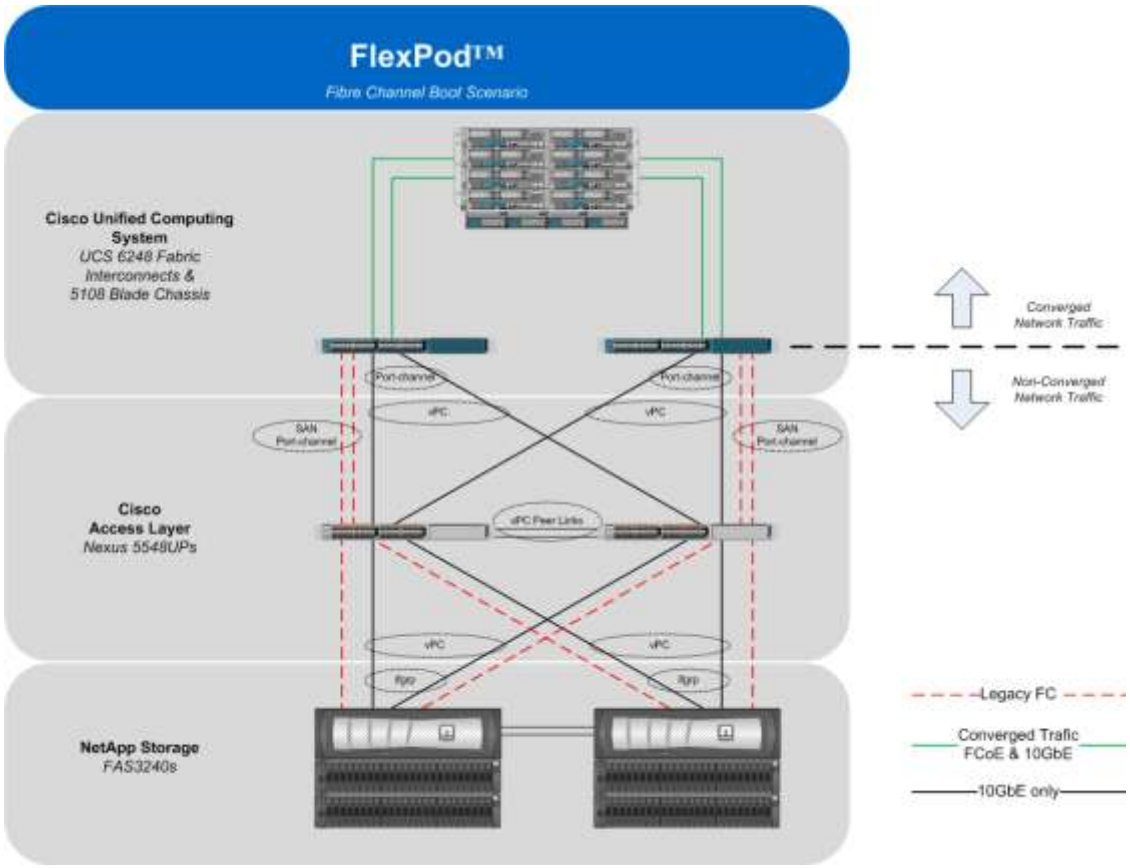
Architecture

The FlexPod architecture is highly modular or "pod" like. While each customer's FlexPod unit might vary in its exact configuration, once a FlexPod unit is built, it can easily be scaled as requirements and demand change. This includes scaling both up (adding additional resources within a FlexPod unit) and out (adding additional FlexPod units).

Specifically, FlexPod is a defined set of hardware and software that serves as an integrated foundation for all virtualization solutions. Microsoft Private Cloud Solution validated with FlexPod includes NetApp storage, Cisco networking, the Cisco Unified Computing System, and Microsoft virtualization software in a single package in which the computing and storage can fit in one data center rack with the networking residing in a separate rack or deployed according to a customer's datacenter design. Due to port density, the networking components can accommodate multiple such configurations.

This document details the deployment of MS Hyper-V on top of a FlexPod infrastructure. As such, this document focuses on infrastructure deployment as well as OS provisioning and best practices. Figure 1 shows the Hyper-V built on FlexPod components and the network connections for a configuration with FC and Ethernet based storage. One benefit of a FlexPod architecture is the ability to customize or "flex" the environment to suit a customers' requirements. For this reason, an alternate FCoE-based storage configuration is included in the Appendix.

Figure 1 FlexPod for Microsoft Private Cloud components



The reference configuration includes:

- Two Cisco Nexus 5548 switches
- Two Cisco UCS 6248 fabric interconnects
- One chassis of Cisco UCS blades with two fabric extenders per chassis
- FAS3240A (HA Pair)

Storage is provided by a NetApp FAS3240A (HA configuration within a single chassis) with accompanying disk shelves. All systems and fabric links feature redundancy, providing for end-to-end high availability (HA). For server virtualization, the deployment includes MS Hyper-V. While this is the default base design, each of the components can be scaled flexibly to support the specific business requirements in question. For example, more (or different) blades and chassis could be deployed to increase compute capacity, additional disk shelves could be deployed to improve I/O capacity and throughput, or special hardware or software features could be added to introduce new features.

The remainder of this document guides you through the low-level steps of deploying the base architecture, as shown in

Figure 1. This includes everything from physical cabling, to compute and storage configuration, to configuring virtualization with MS Hyper-V.

Software Revisions

It is important to note the software versions used in this document. Table 1 details the software revisions used throughout this document.

Table 1 Software Revisions

Layer	Compute	Version or Release	Details
Compute	Cisco UCS Fabric Interconnect	2.0(1t)	Embedded management
	Cisco UCS B-200-M2	2.0(1t)	Hardware BIOS version
Network	Nexus Fabric Switch	5.0(3)N2(2a)	Operating system version
Storage	NetApp FAS3240 HA	ONTAP 8.0.2	Operating system version
Software	Cisco UCS Hosts	Microsoft Windows Server 2008 R2 SP1 Data Center Edition + MS Hyper-V Role	Operating system version
	.NET Framework	3.5.1	Feature enabled within Windows operating system
	Microsoft Hotfixes	KB2517329 KB2552040 KB2494016 KB2520235 KB2531907 KB2522766 KB2528357	Miscellaneous Microsoft Hotfixes required
	NetApp SnapDrive for Windows	6.4 64-bit	NetApp integration within Windows operating system
	Data ONTAP DSM	3.5	Windows MPIO software
	MS SQL Server	Windows 2008 SP2	VM (2): SQL Server DB
	Systems Center Operation Manager	2007 R2	VM (1):
	Systems Center Virtual Machine Manager	2008 R2 SP1	VM (1):
	Systems Center Opalis	6.3	VM (1):
	OnCommand Plug-In	3.0	NetApp Integration within Systems Center

Layer	Compute	Version or Release	Details
	Cisco UCS Management Pack R2	2.1.0	Cisco Integration within System Center Operations Manager
	Cisco UCS Power Tools	0.9.3.1	Cisco UCS Power Shell Management Cmdlets

Configuration Guidelines

This document provides details for configuring a fully redundant, highly-available configuration. As such, references are made as to which component is being configured with each step whether that be A or B. For example, Controller A and Controller B, are used to identify the two NetApp storage controllers that are provisioned with this document while Nexus A and Nexus B identify the pair of Cisco Nexus switches that are configured. The Cisco UCS fabric interconnects are configured likewise. Additionally, this document details steps for provisioning multiple UCS hosts and these are identified sequentially, VM-Host-Infra-01 and VM-Host-Infra-02, and so on. Finally, when indicating that the reader should include information pertinent to their environment in a given step, this is indicated with the inclusion of <*italicized text*> as part of the command structure. See the example below for the `vlan create` command:

```
            controller A> vlan create
Usage:
            vlan create [-g {on|off}] <ifname> <vlanid_list>
            vlan add <ifname> <vlanid_list>
            vlan delete -q <ifname> [<vlanid_list>]
            vlan modify -g {on|off} <ifname>
            vlan stat <ifname> [<vlanid_list>]
Example:
controller A> vlan create vif0 <management VLAN ID>
```

This document is intended to allow the reader to fully configure the customer environment. In order to do so, there are various steps which will require you to insert your own naming conventions, IP address and VLAN schemes as well as record appropriate WWPN, WWNN, or MAC addresses. Table 2 details the list of VLANs necessary for deployment as outlined in this guide. Note that in this document that the VM-Data VLAN is used for virtual machine management interfaces. The VM-Mgmt VLAN is used for management interfaces of the Hyper-V hosts. A Layer-3 route must exist between the VM-Mgmt and VM-Data VLANS.

Table 2 Necessary VLANs

VLAN Name	VLAN Purpose	ID Used in this Document
VM-Mgmt	VLAN for management interfaces	805
Native	VLAN to which untagged frames are assigned	2
CSV	VLAN for cluster shared volume	801
iSCSI-A	VLAN for iSCSI traffic for fabric A	802
iSCSI-B	VLAN for iSCSI traffic for fabric B	807

Live Migration	VLAN designated for the movement of VM's from one physical host to another	803
App Cluster	VLAN for cluster connectivity	806
Data	VLAN for application data	804

Deployment

This document details the necessary steps to deploy base infrastructure components as well as provisioning MS Hyper-V as the foundation for virtualized workloads. At the end of these deployment steps, you will be prepared to provision your applications on top of a MS Hyper-V virtualized infrastructure. The outlined procedure includes:

- Initial NetApp Controller configuration
- Initial Cisco UCS configuration
- Initial Cisco Nexus configuration
- Creation of necessary VLANs and VSANs for management, basic functionality, and specific to the MS virtualized infrastructure
- Creation of necessary vPCs to provide HA among devices
- Creation of necessary service profile pools: WWPN, world-wide node name (WWNN), MAC, server, and so forth
- Creation of necessary service profile policies: adapter, boot, and so forth
- Creation of two service profile templates from the created pools and policies: one each for fabric A and B
- Provisioning of two servers from the created service profiles in preparation for OS installation
- Initial configuration of the infrastructure components residing on the NetApp Controller
- Deployment of MS Hyper-V
- Deployment of MS System Center
- Deployment of the NetApp Plug-ins

The Microsoft Private Cloud Solution validated with FlexPod architecture is flexible; therefore, the exact configuration detailed in this section might vary for customer implementations depending on specific requirements. Although customer implementations might deviate from the information that follows, the best practices, features, and configurations listed in this section should still be used as a reference for building a customized MS Hyper-V built on FlexPod architecture.

Cabling Information

The following information is provided as a reference for cabling the physical equipment in a FlexPod environment. The tables include both local and remote device and port locations in order to simplify cabling requirements.

The tables in this section contain details for the prescribed and supported configuration of the FAS3240 running Data ONTAP 8.0.2. This configuration leverages a dual-port 10GbE adapter as well as the native FC target ports and the onboard SAS ports for disk shelf connectivity. For any modifications of this prescribed architecture, consult the currently available NetApp Interoperability Matrix Tool (IMT).

This document assumes that out-of-band management ports are plugged into an existing management infrastructure at the deployment site.

Be sure to follow the cable directions in this section. Failure to do so will result in necessary changes to the deployment procedures that follow because specific port locations are mentioned.

It is possible to order a FAS3240A system in a different configuration from what is prescribed in the tables in this section. Before starting, be sure the configuration matches what is described in the tables and diagrams in this section

Figure 2 shows a FlexPod cabling diagram. The labels indicate connections to end points rather than port numbers on the physical device. For example, connection 1 is an FCoE target port connected from NetApp controller A to Nexus 5548 A. SAS connections 23, 24, 25, and 26 as well as ACP connections 27 and 28 should be connected to the NetApp storage controller and disk shelves according to best practices for the specific storage controller and disk shelf quantity.

Figure 2 FlexPod Cabling Diagram

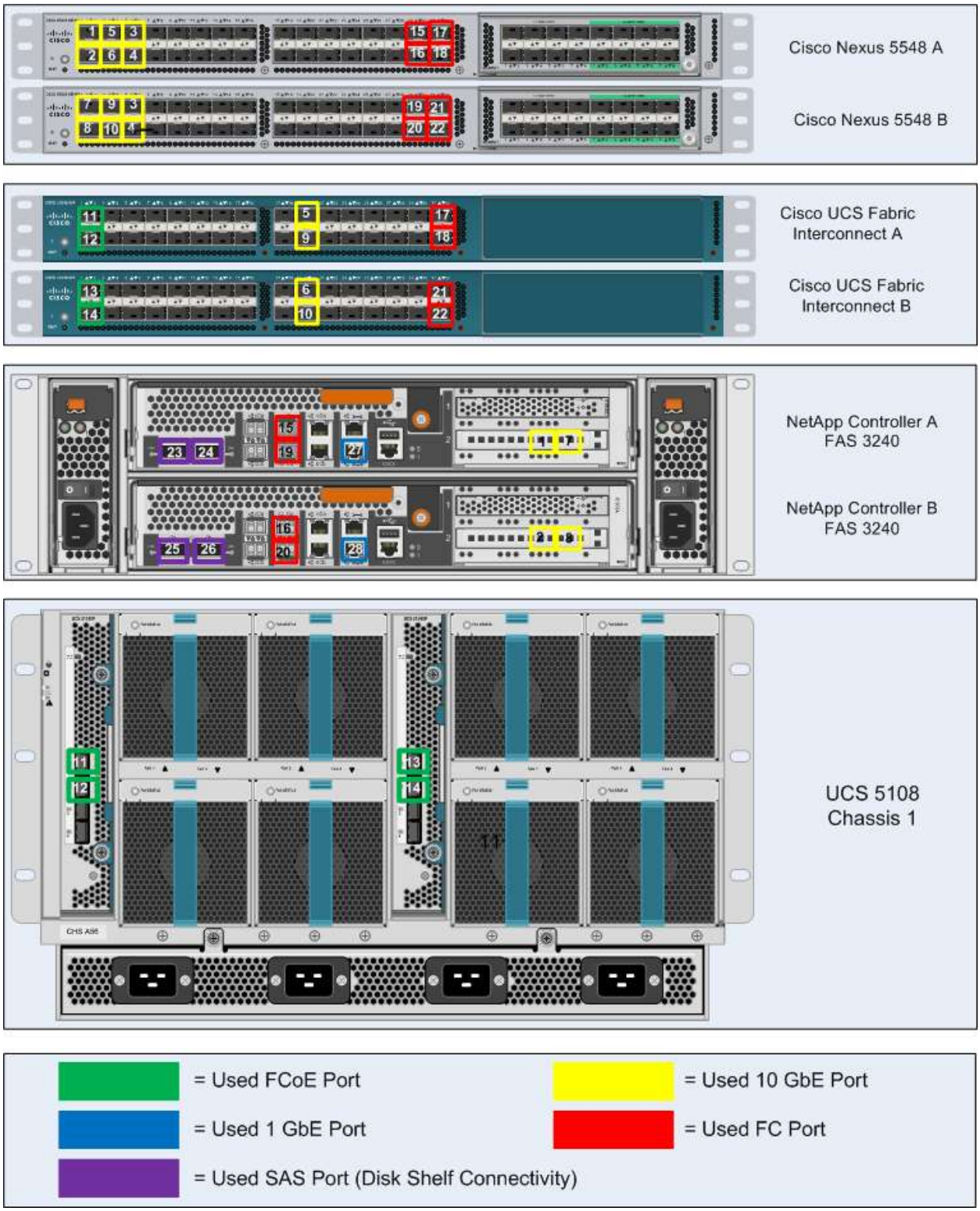


Table 3 Cisco Nexus 5548 A Ethernet Cabling Information

Local Device	Local Port	Connection	Remote Device	Remote Port
Cisco Nexus 5548 A	Eth1/1	10GbE	NetApp controller A	e2a
	Eth1/2	10GbE	NetApp controller B	e2a
	Eth1/5	10GbE	Cisco Nexus 5548 B	Eth1/5
	Eth1/6	10GbE	Cisco Nexus 5548 B	Eth1/6
	Eth1/3	10GbE	Cisco UCS fabric interconnect A	Eth1/19
	Eth1/4	10GbE	Cisco UCS fabric interconnect B	Eth1/19
	MGMT0	100MbE	100MbE management switch	Any

Note: For devices requiring GbE connectivity, use the GbE Copper SFP+s (GLC–T=).

Table 4 Cisco Nexus 5548 B Ethernet Cabling Information

Local Device	Local Port	Connection	Remote Device	Remote Port
Cisco Nexus 5548 B	Eth1/1	10GbE	NetApp controller A	e2b
	Eth1/2	10GbE	NetApp controller B	e2b
	Eth1/5	10GbE	Cisco Nexus 5548 A	Eth1/5
	Eth1/6	10GbE	Cisco Nexus 5548 A	Eth1/6
	Eth1/3	10GbE	Cisco UCS fabric interconnect A	Eth1/20
	Eth1/4	10GbE	Cisco UCS fabric interconnect B	Eth1/20
	MGMT0	100MbE	100MbE management switch	Any

Note: For devices requiring GbE connectivity, use the GbE Copper SFP+s (GLC–T=).

Table 5 NetApp controller A Ethernet Cabling Information

Local Device	Local Port	Connection	Remote Device	Remote Port
NetApp controller A	e0M	100MbE	100MbE management switch	Any
	e0P	GbE	SAS shelves	ACP port
	e2a	10GbE	Cisco Nexus 5548 A	Eth1/1

Local Device	Local Port	Connection	Remote Device	Remote Port
	e2b	10GbE	Cisco Nexus 5548 B	Eth1/1

Table 6 NetApp controller B Ethernet cabling information

Local Device	Local Port	Connection	Remote Device	Remote Port
NetApp controller B	e0M	100MbE	100MbE management switch	Any
	e0P	GbE	SAS shelves	ACP port
	e2a	10GbE	Cisco Nexus 5548 A	Eth1/2
	e2b	10GbE	Cisco Nexus 5548 B	Eth1/2

Table 7 Cisco UCS fabric interconnect A Ethernet cabling information

Local Device	Local Port	Connection	Remote Device	Remote Port
Cisco UCS fabric interconnect A	Eth1/19	10GbE	Cisco Nexus 5548 A	Eth1/3
	Eth1/20	10GbE	Cisco Nexus 5548 B	Eth1/3
	Eth1/1	FCoE/10GbE	Chassis 1 FEX A	Port 1
	Eth1/2	FCoE/10GbE	Chassis 1 FEX A	Port 2
	Eth1/3	FCoE/10GbE	Chassis 2 FEX A (if required)	Port 1
	Eth1/4	FCoE/10GbE	Chassis 2 FEX A (if required)	Port 2
	Eth1/5	FCoE/10GbE	Chassis 3 FEX A (if required)	Port 1
	Eth1/6	FCoE/10GbE	Chassis 3 FEX A (if required)	Port 2
	MGMT0	100MbE	100MbE management switch	Any
	L1	GbE	Cisco UCS fabric interconnect B	L1
	L2	GbE	Cisco UCS fabric interconnect B	L2

Table 8 Cisco UCS fabric interconnect B Ethernet cabling information

Local Device	Local Port	Connection	Remote Device	Remote Port
Cisco UCS fabric interconnect B	Eth1/19	10GbE	Cisco Nexus 5548 A	Eth1/4
	Eth1/20	10GbE	Cisco Nexus 5548 B	Eth1/4
	Eth1/1	10GbE/FCoE	Chassis 1 FEX B	Port 1
	Eth1/2	10GbE/FCoE	Chassis 1 FEX B	Port 2
	Eth1/3	10GbE/FCoE	Chassis 2 FEX B (if required)	Port 1
	Eth1/4	10GbE/FCoE	Chassis 2 FEX B (if required)	Port 2
	Eth1/5	10GbE/FCoE	Chassis 3 FEX B (if required)	Port 1
	Eth1/6	10GbE/FCoE	Chassis 3 FEX B (if required)	Port 2
	MGMT0	100MbE	100 MbE management switch	Any
	L1	GbE	Cisco UCS fabric interconnect A	L1
	L2	GbE	Cisco UCS fabric interconnect A	L2

Table 9 Cisco Nexus 5548 A Fibre Channel cabling information

Local Device	Local Port	Connection	Remote Device	Remote Port
Cisco Nexus 5548 A	FC1/29	FC	Controller_A	0c
	FC1/30	FC	Controller_B	0c
	FC1/31	FC	Cisco UCS fabric interconnect A	Port 31
	FC1/32	FC	Cisco UCS fabric interconnect A	Port 32

Table 10 Cisco Nexus 5548 B Fibre Channel cabling information

Local Device	Local Port	Connection	Remote Device	Remote Port
Cisco Nexus 5548 B	FC1/29	FC	Controller_A	0d
	FC1/30	FC	Controller_B	0d
	FC1/31	FC	Cisco UCS fabric interconnect A	Port 31
	FC1/32	FC	Cisco UCS fabric interconnect A	Port 32

Table 11 Cisco UCS fabric interconnect A Fibre Channel cabling information

Local Device	Local Port	Connection	Remote Device	Remote Port
Cisco UCS fabric interconnect A	Port 31	FC	Cisco Nexus 5548 A	FC1/31
	Port 32	FC	Cisco Nexus 5548 A	FC1/32

Table 12 Cisco UCS Fabric Interconnect B Fibre Channel cabling information

Local Device	Local Port	Connection	Remote Device	Remote Port
Cisco UCS fabric interconnect B	Port 31	FC	Cisco Nexus 5548 B	FC1/31
	Port 32	FC	Cisco Nexus 5548 B	FC1/32

NetApp FAS3240A Deployment Procedure: Part 1

The following section provides a detailed procedure for configuring the NetApp FAS3240 A for use in a MS-HyperV built on FlexPod environment. These steps should be followed precisely. Failure to do so could result in an improper configuration.

Note: The configuration steps detailed in this section provides guidance for configuring the FAS3240A running ONTAP 8.0.2.

Assign Controller Disk Ownership

These steps provide details for assigning disk ownership and disk initialization and verification.

Controller A

1. During controller boot, when prompted for Boot Menu, press `CTRL-C`.
2. At the menu prompt, select option `5` for Maintenance mode boot.
3. Type `Yes` if prompted with `Continue to boot?`
4. Type `disk show`. No disks should be assigned to the controller.
5. Reference the `Local System ID:` value for the following disk assignment.

Note: Half the total number of disks in the environment are assigned to this controller and half to the other controller. Divide the number of disks in half and use the result in the following command for the <# of disks>.

6. Type `disk assign -n` <*#*>.
7. Type `halt` to reboot the controller.
8. If the controller stops at a LOADER–A> prompt, type `autoboot` to start Data ONTAP.
9. During controller boot, when prompted, press `CTRL-C`.
10. At the menu prompt, select option `4` for Clean configuration and initialize all disks.
11. The installer asks if you want to zero the disks and install a new file system. Answer `y`.
12. A warning displays that this will erase all of the data on the disks. Answer `y` that you are sure this is what you want to do.

Note: The initialization and creation of the root volume can take 75 minutes or more to complete, depending on the number of disks attached. Once initialization is complete, the storage system reboots.

Controller B

1. During controller boot, when prompted to Press CTRL-C for special boot menu, press CTRL-C.
2. At the menu prompt, select option 5 for Maintenance mode boot.
3. Type `Yes` if prompted with `Continue to boot?`
4. Type `disk show`. No disks should be assigned to the controller.
5. Reference the `Local System ID:` value for the following disk assignment.

Note: The initialization and creation of the root volume can take 75 minutes or more to complete, depending on the number of disks attached. Once initialization is complete, the storage system reboots.

6. Type `disk assign -n <#>`.
7. Type `halt` to reboot the controller.
8. If the controller stops at a `LOADER-B>` prompt, type `autoboot` to start Data ONTAP.
9. During controller boot, when prompted to Press CTRL-C for Boot Menu, press CTRL-C.
10. At the menu prompt, select option 4 for Clean configuration and initialize all disks.
11. The installer asks if you want to zero the disks and install a new file system. Answer `y`.
12. A warning displays that this will erase all of the data on the disks. Answer `y` that you are sure this is what you want to do.

Note: The initialization and creation of the root volume can take 75 minutes or more to complete, depending on the number of disks attached. Once initialization is complete, the storage system reboots.

Set up Data ONTAP 8.0.2

These steps provide details for setting up Data ONTAP 8.0.2.

Controller A

1. After the disk initialization and the creation of the root volume, Data ONTAP setup begins.
2. Enter the hostname of the storage system.
3. Answer `y` for setting up interface groups.
4. Enter `1` for the number of interface groups to configure.
5. Name the interface `vif0`.
6. Enter `l` to specify the interface as LACP.
7. Enter I to specify IP load balancing
8. Enter `2` for the number of links for `vif0`.
9. Enter `e2a` for the name of the first link.
10. Enter `e2b` for the name of the second link.
11. Enter the controller in-band management address when prompted for an IP address for `vif0`.
12. Enter the netmask for the controller in-band management address.
13. Enter `y` for interface group `vif0` taking over a partner interface.

14. Enter `vif0` for the name of the interface to be taken over.
15. Press Enter to accept the blank IP address for `e0a`.
16. Enter `n` for interface `e0a` taking over a partner interface.
17. Press Enter to accept the blank IP address for `e0b`.
18. Enter `n` for interface `e0b` taking over a partner interface.
19. Enter the IP address of the out-of-band management interface, `e0M`.
20. Enter the subnet mask for `e0M`.
21. Enter `y` for interface `e0M` taking over a partner IP address during failover.
22. Enter `e0M` for the name of the interface to be taken over.
23. Press Enter to accept the default flow control of `full`.
24. Answer `n` to continuing setup through the Web interface.
25. Enter the IP address for the default gateway for the storage system.
26. Enter the IP address for the administration host.
27. Enter the local timezone (for example, PST, MST, CST, or EST).
28. Enter the location for the storage system.
29. Answer `y` to enable DNS resolution.
30. Enter the DNS domain name.
31. Enter the IP address for the first nameserver.
32. Answer `n` to finish entering DNS servers, or answer `y` to add up to two more DNS servers.
33. Answer `n` for running the NIS client.
34. Press Enter to acknowledge the AutoSupport™ message.
35. Answer `y` to configuring the SP LAN interface.
36. Answer `n` to setting up DHCP on the SP LAN interface.
37. Enter the IP address for the SP LAN interface.
38. Enter the subnet mask for the SP LAN interface.
39. Enter the IP address for the default gateway for the SP LAN interface.
40. Enter the fully qualified domain name for the mail host to receive SP messages and AutoSupport.
41. Enter the IP address for the mail host to receive SP messages and AutoSupport.
42. Enter the new administrative (root) password.
43. Enter the new administrative (root) password again to confirm.
44. After these steps are completed, the controller should display a password prompt. Enter the administrative password to login as root.

Controller B

1. After the disk initialization and the creation of the root volume, Data ONTAP setup begins.
2. Enter the hostname of the storage system.
3. Answer `y` for setting up interface groups.
4. Enter `1` for the number of interface groups to configure.
5. Name the interface `vif0`.

6. Enter `l` to specify the interface as LACP.
7. Enter I to specify IP load balancing
8. Enter `2` for the number of links for `vif0`.
9. Enter `e2a` for the name of the first link.
10. Enter `e2b` for the name of the second link.
11. Enter the controller in-band management address when prompted for an IP address for `vif0`.
12. Enter the netmask for the controller in-band management address.
13. Enter `y` for interface group `vif0` taking over a partner interface.
14. Enter `vif0` for the name of the interface to be taken over.
15. Press Enter to accept the blank IP address for `e0a`.
16. Enter `n` for interface `e0a` taking over a partner interface.
17. Press Enter to accept the blank IP address for `e0b`.
18. Enter `n` for interface `e0b` taking over a partner interface.
19. Enter the IP address of the out-of-band management interface, `e0M`.
20. Enter the subnet mask for `e0M`.
21. Enter `y` for interface `e0M` taking over a partner IP address during failover.
22. Enter `e0M` for the name of the interface to be taken over.
23. Press Enter to accept the default flow control of `full`.
24. Answer `n` to continuing setup through the Web interface.
25. Enter the IP address for the default gateway for the storage system.
26. Enter the IP address for the administration host.
27. Enter the local timezone (for example, PST, MST, CST, or EST).
28. Enter the location for the storage system.
29. Answer `y` to enable DNS resolution.
30. Enter the DNS domain name.
31. Enter the IP address for the first nameserver.
32. Answer `n` to finish entering DNS servers, or answer `y` to add up to two more DNS servers.
33. Answer `n` for running the NIS client.
34. Press Enter to acknowledge the AutoSupport™ message.
35. Answer `y` to configuring the SP LAN interface.
36. Answer `n` to setting up DHCP on the SP LAN interface.
37. Enter the IP address for the SP LAN interface.
38. Enter the subnet mask for the SP LAN interface.
39. Enter the IP address for the default gateway for the SP LAN interface.
40. Enter the fully qualified domain name for the mail host to receive SP messages and AutoSupport.
41. Enter the IP address for the mail host to receive SP messages and AutoSupport.
42. Enter the new administrative (root) password.
43. Enter the new administrative (root) password again to confirm.

44. After these steps are completed, the controller should display a password prompt. Enter the administrative password to login as root.

Install Data ONTAP to Onboard Flash Storage

These steps provide details for installing Data ONTAP to the onboard flash storage.

For Controller A and Controller B

1. Install the Data ONTAP image to the onboard flash device by using the `software install` and indicate the http or https Web address of the NetApp Data ONTAP 8.0.2 flash image.
2. After this is complete, type `download` and press `Enter` to download the software to the flash device.

Harden Storage System Logins and Security

These steps provide details for hardening the storage system logins and security.

For Controller A and Controller B

1. Type secureadmin disable ssh.
2. Type secureadmin setup –f ssh to enable ssh on the storage controller.
3. If prompted, type yes to rerun ssh setup.
4. Accept the default values for ssh1.x protocol.
5. Enter 1024 for ssh2 protocol.
6. Enter yes if the information specified is correct and to create the ssh keys.
7. Type options telnet.enable off to disable telnet on the storage controller.
8. Type secureadmin setup ssl to enable ssl on the storage controller.
9. If prompted, type yes to rerun ssl setup.
10. Enter the country name code, state or province name; locality name; organization name, and organization unit name.
11. Enter the fully qualified domain name of the storage system.
12. Enter the administrator's e-mail address.
13. Accept the default for days until the certificate expires.
14. Enter 1024 for the ssl key length.
15. Enter options httpd.admin.enable off to disable http access to the storage system.
16. Enter options httpd.admin.ssl.enable on to enable secure access to FilerView.

Install Required Licenses

These steps provide details for licensing relevant storage licenses for feature enablement, which are used in this reference architecture.

Note: Recommended licenses include:

- near_store: To enable the nearstore personality on a controller
- a_sis: To enable advanced single instance storage availability
- cluster (cf): To configure storage controllers into an HA pair
- CIFS: To enable the CIFS protocol
- FCP: To enable the FCP protocol
- iSCSI: To enable the iSCSI protocol

- flash_cache: To enable usage of the Flash Cache module
- flex_clone: To enable the provisioning of NetApp Flex Clones

Note: If deduplication is required, license near-store prior to licensing a_sis.

For Controller A and Controller B

1. Type license add <*necessary licenses*> to add licenses to the storage system.
2. Type license to double-check the installed licenses.
3. Type reboot to reboot the storage controller.

Configure Native FC ports as FC Targets adapters

These steps provide details for configuring the native FC ports as target ports.

For Controller A and Controller B

1. Type `fcadmin config`.
   This allows the administrator to confirm the state of the native fc ports. If the ports are configured as initiators as opposed to targets proceed to step 2. For the following changes to take effect, a reboot must occur.
2. Type `fc admin config –t target 0c`.
3. Type `fc admin config –t target 0d`.
4. Type `reboot` to reboot the storage controller.

Enable Active-Active Controller Configuration Between Two Storage Systems

This step provides details for enabling active-active controller configuration between the two storage systems.

Controller A only

1. After both controllers have rebooted, type `cf enable` and press `Enter` to enable active-active controller configuration.

Start FCP

This step provides details for enabling the fibre channel protocol.

For Controller A and Controller B

1. Type `fcp start`.

Start iSCSI

This step provides details for enabling the iSCSI protocol.

For Controller A and Controller B

1. Type `iscsi start`.

Set up Storage System NTP Time Synchronization and CDP enablement

These steps provide details for setting up storage system NTP time synchronization and enablement of Cisco Discovery Protocol (CDP).

For Controller A and Controller B

1. Type `date CCyymmddhhmm` where CCyy is the four-digit year, mm is the two-digit month, dd is the two-digit day of the month, hh is the two-digit hour, and the second mm is the two-digit minute to set the storage system time to the actual time.
2. Type `options timed.proto ntp` to synchronize with an NTP server.
3. Type `options timed.servers <NTP server IP>` to add the NTP server to the storage system list.
4. Type `options timed.enable on` to enable NTP synchronization on the storage system.\
5. Type `options cdpd.enable on.`

Create Data Aggregate aggr1

These steps provide details for creating the data `aggregate aggr1.` In most cases, this command finishes quickly, but depending on the state of each disk, it might be necessary to zero some or all of the disks in order to add them to the aggregate. This might take up to 60 minutes to complete.

Controller A

1. Type `aggr create aggr1 –B 64 <# of disks for aggr1>` to create `aggr1` on the storage controller.

Controller B

1. Type `aggr create aggr1 –B 64 <# of disks for aggr1>` to create `aggr1` on the storage controller.

Create SNMP Requests Role and Assign SNMP Login Privileges

These steps provide details for creating SNMP requests role and assign SNMP login privileges.

For Controller A and Controller B

1. Run the following command: `useradmin role add <Controller SNMP request role> -a login-snmp`.

Create SNMP Management Group and Assign SNMP Request Role

This step provides details for creating SNMP management group and assigning a SNMP request role to it.

For Controller A and Controller B

1. Run the following command: `useradmin group add <Controller SNMP managers> -r <Controller SNMP request role>`.

Create SNMP User and Assign to SNMP Management Group

This step provides details for creating SNMP user and assigning it to an SNMP management group.

For Controller A and Controller B

1. Run the following command: `useradmin user add <Controller SNMP users> -g <Controller SNMP managers>`.

After the user is created, the system prompts for a password. Enter the SNMP password when prompted.

Set up SNMP v1 Communities on Storage Controllers

These steps provide details for setting up SNMP v1 communities on the storage controllers so that OnCommand System Manager can be used.

For Controller A and Controller B

1. Run the following command: `snmp community delete all`.
2. Run the following command: `snmp community add ro <Controller SNMP community>.`

Set up SNMP Contact Information for each Storage Controller

This step provide details for setting SNMP contact information for each of the storage controllers.

For Controller A and Controller B

1. Run the following command: `snmp contact <Controller admin email address>.`

Set SNMP Location Information for Each Storage Controller

This step provides details for setting SNMP location information for each of the storage controllers.

For Controller A and Controller B

1. Run the following command: `snmp location <Controller SNMP site name>.`

Reinitialize SNMP on Storage Controllers

This step provides details for reinitializing SNMP on the storage controllers.

For Controller A and Controller B

1. Run the following command: `snmp init 1.`

Enable Flash Cache

This step provides details for enabling the NetApp Flash Cache module, if installed.

For Controller A and Controller B

1. Enter the following command to enable Flash Cache on each controller: `options flexscale.enable on`.

Add VLAN Interfaces

These steps provide details for adding VLAN interfaces on the storage controllers.

Controller A

1. Run the following command: `VLAN add vif0-<iSCSI A VLAN ID>.`
2. Run the following command: `wrfile –a /etc/rc vlan add vif0-<iSCSI A VLAN ID>.`

3. Run the following command: `ifconfig vif0-<iSCSI A VLAN ID> mtusize 1500 partner vif0-<iSCSI A VLAN ID>`.
4. Run the following command: `wrfile –a /etc/rc ifconfig vif0-<iSCSI A VLAN ID> mtusize 1500 partner vif0-<iSCSI A VLAN ID>`.
5. Run the following command: `ifconfig vif0-<iSCSI A VLAN ID> <Controller A iSCSI A VLAN IP> netmask <iSCSI A VLAN netmask>`.
6. Run the following command: `wrfile –a ifconfig vif0-<iSCSI VLAN ID> <Controller A iSCSI A VLAN IP> netmask <iSCSI A VLAN netmask>`.
7. Run the following command: `VLAN add vif0-<iSCSI B VLAN ID>`.
8. Run the following command: `wrfile –a /etc/rc vlan add vif0-<iSCSI B VLAN ID>`.
9. Run the following command: `ifconfig vif0-<iSCSI B VLAN ID> mtusize 1500 partner vif0-<iSCSI B VLAN ID>`.
10. Run the following command: `wrfile –a /etc/rc ifconfig vif0-<iSCSI B VLAN ID> mtusize 1500 partner vif0-<iSCSI B VLAN ID>`.
11. Run the following command: `ifconfig vif0-<iSCSI B VLAN ID> <Controller A iSCSI B VLAN IP> netmask <iSCSI B VLAN netmask>`.
12. Run the following command: `wrfile –a ifconfig vif0-<iSCSI VLAN ID> <Controller A iSCSI B VLAN IP> netmask <iSCSI B VLAN netmask>`.
13.

Controller B

1. Run the following command: `VLAN add vif0-<iSCSI A VLAN ID>`.
2. Run the following command: `wrfile –a /etc/rc vlan add vif0-<iSCSI A VLAN ID>`.
3. Run the following command: `ifconfig vif0-<iSCSI A VLAN ID> mtusize 1500 partner vif0-<iSCSI A VLAN ID>`.
4. Run the following command: `wrfile –a /etc/rc ifconfig vif0-<iSCSI A VLAN ID> mtusize 1500 partner vif0-<iSCSI A VLAN ID>`.
5. Run the following command: `ifconfig vif0-<iSCSI A VLAN ID> <Controller B iSCSI A VLAN IP> netmask <iSCSI A VLAN netmask>`.
6. Run the following command: `wrfile –a ifconfig vif0-<iSCSI VLAN ID> <Controller B iSCSI A VLAN IP> netmask <iSCSI A VLAN netmask>`.
7. Run the following command: `VLAN add vif0-<iSCSI B VLAN ID>`.
8. Run the following command: `wrfile –a /etc/rc vlan add vif0-<iSCSI B VLAN ID>`.
9. Run the following command: `ifconfig vif0-<iSCSI B VLAN ID> mtusize 1500 partner vif0-<iSCSI B VLAN ID>`.
10. Run the following command: `wrfile –a /etc/rc ifconfig vif0-<iSCSI B VLAN ID> mtusize 1500 partner vif0-<iSCSI B VLAN ID>`.
11. Run the following command: `ifconfig vif0-<iSCSI B VLAN ID> <Controller B iSCSI B VLAN IP> netmask <iSCSI B VLAN netmask>`.
12. Run the following command: `wrfile –a ifconfig vif0-<iSCSI VLAN ID> <Controller B iSCSI B VLAN IP> netmask <iSCSI B VLAN netmask>`.

Add Infrastructure Volumes

These steps provide details for adding volumes on the storage controller for SAN boot of the Cisco UCS hosts as well as virtual machine provisioning.

Note: As this configuration calls for an active / active use of the storage controllers, volumes are created on both controllers and the load is distributed.

Controller A

1. Run the following command: `vol create CSV_A –s none aggr1 500g.`
2. Run the following command: `sis on /vol/CSV_A.`
3. Run the following command: `vol create win_boot_A –s none aggr1 1t.`
4. Run the following command: `sis on /vol/win_boot_A.`
5. Run the following command: `vol create Infra_iSCSI_A –s none aggr1 1500g.`
6. Run the following command: `sis on /vol/Infra_iSCSI_A.`

Controller B

1. Run the following command: `vol create CSV_B –s none aggr1 500g.`
2. Run the following command: `sis on /vol/CSV_B.`
3. Run the following command: `vol create win_boot_B –s none aggr1 1t.`
4. Run the following command: `sis on /vol/win_boot_B.`
5. Run the following command: `vol create Infra_iSCSI_B –s none aggr1 1500g.`
6. Run the following command: `sis on /vol/Infra_iSCSI_B.`

Cisco Nexus 5548 Deployment Procedure: Part 1

The following section provides a detailed procedure for configuring the Cisco Nexus 5548 switches for use in a FlexPod environment. Follow these steps precisely because failure to do so could result in an improper configuration.

Note: The configuration steps detailed in this section provides guidance for configuring the Nexus 5548 UP running release 5.0(3)N2(2a).

This configuration also leverages the native VLAN on the trunk ports to discard untagged packets, by setting the native VLAN on the PortChannel, but not including this VLAN in the allowed VLANs on the PortChannel.

Set up Initial Cisco Nexus 5548 Switch

These steps provide details for the initial Cisco Nexus 5548 Switch setup.

Cisco Nexus 5548 A

On initial boot and connection to the serial or console port of the switch, the NX-OS setup should automatically start.

1. Enter `yes` to enforce secure password standards.
2. Enter the password for the admin user.
3. Enter the password a second time to commit the password.
4. Enter `yes` to enter the basic configuration dialog.
5. Create another login account (yes/no) `[n]:` Enter.

6. Configure read-only SNMP community string (yes/no) [n]: Enter.
7. Configure read-write SNMP community string (yes/no) [n]: Enter.
8. Enter the switch name: *<Nexus A Switch name>* Enter.
9. Continue with out-of-band (mgmt0) management configuration? (yes/no) [y]: Enter.
10. Mgmt0 IPv4 address: *<Nexus A mgmt0 IP>* Enter.
11. Mgmt0 IPv4 netmask: *<Nexus A mgmt0 netmask>* Enter.
12. Configure the default gateway? (yes/no) [y]: Enter.
13. IPv4 address of the default gateway: *<Nexus A mgmt0 gateway>* Enter.
14. Enable the telnet service? (yes/no) [n]: Enter.
15. Enable the ssh service? (yes/no) [y]: Enter.
16. Type of ssh key you would like to generate (dsa/rsa):rsa.
17. Number of key bits <768–2048> :1024 Enter.
18. Configure the ntp server? (yes/no) [y]: Enter.
19. NTP server IPv4 address: *<NTP Server IP>* Enter.
20. Enter basic FC configurations (yes/no) [n]: Enter.
21. Would you like to edit the configuration? (yes/no) [n]: Enter.
22. Be sure to review the configuration summary before enabling it.
23. Use this configuration and save it? (yes/no) [y]: Enter.
24. Configuration may be continued from the console or by using SSH. To use SSH, connect to the mgmt0 address of Nexus A.
25. Log in as user admin with the password previously entered.

Cisco Nexus 5548 B

On initial boot and connection to the serial or console port of the switch, the NX-OS setup should automatically start.

1. Enter yes to enforce secure password standards.
2. Enter the password for the admin user.
3. Enter the password a second time to commit the password.
4. Enter yes to enter the basic configuration dialog.
5. Create another login account (yes/no) [n]: Enter.
6. Configure read-only SNMP community string (yes/no) [n]: Enter.
7. Configure read-write SNMP community string (yes/no) [n]: Enter.
8. Enter the switch name: *<Nexus B Switch name>* Enter.
9. Continue with out-of-band (mgmt0) management configuration? (yes/no) [y]: Enter.
10. Mgmt0 IPv4 address: *<Nexus B mgmt0 IP>* Enter.
11. Mgmt0 IPv4 netmask: *<Nexus B mgmt0 netmask>* Enter.
12. Configure the default gateway? (yes/no) [y]: Enter.
13. IPv4 address of the default gateway: *<Nexus B mgmt0 gateway>* Enter.

14. Enable the telnet service? (yes/no) `[n]:` Enter.
15. Enable the ssh service? (yes/no) `[y]:` Enter.
16. Type of ssh key you would like to generate (dsa/rsa):`rsa`.
17. Number of key bits <768–2048> :`1024` Enter.
18. Configure the ntp server? (yes/no) [`y`]: Enter.
19. NTP server IPv4 address: *`<NTP Server IP>`* Enter.
20. Enter basic FC configurations (yes/no) [`n`]: Enter.
21. Would you like to edit the configuration? (yes/no) [`n`]: Enter.
22. Be sure to review the configuration summary before enabling it.
23. Use this configuration and save it? (yes/no) [`y`]: Enter.
24. Configuration may be continued from the console or by using SSH. To use SSH, connect to the mgmt0 address of Nexus A.
25. Log in as user `admin` with the password previously entered.

Enable Appropriate Cisco Nexus Features

These steps provide details for enabling the appropriate Cisco Nexus features.

For Nexus A and Nexus B

1. Type `config t` to enter the global configuration mode.
2. Type `feature lacp`.
3. Type `feature fcoe`.
4. Type `feature npiv`.
5. Type `feature vpc`.
6. Type `feature fport-channel-trunk`.

Set Global Configurations

These steps provide details for setting global configurations.

For Nexus A and Nexus B

1. From the global configuration mode, type `spanning-tree port type network default` to make sure that, by default, the ports are considered as network ports in regards to spanning-tree.
2. Type `spanning-tree port type edge bpduguard default` to enable bpduguard on all edge ports by default.
3. Type `spanning-tree port type edge bpdufilter default` to enable bpdufilter on all edge ports by default.
4. Type ip access-list classify_Silver.
5. Type `10 permit ip <iSCSI-A net address> any` .where the variable is the network address of the iSCSI-A VLAN in CIDR notation (i.e. 192.168.102.0/24).
6. Type `20 permit ip any <iSCSI-A net address>`.
7. Type `30 permit ip <iSCSI-B net address> any`.
8. Type `40 permit ip any <iSCSI-B net address>`.
9. Type `exit`.

10. Type `class-map type qos match-all class-gold.`
11. Type `match cos 4.`
12. Type `exit.`
13. Type `class-map type qos match-all class-silver.`
14. Type `match cos 2.`
15. Type `match access-group name classify_Silver.`
16. Type `exit.`
17. Type `class-map type queuing class-gold.`
18. Type `match qos-group 3.`
19. Type `exit.`
20. Type `class-map type queuing class-silver.`
21. Type `match qos-group 4.`
22. Type `exit.`
23. Type `policy-map type qos system_qos_policy.`
24. Type `class class-gold.`
25. Type `set qos-group 3.`
26. Type `class class-silver.`
27. Type `set qos-group 4.`
28. Type `class class-fcoe.`
29. Type `set qos-group 1.`
30. Type `exit.`
31. Type `exit.`
32. Type `policy-map type queuing system_q_in_policy.`
33. Type `class` Type `queuing class-fcoe.`
34. Type `bandwidth percent 20.`
35. Type `class type queuing class-gold.`
36. Type `bandwidth percent 33.`
37. Type `class type queuing class-silver.`
38. Type `bandwidth percent 29.`
39. Type `class type queuing class-default.`
40. Type `bandwidth percent 18.`
41. Type `exit.`
42. Type `exit.`
43. Type `policy-map type queuing system_q_out_policy.`
44. Type `class type queuing class-fcoe.`
45. Type `bandwidth percent 20.`
46. Type `class type queuing class-gold.`

47. Type `bandwidth percent 33.`
48. Type `class type queuing class-silver.`
49. Type `bandwidth percent 29.`
50. Type `class type queuing class-default.`
51. Type `bandwidth percent 18.`
52. Type `exit.`
53. Type `exit.`
54. Type `class-map type network-qos class-gold.`
55. Type `match qos-group 3.`
56. Type `exit.`
57. Type `class-map type network-qos class-silver.`
58. Type `match qos-group 4.`
59. Type `exit.`
60. Type `policy-map type network-qos system_nq_policy.`
61. Type `class type network-qos class-gold.`
62. Type `set cos 4.`
63. Type `mtu 9000.`
64. Type `class type network-qos class-fcoe.`
65. Type `pause no-drop.`
66. `Type mtu 2158.`
67. Type `class type network-qos class-silver.`
68. Type `set cos 2.`
69. Type `mtu 9000.`
70. Type `class type network-qos class-default.`
71. Type `mtu 9000.`
72. Type `exit.`
73. Type `system qos.`
74. Type `service-policy type qos input system_qos_policy.`
75. Type `service-policy type queuing input system_q_in_policy.`
76. Type `service-policy type queuing output system_q_out_policy.`
77. Type `service-policy type network-qos system_nq_policy.`
78. Type `exit.`
79. Type `copy run start.`

Configure FC Ports

These steps provide details for configuring the necessary FC ports on the Nexus devices.

Nexus A and Nexus B

1. Type `slot 1.`

2. Type `port 29-32 type fc`.
   Note: If you are using FCoE between the Nexus 5548 and storage, change this to: Type `port 31-32 type fc`.
3. Type `copy run start`.
4. Type `reload`.

The Nexus switch will reboot. This will take several minutes.

Create Necessary VLANs

These steps provide details for creating the necessary VLANs.

Nexus A and Nexus B

Following switch reload, Log in as user `admin` with the password previously entered.

1. Type `config-t`.
2. Type `vlan <VM-MGMT VLAN ID>`.
3. Type `name VM-MGMT-VLAN`.
4. Type `exit`.
5. Type `vlan <Default VLAN ID>`.
6. Type `name Native-VLAN`.
7. Type `exit`.
8. Type `vlan <CSV VLAN ID>`.
9. Type `name CSV-VLAN`.
10. Type `exit`.
11. Type `vlan <iSCSI A VLAN ID>`.
12. Type `name iSCSI-A-VLAN`.
13. Type `exit`.
14. Type `vlan <iSCSI B VLAN ID>`.
15. Type `name iSCSI-B-VLAN`.
16. Type `exit`.
17. Type `vlan <Live Migration VLAN ID>`.
18. Type `name Live-Migration-VLAN`.
19. Type `exit`.
20. Type `vlan <App-Cluster VLAN ID>`.
21. Type `name App-Cluster-Comm-VLAN`.
22. Type `exit`.
23. Type `vlan <VM Data VLAN ID>`.
24. Type `name VM-Data-VLAN`.
25. Type `exit`.

Add Individual Port Descriptions for Troubleshooting

These steps provide details for adding individual port descriptions for troubleshooting activity and verification.

Cisco Nexus 5548 A

1. From the global configuration mode, type `interface Eth1/1`.
2. Type `description <Controller A:e2a>`.
3. Type `exit`.
4. Type `interface Eth1/2`.
5. Type `description <Controller B:e2a>`.
6. Type `exit`.
7. Type `interface Eth1/5`.
8. Type `description <Nexus B:Eth1/5>`.
9. Type `exit`.
10. Type `interface Eth1/6`.
11. Type `description <Nexus B:Eth1/6>`.
12. Type `exit`.
13. Type `interface Eth1/3`.
14. Type `description <UCSM A:Eth1/19>`.
15. Type `exit`.
16. Type `interface Eth1/4`.
17. Type `description <UCSM B:Eth1/19>`.
18. Type `exit`.

Cisco Nexus 5548 B

1. From the global configuration mode, type `interface Eth1/1`.
2. Type `description <Controller A:e2b>`.
3. Type `exit`.
4. Type `interface Eth1/2`.
5. Type `description <Controller B:e2b>`.
6. Type `exit`.
7. Type `interface Eth1/5`.
8. Type `description <Nexus A:Eth1/5>`.
9. Type `exit`.
10. Type `interface Eth1/6`.
11. Type `description <Nexus A:Eth1/6>`.
12. Type `exit`.
13. Type `interface Eth1/3`.
14. Type `description <UCSM A:Eth1/20>`.

15. Type `exit`.
16. Type `interface Eth1/4`.
17. Type `description <UCSM B:Eth1/20>`.
18. Type `exit`.

Create Necessary PortChannels

These steps provide details for creating the necessary PortChannels between devices.

Cisco Nexus 5548 A

1. From the global configuration mode, type `interface Po10`.
2. Type `description vPC peer-link`.
3. Type `exit`.
4. Type `interface Eth1/5-6`.
5. Type `channel-group 10 mode active`.
6. Type `no shutdown`.
7. Type `exit`.
8. Type `interface Po11`.
9. Type `description <Controller A>`.
10. Type `exit`.
11. Type `interface Eth1/1`.
12. Type `channel-group 11 mode active`.
13. Type `no shutdown`.
14. Type `exit`.
15. Type `interface Po12`.
16. Type `description <Controller B>`.
17. Type `exit`.
18. Type `interface Eth1/2`.
19. Type `channel-group 12 mode active`.
20. Type `no shutdown`.
21. Type `exit`.
22. Type `interface Po13`.
23. Type `description <UCSM A>`.
24. Type `exit`.
25. Type `interface Eth1/3`.
26. Type `channel-group 13 mode active`.
27. Type `no shutdown`.
28. Type `exit`.
29. Type `interface Po14`.
30. Type `description <UCSM B>`.

31. Type `exit`.
32. Type `interface Eth1/4`.
33. Type `channel-group 14 mode active`.
34. Type `no shutdown`.
35. Type `exit`.
36. Type `copy run start`.

Cisco Nexus 5548 B

1. From the global configuration mode, type `interface Po10`.
2. Type `description vPC peer-link`.
3. Type `exit`.
4. Type `interface Eth1/5-6`.
5. Type `channel-group 10 mode active`.
6. Type `no shutdown`.
7. Type `exit`.
8. Type `interface Po11`.
9. Type `description <Controller A>`.
10. Type `exit`.
11. Type `interface Eth1/1`.
12. Type `channel-group 11 mode active`.
13. Type `no shutdown`.
14. Type `exit`.
15. Type `interface Po12`.
16. Type `description <Controller B>`.
17. Type `exit`.
18. Type `interface Eth1/2`.
19. Type `channel-group 12 mode active`.
20. Type `no shutdown`.
21. Type `exit`.
22. Type `interface Po13`.
23. Type `description <UCSM A>`.
24. Type `exit`.
25. Type `interface Eth1/3`.
26. Type `channel-group 13 mode active`.
27. Type `no shutdown`.
28. Type `exit`.

29. Type `interface Po14`.
30. Type `description <UCSM B>`.
31. Type `exit`.
32. Type `interface Eth1/4`.
33. Type `channel-group 14 mode active`.
34. Type `no shutdown`.
35. Type `exit`.
36. Type `copy run start`.

Add PortChannel Configurations

These steps provide details for adding PortChannel configurations.

Cisco Nexus 5548 A

1. From the global configuration mode, type `interface Po10`.
2. Type `switchport mode trunk`.
3. Type `switchport trunk native vlan <Native VLAN ID>`.
4. Type `switchport trunk allowed vlan <MGMT VLAN ID, CSV VLAN ID, iSCSI A VLAN ID, iSCSI B VLAN ID, Live Migration VLAN ID, VM Cluster Comm VLAN ID, VM Data VLAN ID>`.
5. Type `spanning-tree port type network`.
6. Type `no shutdown`.
7. Type `exit`.
8. Type `interface Po11`.
9. Type `switchport mode trunk`.
10. Type `switchport trunk native vlan <MGMT VLAN ID>`.
11. Type `switchport trunk allowed vlan <MGMT VLAN ID, iSCSI A VLAN ID, iSCSI B VLAN ID>`.
12. Type `spanning-tree port type edge trunk`.
13. Type `no shut`.
14. Type `exit`.
15. Type `interface Po12`.
16. Type `switchport mode trunk`.
17. Type `switchport trunk native vlan <MGMT VLAN ID>`.
18. Type `switchport trunk allowed vlan <MGMT VLAN ID, iSCSI A, iSCSI B VLAN ID >`.
19. Type `spanning-tree port type edge trunk`.
20. Type `no shut`.
21. Type `exit`.
22. Type `interface Po13`.
23. Type `switchport mode trunk`.

24. Type `switchport trunk native vlan <Native VLAN ID>`.
25. Type `switchport trunk allowed vlan <MGMT VLAN ID, CSV VLAN ID, iSCSI A VLAN ID, iSCSI B VLAN ID, Live Migration VLAN ID, VM Cluster Comm VLAN ID, VM Data VLAN ID>`.
26. Type `spanning-tree port type edge trunk`.
27. Type `no shut`.
28. Type `exit`.
29. Type `interface Po14`.
30. Type `switchport mode trunk`.
31. Type `switchport trunk native vlan <Native VLAN ID>`.
32. Type `switchport trunk allowed vlan <<MGMT VLAN ID, CSV VLAN ID, iSCSI A VLAN ID, iSCSI B VLAN ID, Live Migration VLAN ID, VM Cluster Comm VLAN ID, VM Data VLAN ID>`.
33. Type `spanning-tree port type edge trunk`.
34. Type `no shut`.
35. Type `exit`.
36. Type `copy run start`.

Cisco Nexus 5548 B

1. From the global configuration mode, type `interface Po10`.
2. Type `switchport mode trunk`.
3. Type `switchport trunk native vlan <Native VLAN ID>`.
4. Type `switchport trunk allowed vlan <MGMT VLAN ID, CSV VLAN ID, iSCSI A, iSCSI B VLAN ID, VLAN ID, Live Migration VLAN ID, VM Cluster Comm VLAN ID, VM Data VLAN ID>`.
5. Type `spanning-tree port type network`.
6. Type `no shutdown`.
7. Type `exit`.
8. Type `interface Po11`.
9. Type `switchport mode trunk`.
10. Type `switchport trunk native vlan <MGMT VLAN ID>`.
11. Type `switchport trunk allowed vlan <<MGMT VLAN ID, iSCSI A VLAN ID, iSCSI B VLAN ID>`.
12. Type `spanning-tree port type edge trunk`.
13. Type `no shut`.
14. Type `exit`.
15. Type `interface Po12`.
16. Type `switchport mode trunk`.
17. Type `switchport trunk native vlan <MGMT VLAN ID>`.
18. Type `switchport trunk allowed vlan < iSCSI A VLAN ID>`.

19. Type `spanning-tree port type edge trunk`.
20. Type `no shut`.
21. Type `exit`.
22. Type `interface Po13`.
23. Type `switchport mode trunk`.
24. Type `switchport trunk native vlan <Native VLAN ID>`.
25. Type `switchport trunk allowed vlan <MGMT VLAN ID, CSV VLAN ID, iSCSI A VLAN ID, iSCSI B VLAN ID, Live Migration VLAN ID, VM Cluster Comm VLAN ID, VM Data VLAN ID>`.
26. Type `spanning-tree port type edge trunk`.
27. Type `no shut`.
28. Type `exit`.
29. Type `interface Po14`.
30. Type `switchport mode trunk`.
31. Type `switchport trunk native vlan <Native VLAN ID>`.
32. Type `switchport trunk allowed vlan <<MGMT VLAN ID, CSV VLAN ID, iSCSI A VLAN ID, iSCSI B VLAN ID, Live Migration VLAN ID, VM Cluster Comm VLAN ID, VM Data VLAN ID>`.
33. Type `spanning-tree port type edge trunk`.
34. Type `no shut`.
35. Type `exit`.
36. Type `copy run start`.

Configure Virtual PortChannels

These steps provide details for configuring virtual PortChannels (vPCs).

Cisco Nexus 5548 A

1. From the global configuration mode, type `vpc domain <Nexus vPC domain ID>`.
2. Type `role priority 10`.
3. Type `peer-keepalive destination <Nexus B mgmt0 IP> source <Nexus A mgmt0 IP>`.
4. Type `exit`.
5. Type `interface Po10`.
6. Type `vpc peer-link`.
7. Type `exit`.
8. Type `interface Po11`.
9. Type `vpc 11`.
10. Type `exit`.
11. Type `interface Po12`.
12. Type `vpc 12`.

13. Type `exit`.
14. Type `interface Po13`.
15. Type `vpc 13`.
16. Type `exit`.
17. Type `interface Po14`.
18. Type `vpc 14`.
19. Type `exit`.
20. Type `copy run start`.

Cisco Nexus 5548 B

1. From the global configuration mode, type `vpc domain <Nexus vPC domain ID>.`
2. Type `role priority 20`.
3. Type `peer-keepalive destination <Nexus A mgmt0 IP> source <Nexus B mgmt0 IP>`.
4. Type `exit`.
5. Type `interface Po10`.
6. Type `vpc peer-link`.
7. Type `exit`.
8. Type `interface Po11`.
9. Type `vpc 11`.
10. Type `exit`.
11. Type `interface Po12`.
12. Type `vpc 12`.
13. Type `exit`
14. Type `interface Po13`.
15. Type `vpc 13`.
16. Type `exit`.
17. Type `interface Po14`.
18. Type `vpc 14`.
19. Type `exit`.
20. Type `copy run start`

Link into Existing Network Infrastructure

Depending on the available network infrastructure, several methods and features can be used to uplink the FlexPod environment. If an existing Cisco Nexus environment is present, NetApp recommends using vPCs to uplink the Cisco Nexus 5548 switches included in the FlexPod environment into the infrastructure. The previously described procedures can be used to create an uplink vPC to the existing environment.

Save the Configuration

Nexus A and Nexus B

Type `copy run start`.

Cisco Unified Computing System Deployment Procedure

The following section provides a detailed procedure for configuring the Cisco Unified Computing System for use in a FlexPod environment. These steps should be followed precisely because a failure to do so could result in an improper configuration.

Perform Initial Setup of the Cisco UCS 6248 Fabric Interconnects

These steps provide details for initial setup of the Cisco UCS 6248 fabric Interconnects

Cisco UCS 6248 A

1. Connect to the console port on the first Cisco UCS 6248 fabric interconnect.
2. At the prompt to enter the configuration method, enter `console` to continue.
3. If asked to either do a new setup or restore from backup, enter `setup` to continue.
4. Enter `y` to continue to set up a new fabric interconnect.
5. Enter `y` to enforce strong passwords.
6. Enter the password for the admin user.
7. Enter the same password again to confirm the password for the admin user.
8. When asked if this fabric interconnect is part of a cluster, answer `y` to continue.
9. Enter `A` for the switch fabric.
10. Enter the cluster name for the system name.
11. Enter the Mgmt0 IPv4 address.
12. Enter the Mgmt0 IPv4 netmask.
13. Enter the IPv4 address of the default gateway.
14. Enter the cluster IPv4 address.
15. To configure DNS, answer `y`.
16. Enter the DNS IPv4 address.
17. Answer `y` to set up the default domain name.
18. Enter the default domain name.
19. Review the settings that were printed to the console, and if they are correct, answer `yes` to save the configuration.
20. Wait for the login prompt to make sure the configuration has been saved.

Cisco UCS 6248 B

1. Connect to the console port on the second Cisco UCS 6248 fabric interconnect.
2. When prompted to enter the configuration method, enter `console` to continue.
3. The installer detects the presence of the partner fabric interconnect and adds this fabric interconnect to the cluster. Enter `y` to continue the installation.
4. Enter the admin password for the first fabric interconnect.
5. Enter the Mgmt0 IPv4 address.
6. Answer yes to save the configuration.

7. Wait for the login prompt to confirm that the configuration has been saved.

Log into Cisco UCS Manager

These steps provide details for logging into the Cisco UCS environment.

1. Open a Web browser and navigate to the Cisco UCS 6248 fabric interconnect cluster address.
2. Select the Launch link to download the Cisco UCS Manager software.
3. If prompted to accept security certificates, accept as necessary.
4. When prompted, enter `admin` for the username and enter the administrative password and click `Login` to log in to the Cisco UCS Manager software.

Add a Block of IP Addresses for KVM Access

These steps provide details for creating a block of KVM ip addresses for server access in the Cisco UCS environment.

Cisco UCS Manager

1. Select the `Admin` tab at the top of the left window.
2. Select `All > Communication Management`.
3. Right-click `Management IP Pool`.
4. Select `Create Block of IP Addresses`.
5. Enter the starting IP address of the block and number of IPs needed as well as the subnet and gateway information.
6. Click `OK` to create the IP block.
7. Click `OK` in the message box.

Synchronize Cisco UCS to NTP

These steps provide details for synchronizing the Cisco UCS environment to the NTP server.

Cisco UCS Manager

1. Select the `Admin` tab at the top of the left window.
2. Select `All > Timezone Management`.
3. Right-click `Timezone Management`.
4. In the right pane, select the appropriate timezone in the `Timezone` drop-down menu.
5. Click `Save Changes` and then `OK`.
6. Click `Add NTP Server`.
7. Input the NTP server IP and click `OK`.

Configure Unified Ports

These steps provide details for modifying an unconfigured Ethernet port into a FC uplink port ports in the Cisco UCS environment.

Note: Modification of the unified ports leads to a reboot of the fabric interconnect in question. This reboot can take up to 10 minutes.

Cisco UCS Manager

1. Navigate to the Equipment tab in the left pane.
2. Select Fabric Interconnect A.
3. In the right pane, click the General tab.
4. Select Configure Unified Ports.
5. Select Yes to launch the wizard.
6. Use the slider tool and move one position to the left to configure the last two ports (31 and 32) as FC uplink ports.
7. Ports 31 and 32 now have the “B” indicator indicating their reconfiguration as FC uplink ports.
8. Click Finish.
9. Click OK.
10. The Cisco UCSM GUI will close as the primary fabric interconnect reboots.
11. Upon successful reboot, open a Web browser and navigate to the Cisco UCS 6248 fabric interconnect cluster address.
12. When prompted, enter admin for the username and enter the administrative password and click Login to log in to the Cisco UCS Manager software.
13. Navigate to the Equipment tab in the left pane.
14. Select Fabric Interconnect B.
15. In the right pane, click the General tab.
16. Select Configure Unified Ports.
17. Select Yes to launch the wizard.
18. Use the slider tool and move one position to the left to configure the last two ports (31 and 32) as FC uplink ports.
19. Ports 31 and 32 now have the “B” indicator indicating their reconfiguration as FC uplink ports.
20. Click Finish.
21. Click OK.

Edit the Chassis Discovery Policy

These steps provide details for modifying the chassis discovery policy as the base architecture includes two uplinks from each fabric extender installed in the Cisco UCS chassis.

Cisco UCS Manager

1. Navigate to the Equipment tab in the left pane.
2. In the right pane, click the Policies tab.
3. Under Global Policies, change the Chassis Discovery Policy to 2-link.
4. Click Save Changes in the bottom right corner.

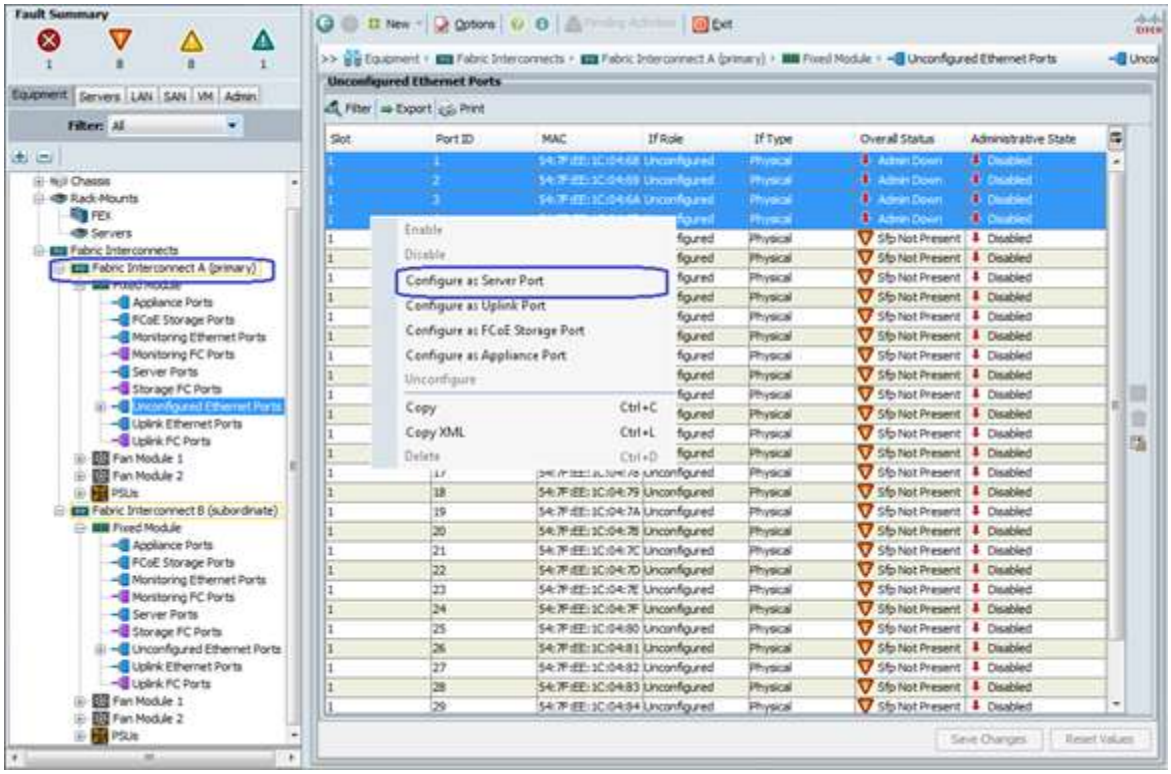
Enable Server and Uplink Ports

These steps provide details for enabling Fibre Channel, server and uplinks ports.

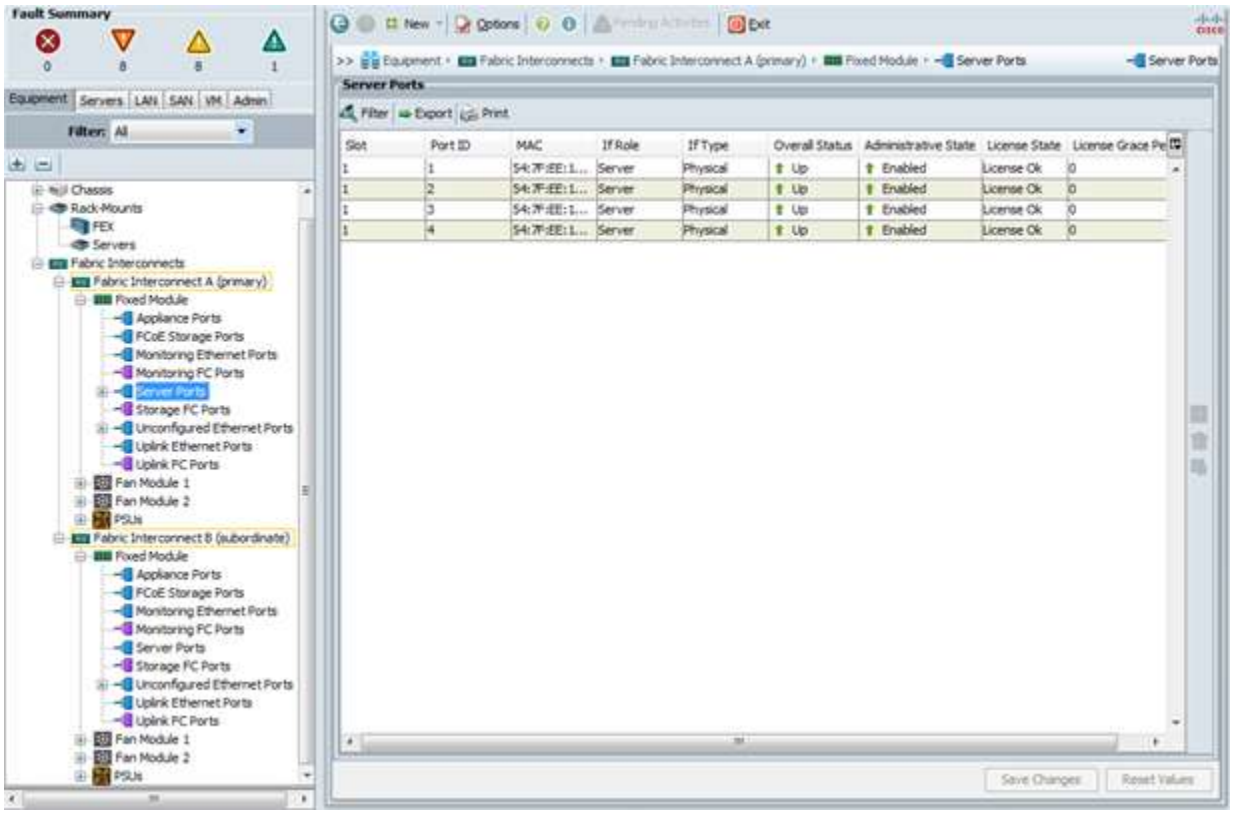
Cisco UCS Manager

1. Select the Equipment tab on the top left of the window.

2. Select `Equipment > Fabric Interconnects > Fabric Interconnect A (primary) > Fixed Module`.
3. Expand the `Unconfigured Ethernet Ports` section.
4. Select the number of ports that are connected to the Cisco UCS chassis (2 per chassis), right-click them, and select `Configure as Server Port`.



5. A prompt displays asking if this is what you want to do. Click `Yes`, then `OK` to continue.



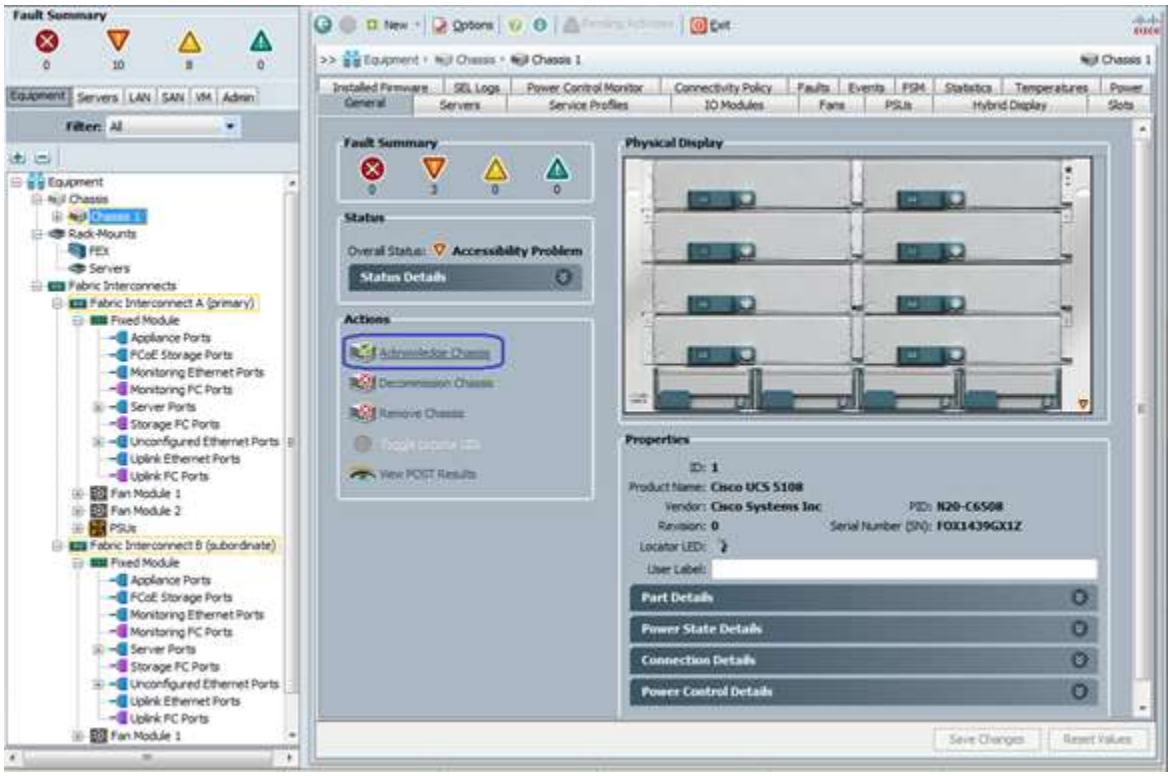
6. Select ports 19 and 20 that are connected to the Cisco Nexus 5548 switches, right-click them, and select `Configure as Uplink Port`.
7. A prompt displays asking if this is what you want to do. Click `Yes`, then `OK` to continue.
8. Select `Equipment > Fabric Interconnects > Fabric Interconnect B (subordinate) > Fixed Module`.
9. Expand the `Unconfigured Ethernet Ports` section.
10. Select ports the number of ports that are connected to the Cisco UCS chassis (2 per chassis), right-click them, and select `Configure as Server Port`.
11. A prompt displays asking if this is what you want to do. Click `Yes`, then `OK` to continue.
12. Select ports 19 and 20 that are connected to the Cisco Nexus 5548 switches, right-click them, and select `Configure as Uplink Port`.
13. A prompt displays asking if this is what you want to do. Click `Yes`, then `OK` to continue.

Acknowledge the Cisco UCS Chassis

The connected chassis needs to be acknowledged before it can be managed by Cisco UCS Manager.

Cisco UCS Manager

1. Select `Chassis 1` in the left pane.
2. Click `Acknowledge Chassis`.



Cisco UCS Manager acknowledges the chassis and the blades servers in it.

Create Uplink PortChannels to the Cisco Nexus 5548 Switches

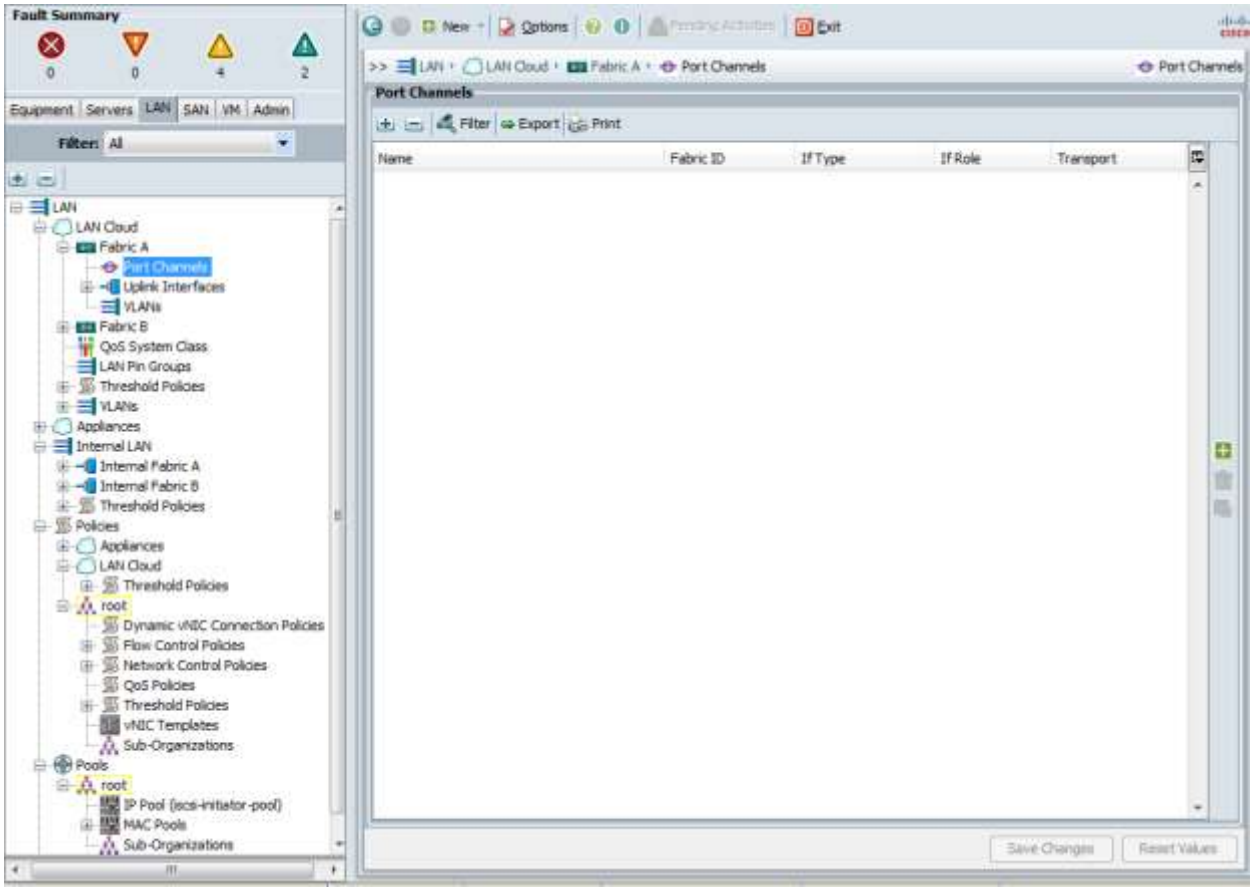
These steps provide details for configuring the necessary PortChannels out of the Cisco UCS environment.

Cisco UCS Manager

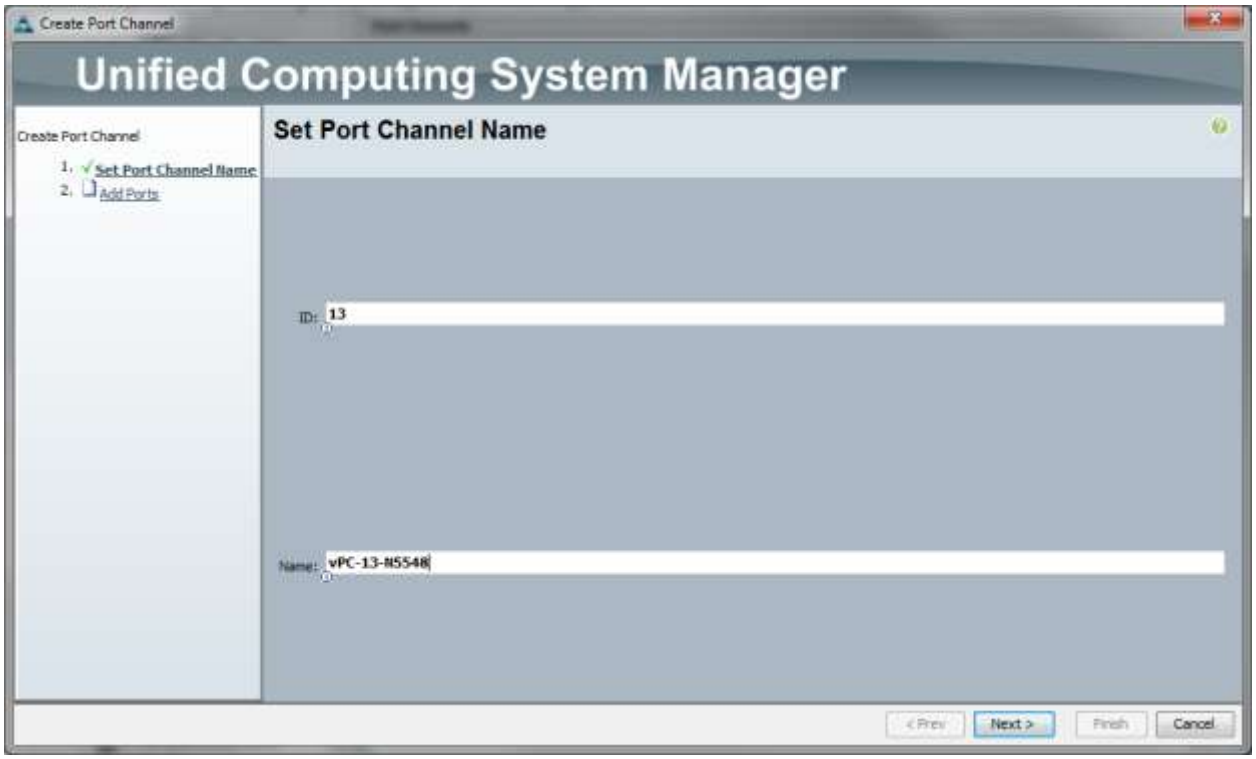
1. Select the `LAN` tab on the left of the window.

Note: Two PortChannels are created, one from fabric A to both Cisco Nexus 5548 switches and one from fabric B to both Cisco Nexus 5548 switches.

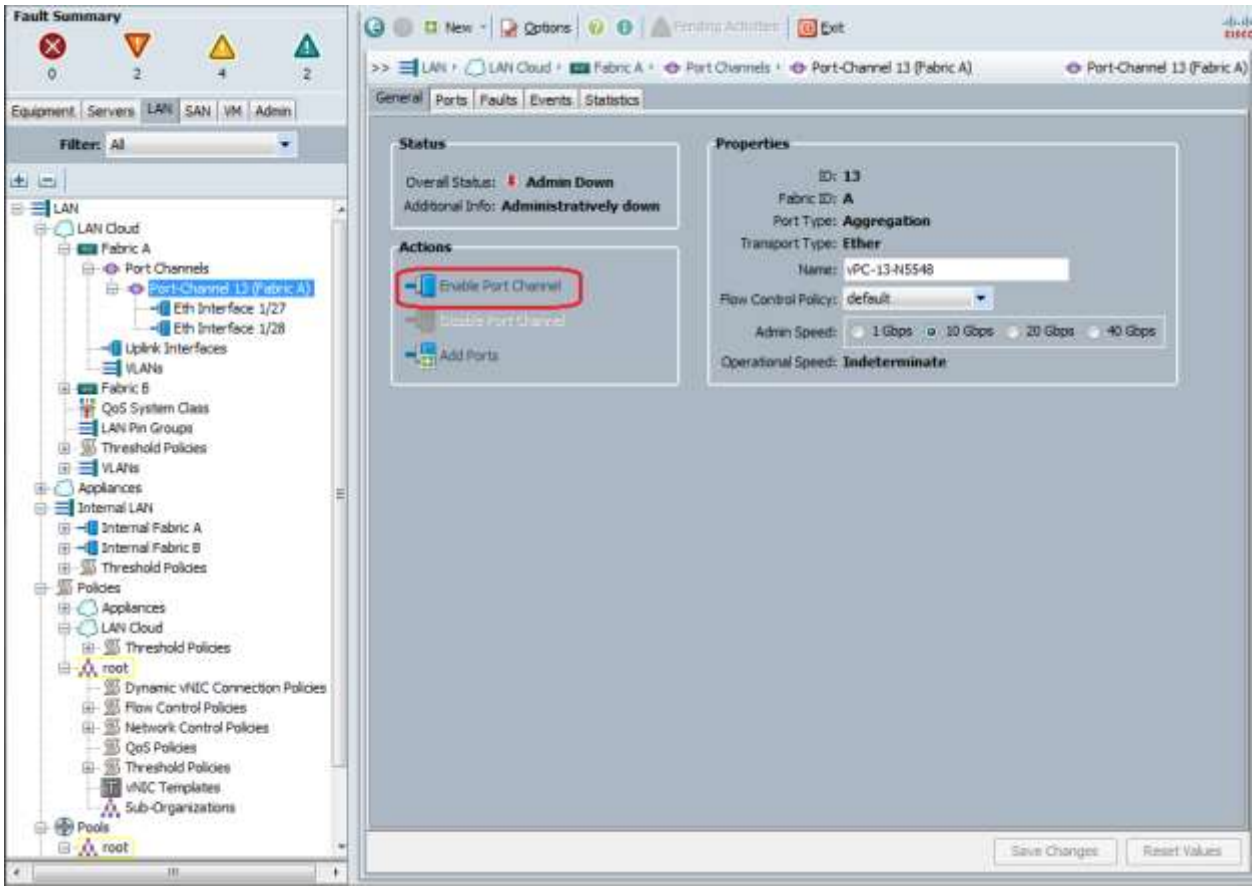
2. Under `LAN Cloud`, expand the `Fabric A` tree.
3. Right-click `Port Channels`.



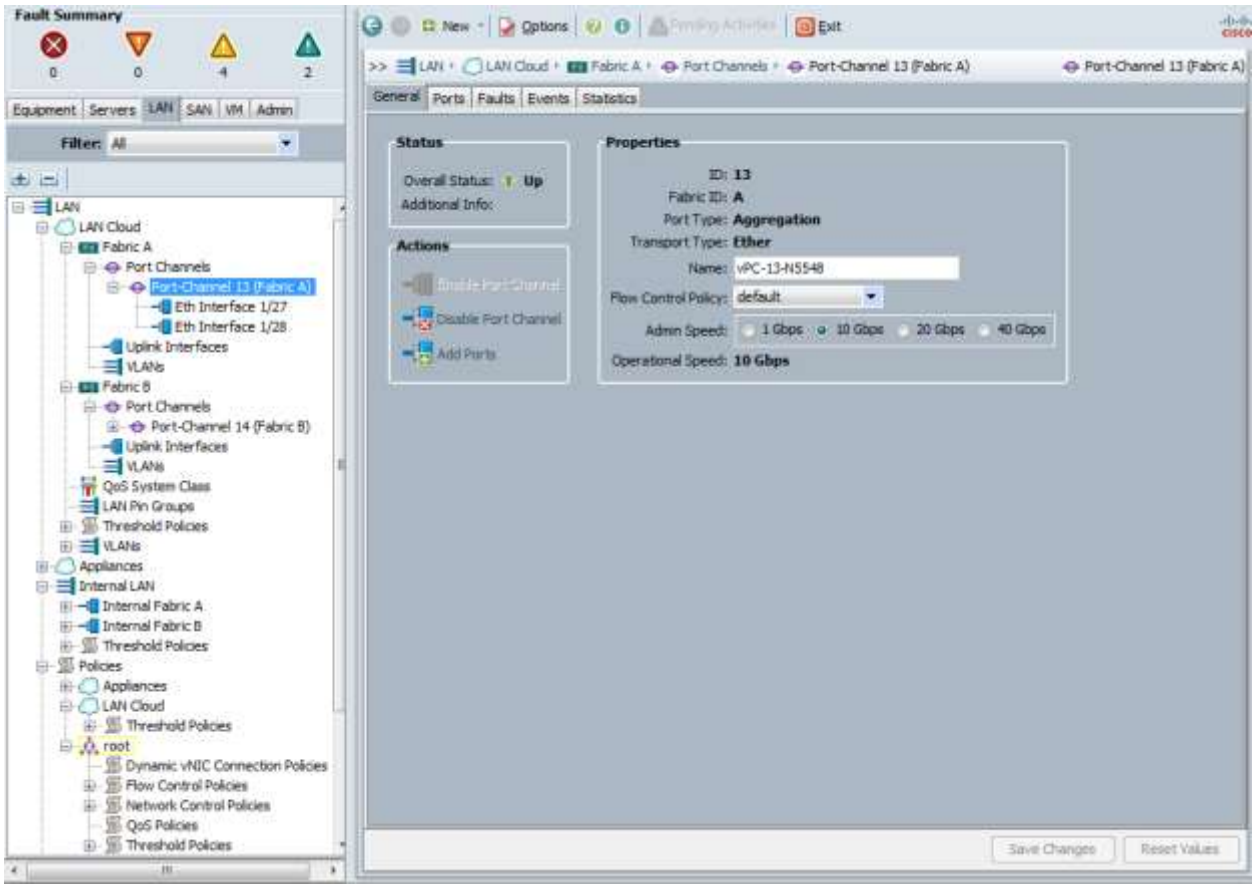
4. Select `Create Port Channel`.
5. Enter `13` as the unique ID of the PortChannel.
6. Enter `vPC-13-N5548` as the name of the PortChannel.
7. Click `Next`.



8. Select the port with slot ID: `1` and port: `19` and also the port with slot ID: `1` and port `20` to be added to the PortChannel.
9. Click `>>` to add the ports to the PortChannel.
10. Click `Finish` to create the PortChannel.
11. Select the check box for `Show navigator for Port-Channel 13 (Fabric A)`
12. Click `OK` to continue.
13. Under `Actions`, select `Enable Port Channel`.
14. In the pop-up box, click `Yes`, then `OK` to enable.



15. Wait until the overall status of the Port Channel is up.
16. Click OK to close the Navigator.



17. Under `LAN Cloud`, expand the `Fabric B` tree.
18. Right-click `Port Channels`.
19. Select `Create Port Channel`.
20. Enter `14` as the unique ID of the PortChannel.
21. Enter `vPC-14-N5548` as the name of the PortChannel.
22. Click `Next`.
23. Select the port with slot ID: `1` and port: `19` and also the port with slot ID: `1` and port `20` to be added to the PortChannel.
24. Click `>>` to add the ports to the PortChannel.
25. Click `Finish` to create the PortChannel.
26. Select Check box for `Show navigator for Port-Channel 14 (Fabric B).`
27. Click `OK` to continue.
28. Under `Actions`, select `Enable Port Channel`.
29. In the pop-up box, click `Yes`, then `OK` to enable.
30. Wait until the overall status of the Port Channel is up
31. Click `OK` to close the Navigator.

Create an Organization

These steps provide details for configuring an organization in the Cisco UCS environment. Organizations are used as a means to organize and restrict access to various groups within the IT organization, thereby enabling multi-tenancy of the compute resources. This document does not assume the use of Organizations, however the necessary steps are included below.

Cisco UCS Manager

1. From the `New…` menu at the top of the window, select `Create Organization`.
2. Enter a name for the organization.
3. Enter a description for the organization (optional).
4. Click `OK`.
5. In the message box that displays, click `OK`.

Create a MAC Address Pool

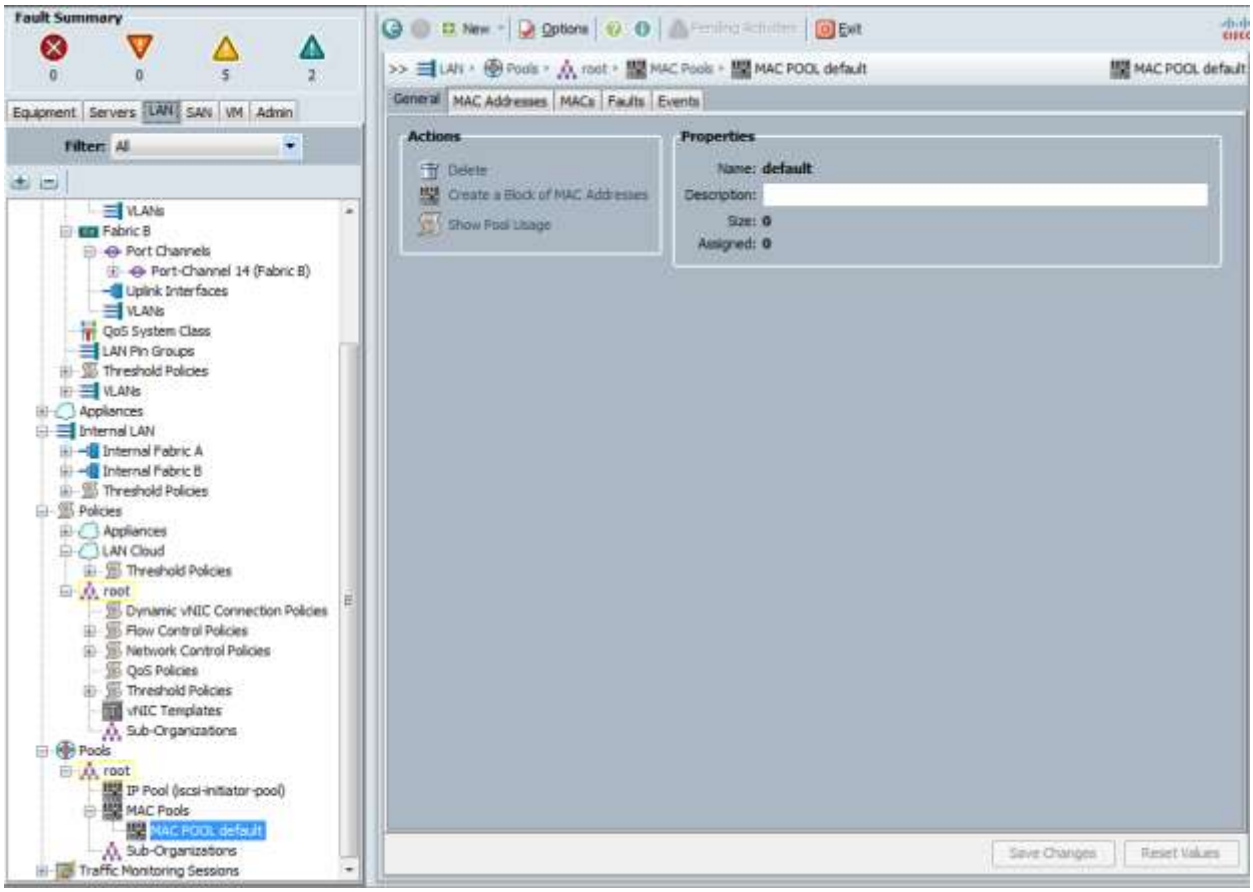
These steps provide details for configuring the necessary MAC address pool for the Cisco UCS environment.

Cisco UCS Manager

1. Select the `LAN` tab on the left of the window.
2. Select `Pools > root`.

Note: One MAC address pool is created.

3. Right-click `MAC Pools` under the root organization .
4. Select `Create MAC Pool` to create the MAC address pool.



5. Enter `MAC_Pool` for the name of the MAC pool.
6. (Optional) Enter a description of the MAC pool.
7. Click `Next`.
8. Click `Add`.
9. Specify a starting MAC address.
10. Specify a size of the MAC address pool sufficient to support the available blade resources.

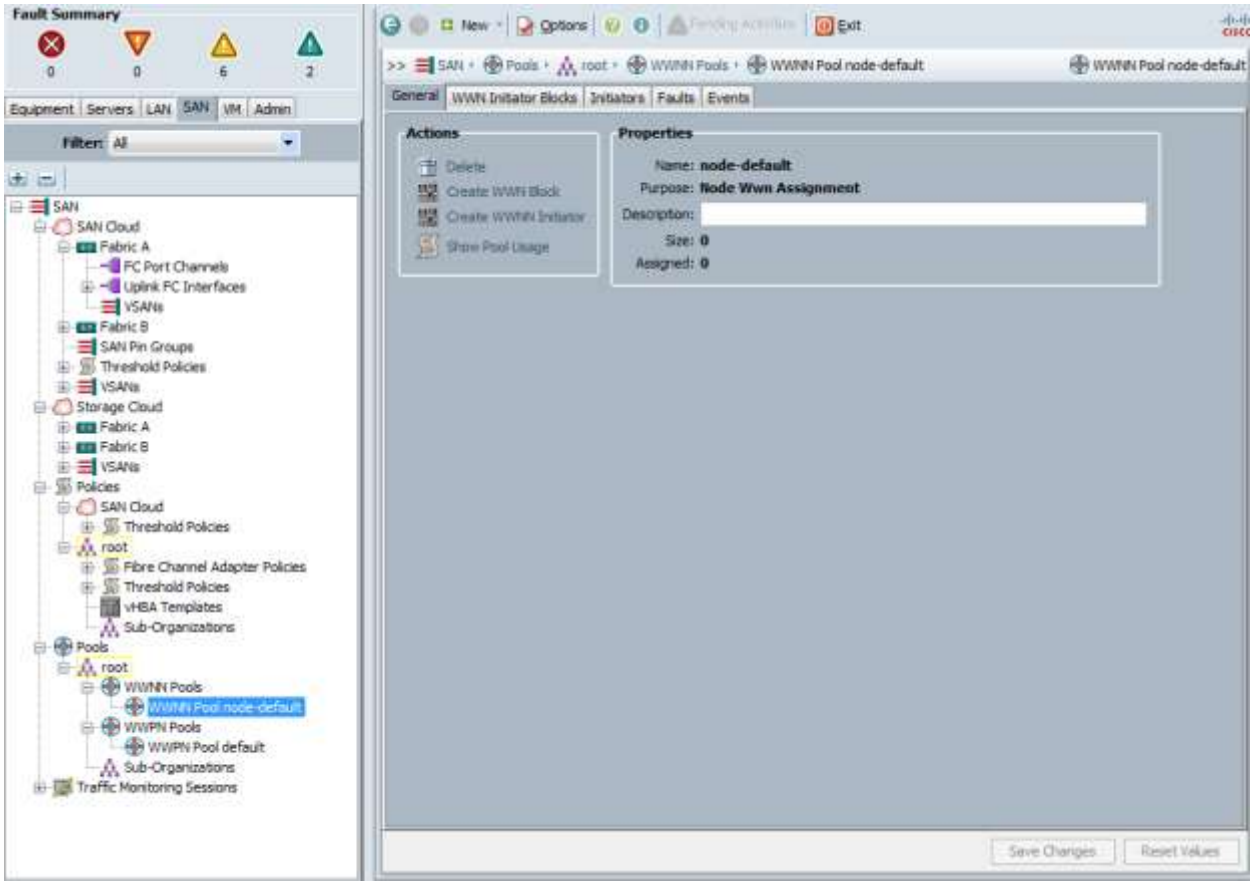
11. Click `OK`.
12. Click `Finish`.
13. In the message box that displays, click `OK`.

Create WWNN Pools

These steps provide details for configuring the necessary WWNN pools for the Cisco UCS environment.

Cisco UCS Manager

1. Select the `SAN` tab at the top left of the window.
2. Select `Pools > root`.
3. Right-click `WWNN Pools`
4. Select `Create WWNN Pool`.



5. Enter `WWNN_Pool` as the name of the WWNN pool.
6. (Optional) Add a description for the WWNN pool.
7. Click `Next` to continue.
8. Click `Add` to add a block of WWNN's.
9. The default is fine, modify if necessary.
10. Specify a size of the WWNN block sufficient to support the available blade resources.

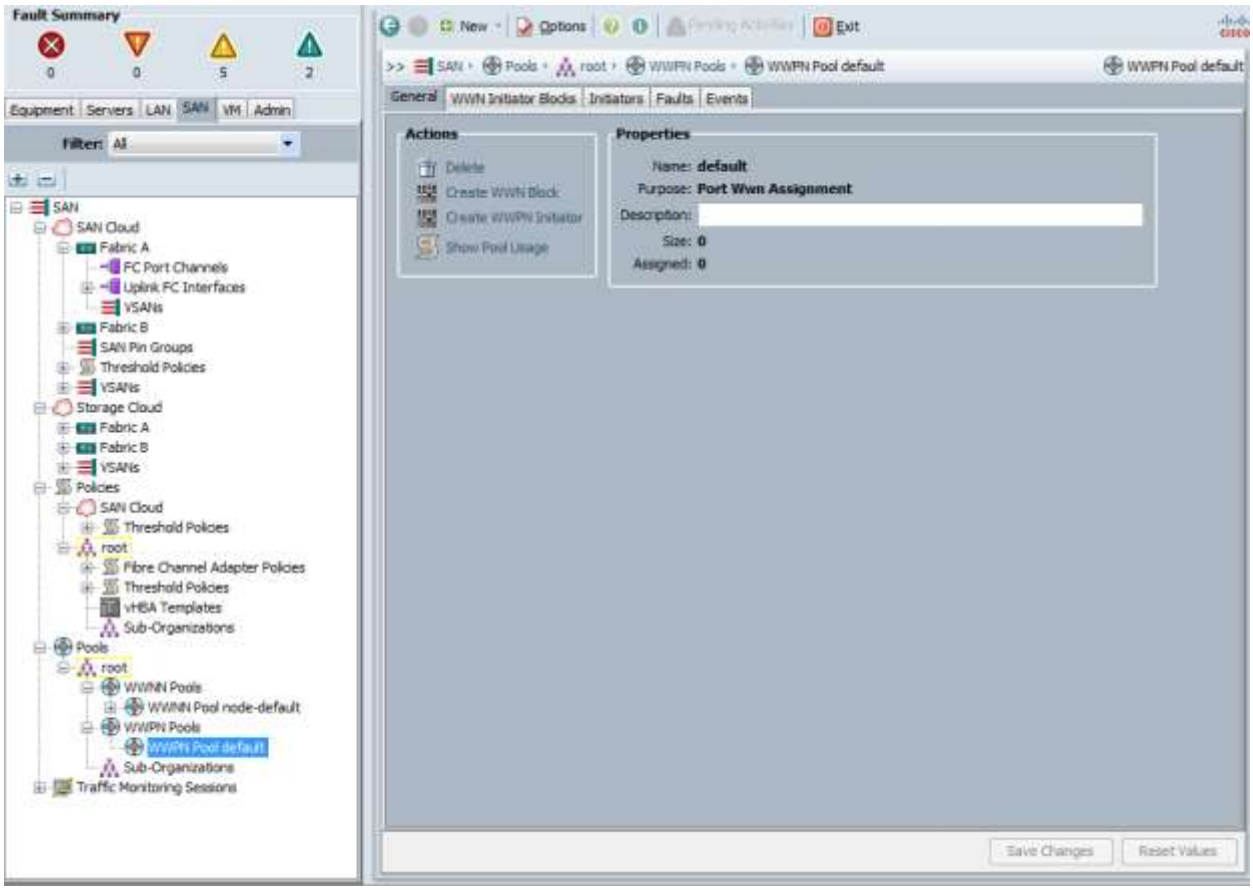
11. Click `OK` to proceed.
12. Click `Finish` to proceed.
13. Click `OK` to finish.

Create WWPN Pools

These steps provide details for configuring the necessary WWPN pools for the Cisco UCS environment.

Cisco UCS Manager

1. Select the `SAN` tab at the top left of the window.
2. Select `Pools > root`.
3. Two WWPN pools are created, one for fabric A and one for fabric B.
4. Right-click `WWPN Pools`
5. Select `Create WWPN Pool`.



6. Enter `WWPN_Pool_A` as the name for the WWPN pool for fabric A.
7. (Optional). Give the WWPN pool a description.
8. Click `Next`.
9. Click `Add` to add a block of WWPNs.
10. Enter the starting WWPN in the block for fabric A.
11. Specify a size of the WWPN block sufficient to support the available blade resources.

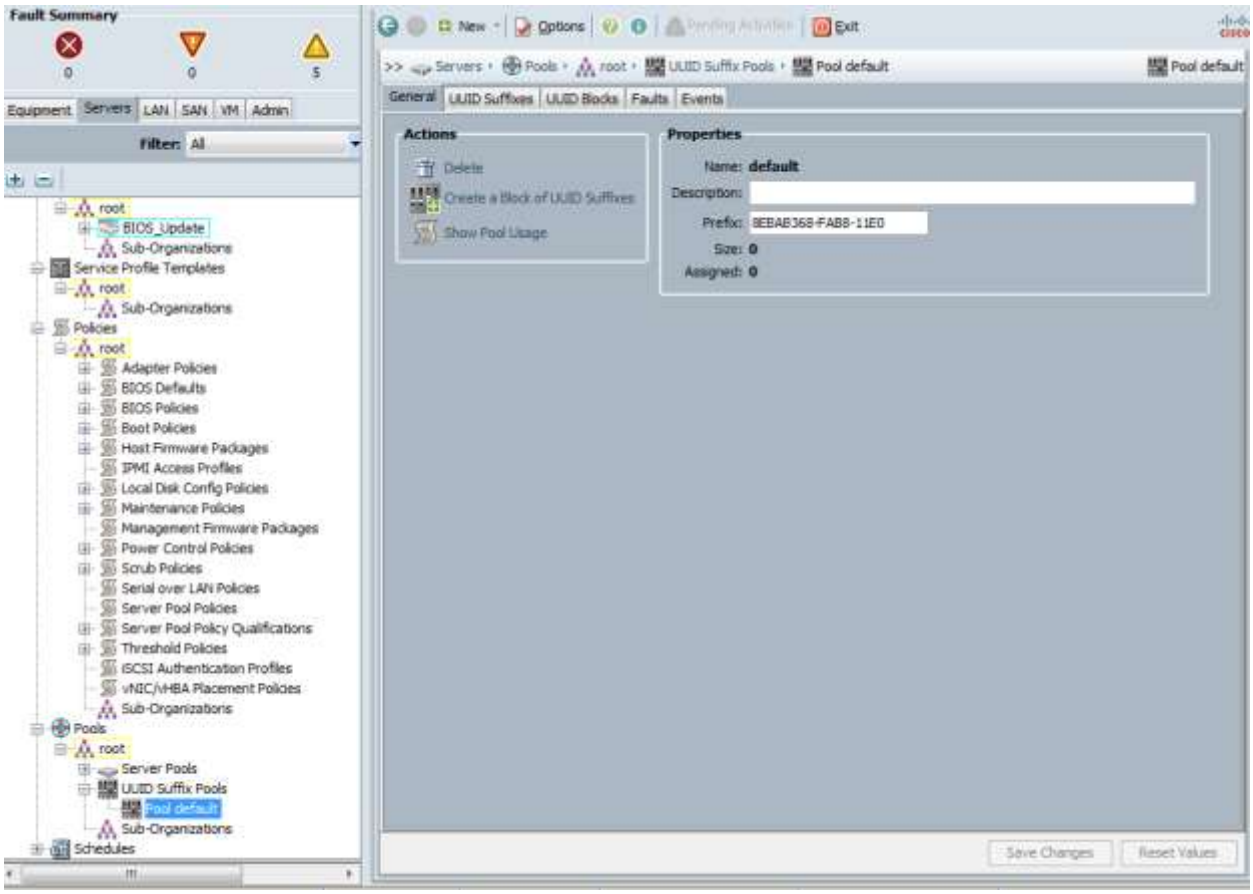
12. Click `OK`.
13. Click `Finish` to create the WWPN pool.
14. Click `OK`.
15. Right-click `WWPN Pools`
16. Select `Create WWPN Pool`.
17. Enter `WWPN_Pool_B` as the name for the WWPN pool for fabric B.
18. (Optional) Give the WWPN pool a description.
19. Click `Next`.
20. Click `Add` to add a block of WWPNs.
21. Enter the starting WWPN in the block for fabric B.
22. Specify a size of the WWPN block sufficient to support the available blade resources.
23. Click `OK`.
24. Click `Finish`.
25. Click `OK` to finish.

Create UUID Suffix Pools

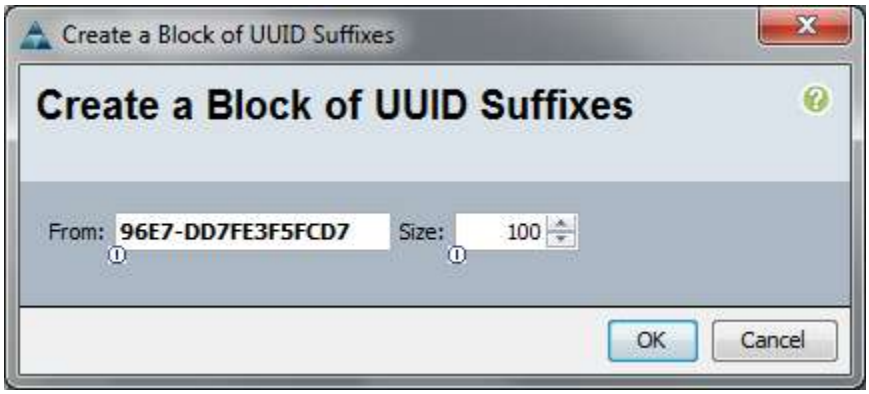
These steps provide details for configuring the necessary UUID suffix pools for the Cisco UCS environment.

Cisco UCS Manager

1. Select the `Servers` tab on the top left of the window.
2. Select `Pools > root`.
3. Right-click `UUID Suffix Pools`
4. Select `Create UUID Suffix Pool`.



5. Name the UUID suffix pool UUID_Pool.
6. (Optional) Give the UUID suffix pool a description.
7. Leave the prefix at the derived option.
8. Click `Next` to continue.
9. Click `Add` to add a block of UUID's
10. The From field is fine at the default setting.
11. Specify a size of the UUID block sufficient to support the available blade resources.



12. Click `OK`.

13. Click `Finish` to proceed.
14. Click `OK` to finish.

Create Server Pools

These steps provide details for configuring the necessary UUID suffix pools for the Cisco UCS environment.

Cisco UCS Manager

1. Select the `Servers` tab at the top left of the window.
2. Select `Pools > root`.
3. Right-click `Server Pools`.
4. Select Create Server Pool.
5. Name the server pool `Infra_Pool`.
6. (Optional) Give the server pool a description.
7. Click `Next` to continue to add servers.
8. Select two B200 servers to be added to the Infra_Pool server pool. Click `>>` to add them to the pool.
9. Click `Finish`.
10. Select `OK` to finish.

Create VLANs

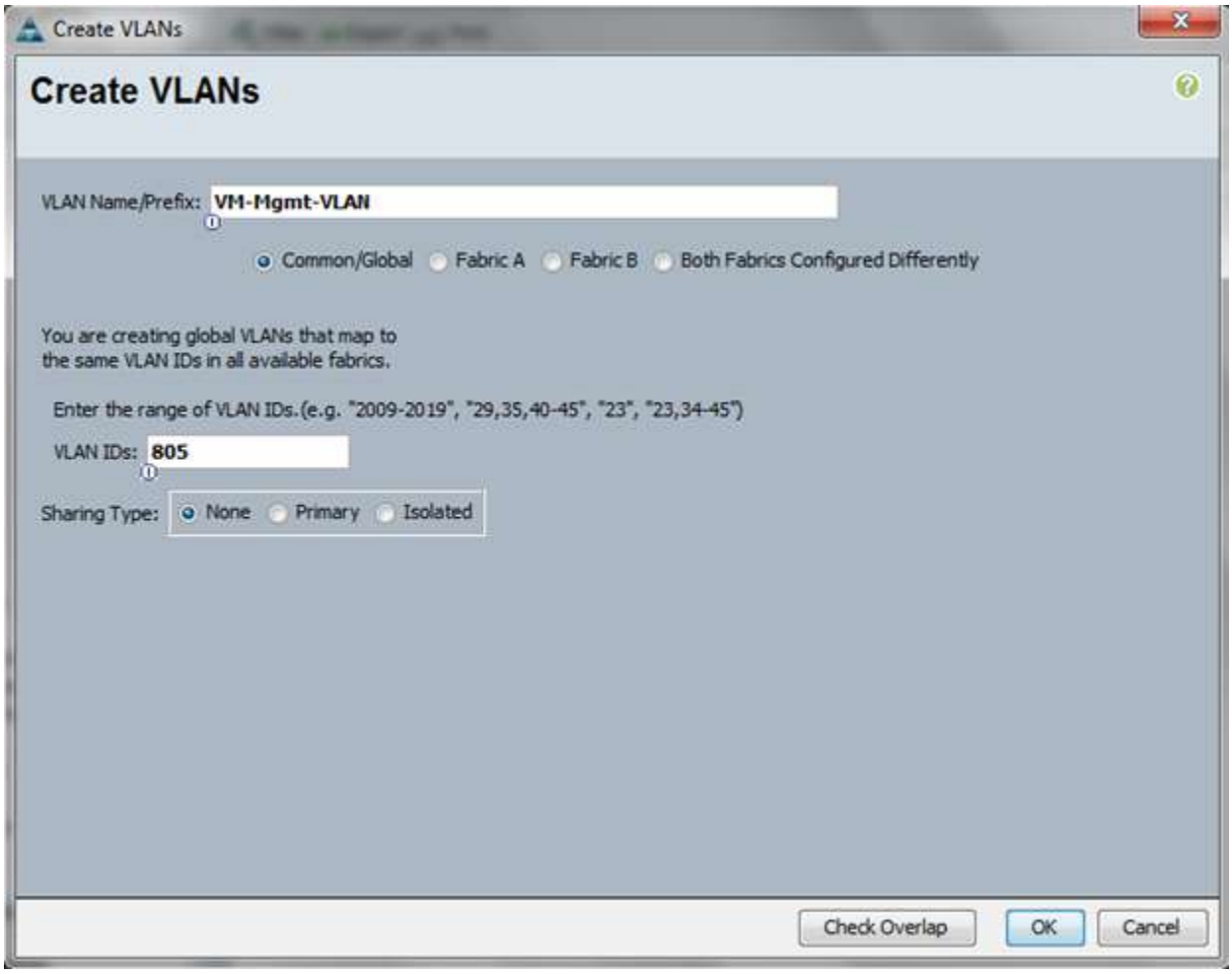
These steps provide details for configuring the necessary VLANs for the Cisco UCS environment.

Cisco UCS Manager

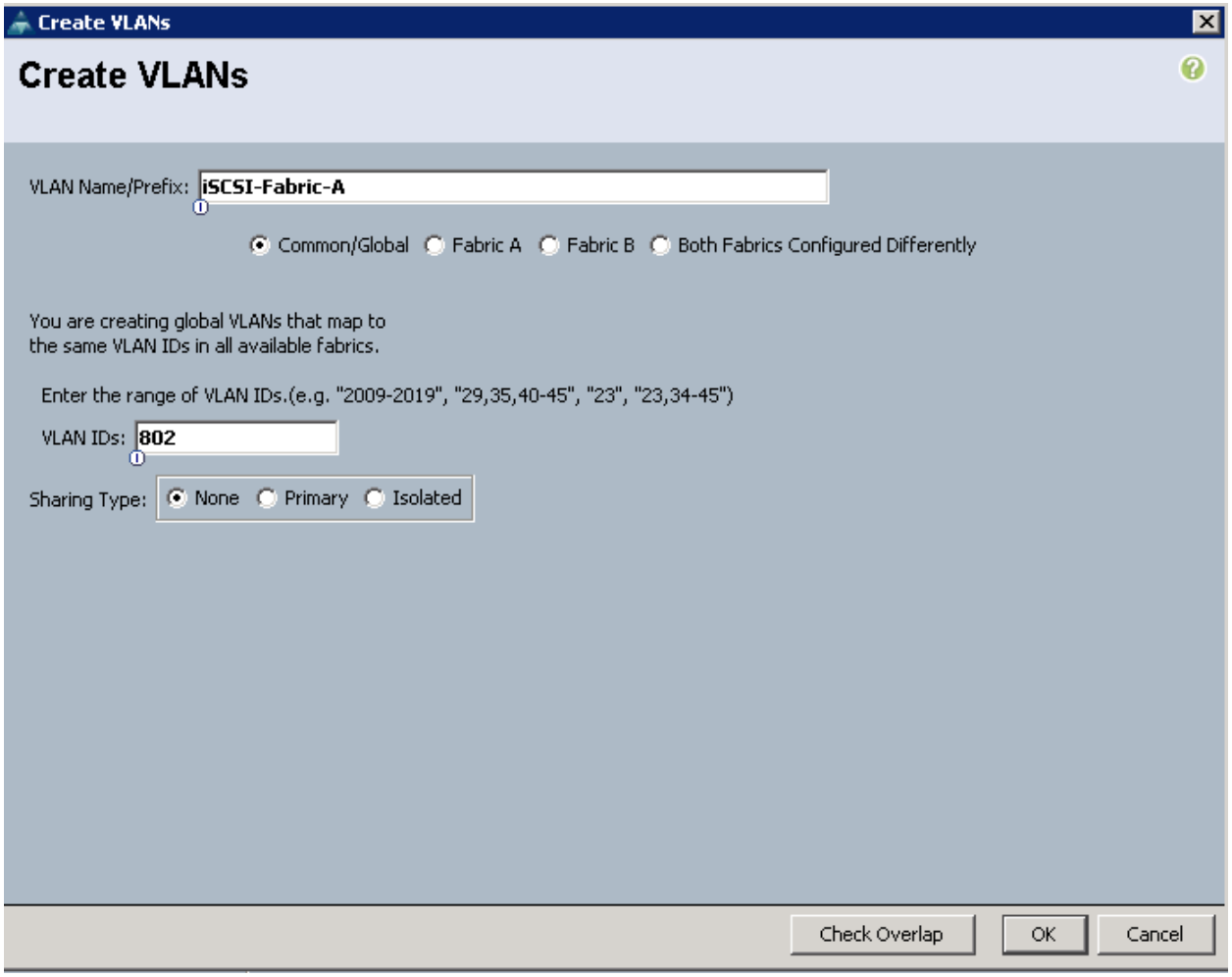
1. Select the `LAN` tab on the left of the window.

Note: Eight VLANs are created.

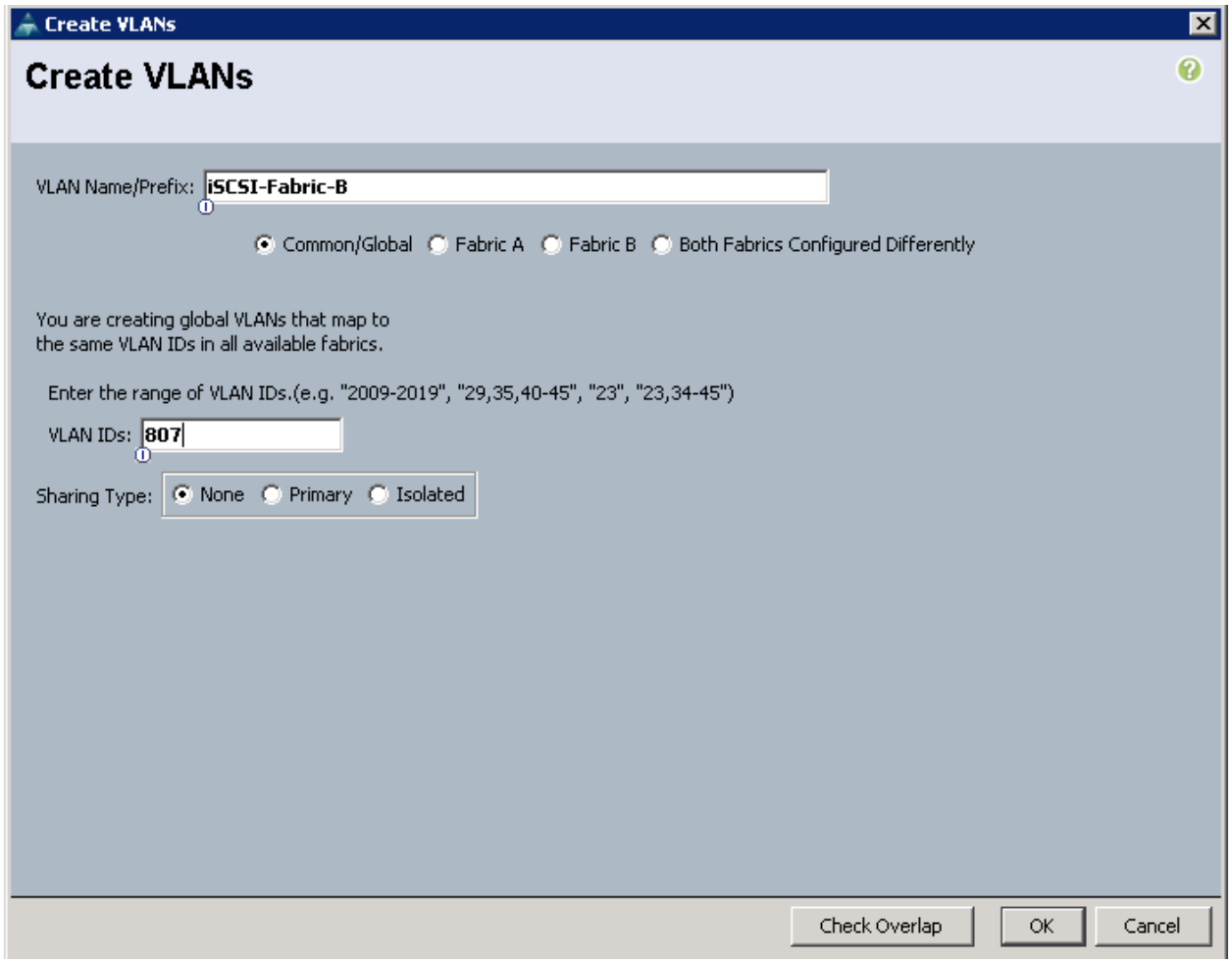
1. Select `LAN Cloud`.
2. Right-click `VLANs`.
3. Select `Create VLANs`.
4. Enter `MGMT-VLAN` as the name of the VLAN to be used for management traffic.
5. Keep the Common/Global option selected for the scope of the VLAN.
6. Enter the VLAN ID for the management VLAN. Keep the sharing type as `none`.
7. Click `OK`.



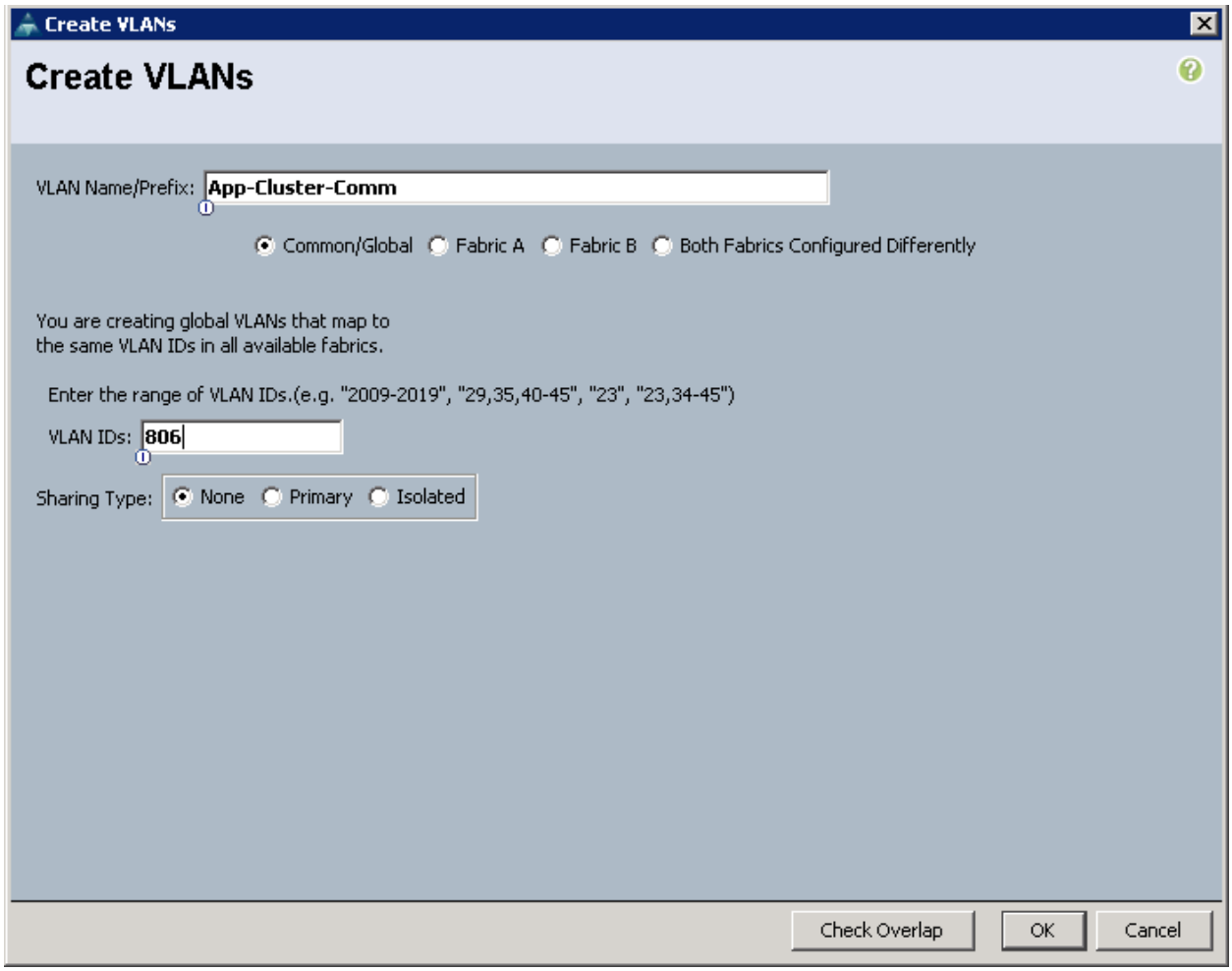
8. Right-click `VLANs`.
9. Select `Create VLANs`.
10. Enter `CSV-VLAN` as the name of the VLAN to be used for the CSV VLAN.
11. Keep the `Common/Global` option selected for the scope of the VLAN.
12. Enter the VLAN ID for the CSV VLAN.
13. Click `OK`.
14. Right-click `VLANs`.
15. Select `Create VLANs`.
16. Enter `iSCSI-VLAN-A` as the name of the VLAN to be used for the first iSCSI VLAN.
17. Keep the `Common/Global` option selected for the scope of the VLAN.
18. Enter the VLAN ID for the first iSCSI VLAN .
19. Click `OK`.



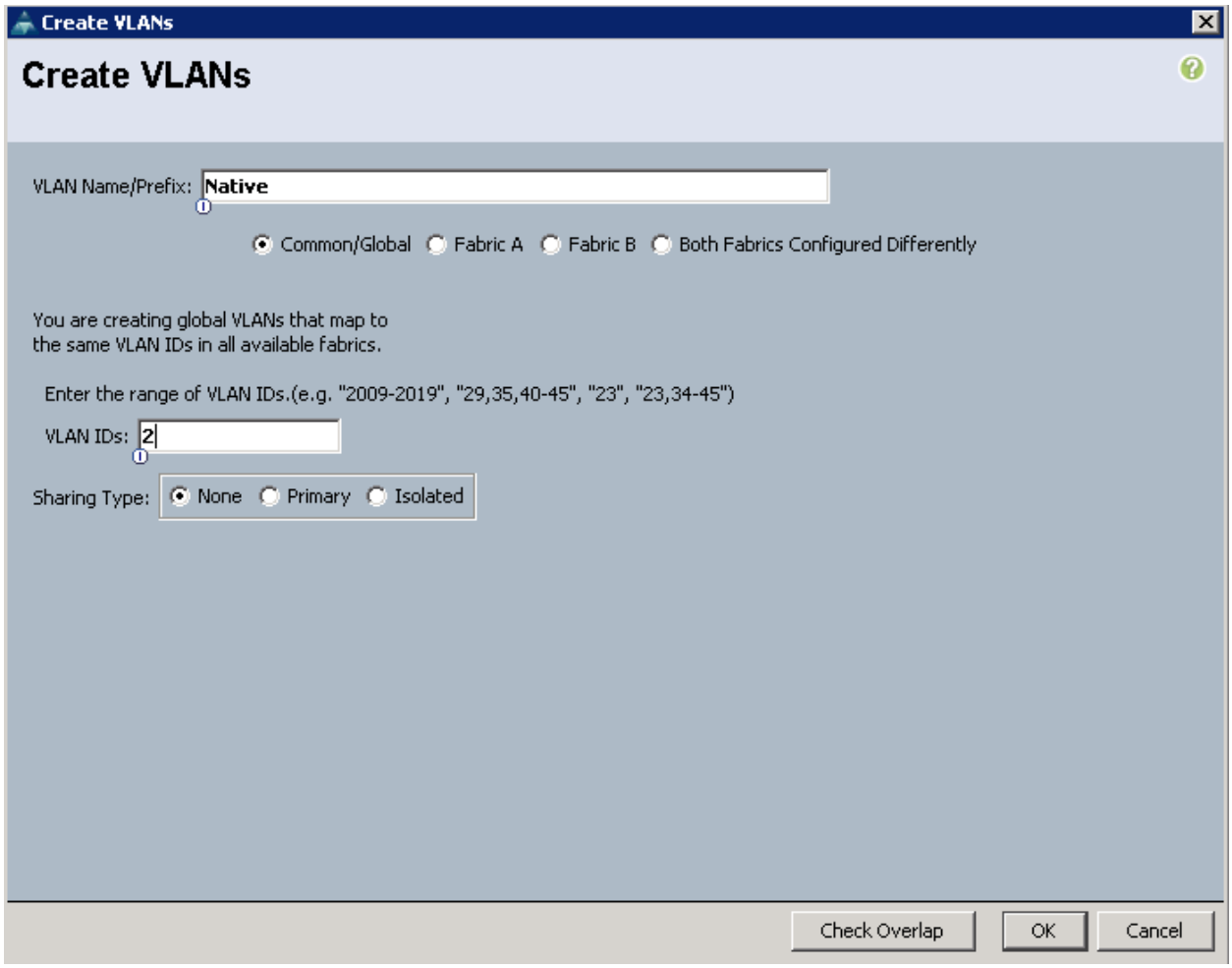
20. Right-click `VLANs`.
21. Select `Create VLANs`.
22. Enter `iSCSI-VLAN-B` as the name of the VLAN to be used for the second iSCSI VLAN.
23. Keep the `Common/Global` option selected for the scope of the VLAN.
24. Enter the VLAN ID for the second iSCSI VLAN.
25. Click `OK`.



26. Right-click `VLANs`.
27. Select `Create VLANs`.
28. Enter `Live Migration-VLAN` as the name of the VLAN to be used for the live migration VLAN.
29. Keep the `Common/Global` option selected for the scope of the VLAN.
30. Enter the VLAN ID for the live migration VLAN.
31. Click `OK`, then `OK`.
32. Right-click `VLANs`.
33. Select `Create VLANs`.
34. Enter `App-Cluster-Comm-VLAN` as the name of the VLAN to be used for the VM CLuster VLAN.
35. Keep the `Common/Global` option selected for the scope of the VLAN.
36. Enter the VLAN ID for the VM Cluster VLAN.
37. Click `OK`.



38. Right-click `VLANs`.
39. Select `Create VLANs`.
40. Enter VM-`Data-VLAN` as the name of the VLAN to be used for the VM data VLAN.
41. Keep the `Common/Global` option selected for the scope of the VLAN.
42. Enter the VLAN ID for the VM data VLAN.
43. Click `OK`.
44. Right-click `VLANs`.
45. Select `Create VLANs`.
46. Enter `Native-VLAN` as the name of the VLAN to be used for the Native VLAN.
47. Keep the `Common/Global` option selected for the scope of the VLAN.
48. Enter the VLAN ID for the Native VLAN.
49. Click `OK`.



50. In the list of VLANs in the left pane, right-click the newly created Native-VLAN and select `Set as Native VLAN`.
51. Click `Yes` and `OK`.

Create VSANs and SAN PortChannels

These steps provide details for configuring the necessary VSANs and SAN PortChannels for the Cisco UCS environment. By default, VSAN 1 is used created and can be used. Alternate VSANs can be created as necessary.

Cisco UCS Manager

1. Select the `SAN` tab at the top left of the window.
2. Expand the `SAN Cloud` tree.
3. Right-click `VSANs`.
4. Select `Create VSAN`.
5. Enter `VSAN_A` as the VSAN name for fabric A.
6. Keep the `Disabled` option selected for the Default Zoning
7. Select `Fabric A`.

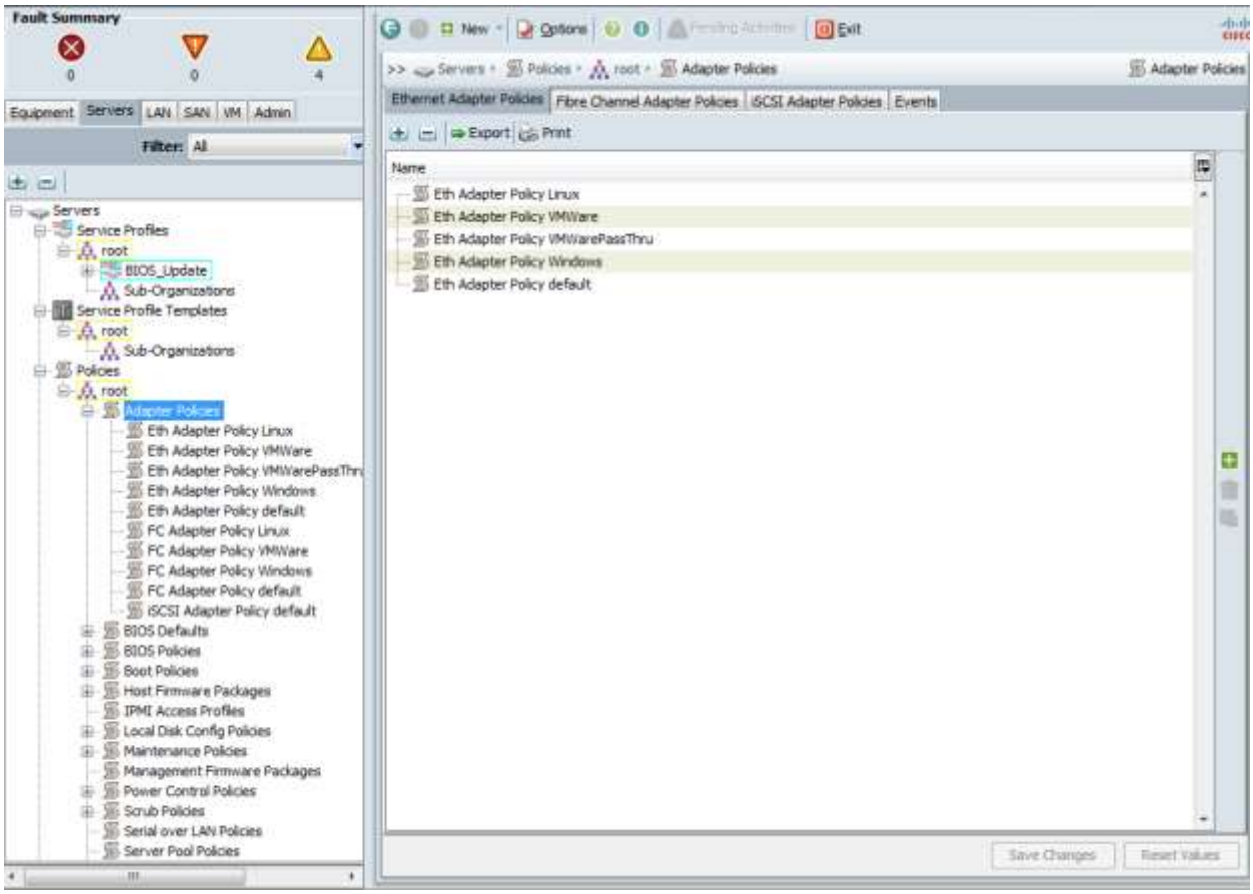
8. Enter the VSAN ID for fabric A.
9. Enter the FCoE VLAN ID for fabric A.
10. Click OK and then OK to create the VSAN.
11. Right-click VSANs.
12. Select Create VSAN.
13. Enter VSAN_B as the VSAN name for fabric B.
14. Keep the Disabled option selected for the Default Zoning
15. Select Fabric B.
16. Enter the VSAN ID for fabric B.
17. Enter the FCoE VLAN ID for fabric B.
18. Click OK and then OK to create the VSAN.
19. Under SAN Cloud, expand the Fabric A tree.
20. Right-click FC Port Channels
21. Select Create Port Channel.
22. Click Yes and then enter 1 for the PortChannel ID and SPo1 for the PortChannel name.
23. Click Next.
24. Select ports 31 and 32 and click >> to add the ports to the PortChannel.
25. Click Finish.
26. Select the Check box for Show navigator for FC Port-Channel 1 (Fabric A)
27. Click OK to complete creating the PortChannel.
28. In the VSAN pull-down under Properties select the vsan VSAN_A for fabric A.
29. Click Apply, then click OK.
30. Under Actions, click Enable Port Channel.
31. Click Yes and then OK to enable the Port Channel. This action also enables the two FC ports in the PortChannel.
32. Click OK to Close the Navigator.
33. Under SAN Cloud, expand the Fabric B tree.
34. Right-click FC Port Channels
35. Select Create Port Channel.
36. Click Yes, and then enter 2 for the PortChannel ID and SPo2 for the PortChannel name.
37. Click Next.
38. Select ports 31 and 32 and click >> to add the ports to the PortChannel.
39. Click Finish.
40. Select Check box for Show navigator for FC Port-Channel 1 (Fabric B)
41. Click OK to complete creating the PortChannel.
42. In the VSAN pull-down under Properties select VSAN_B for fabric B.
43. Click Apply, then click OK.
44. Under Actions, click Enable Port Channel.

45. Click `Yes`, then `OK` to enable the PortChannel. This action also enables the two FC ports in the PortChannel.
46. Click `OK` to Close the Navigator.

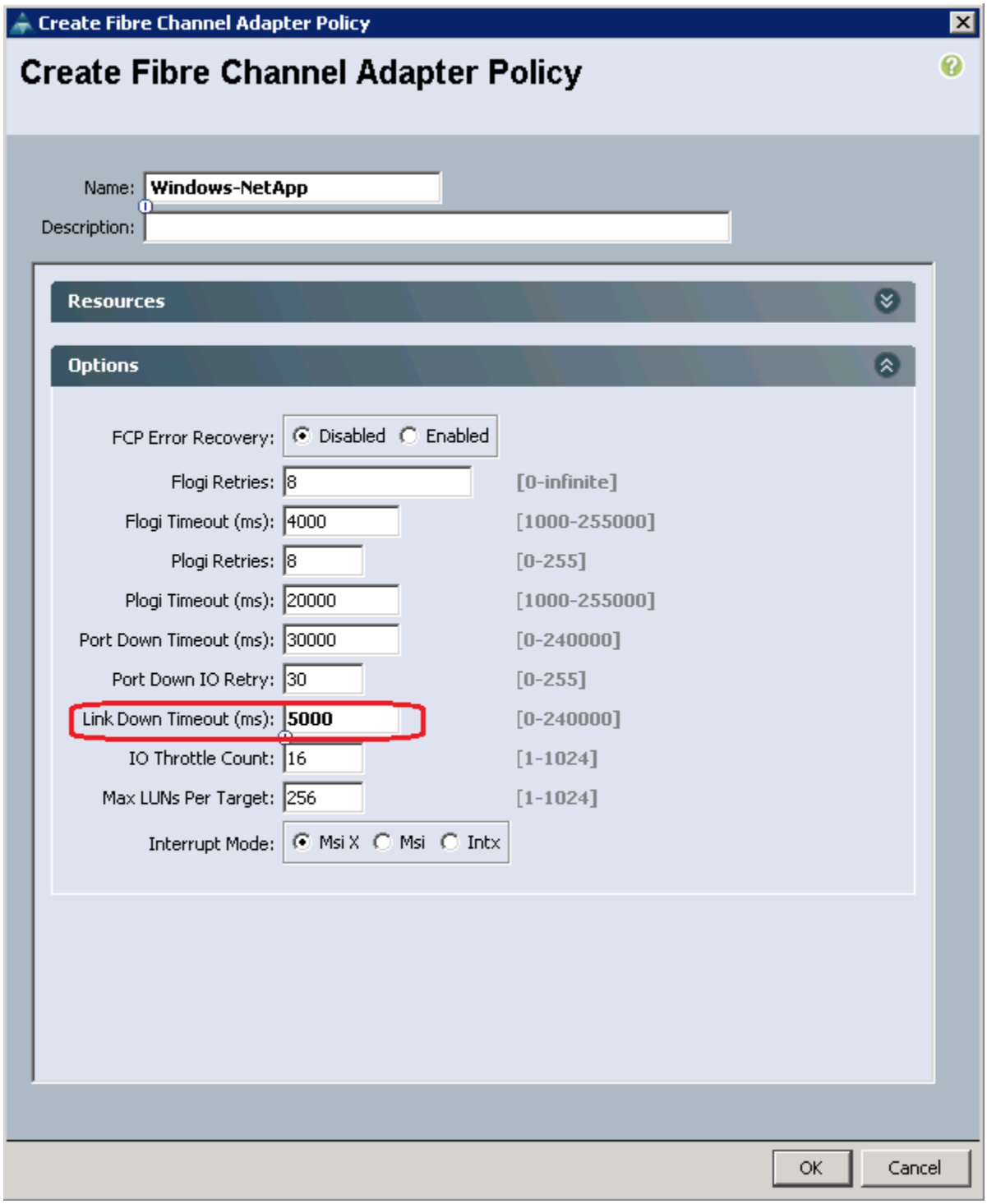
Create a FC Adapter Policy for NetApp Storage Arrays

These steps provide details for a FC adapter policy for NetApp storage arrays..

1. Select to the SAN tab at the top of the left window.
2. Go to `SAN > Policies > root`.
3. Right-click `Fibre Channel Adapter Policies` and click Create New Fibre Channel Adapter Policy.



4. Use `Windows-NetApp` as the name of the Fibre Channel Adapter Policy.
5. The default values are appropriate for most configurable items. Expand the `Options` dropdown. and set the `Link Down Timeout (MS)` option to `5000`.
6. Click `OK` to complete creating the FC adapter policy
7. Click `OK`.

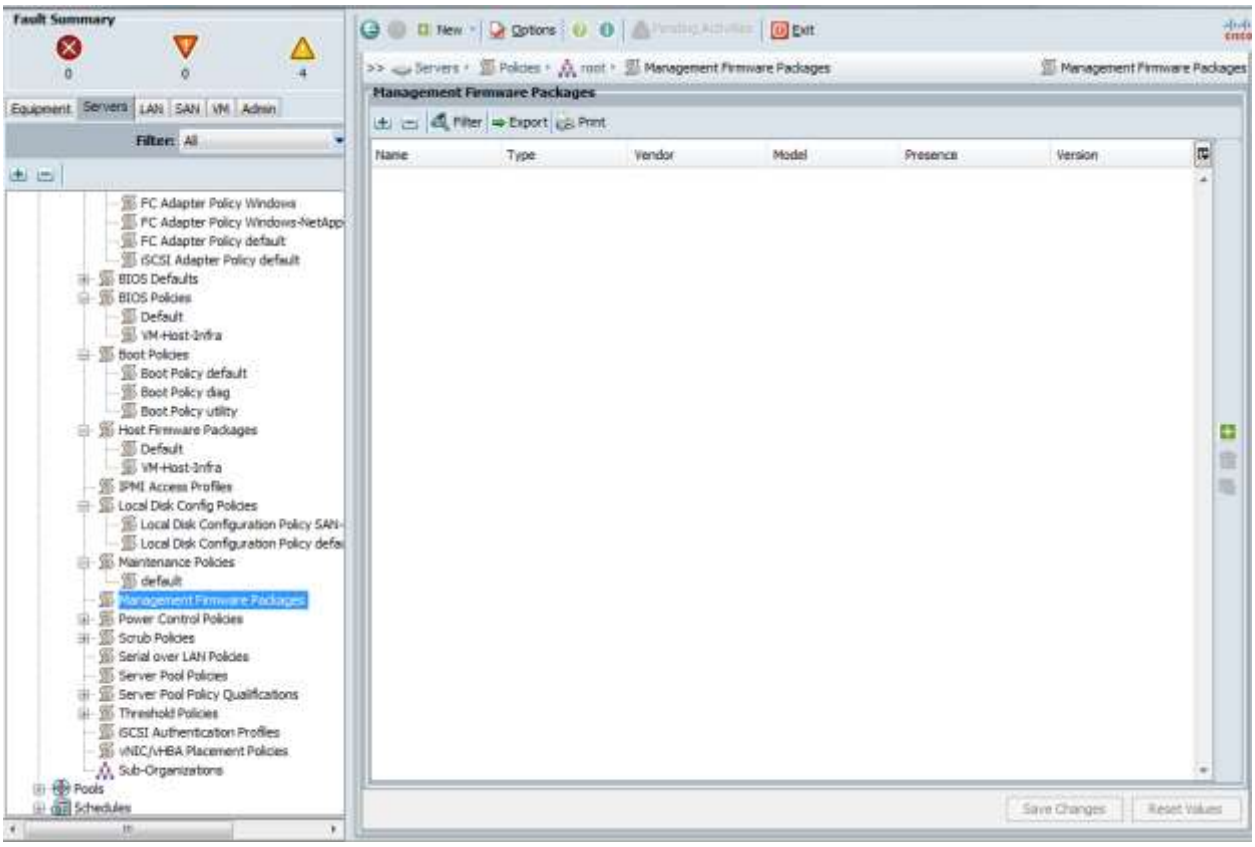


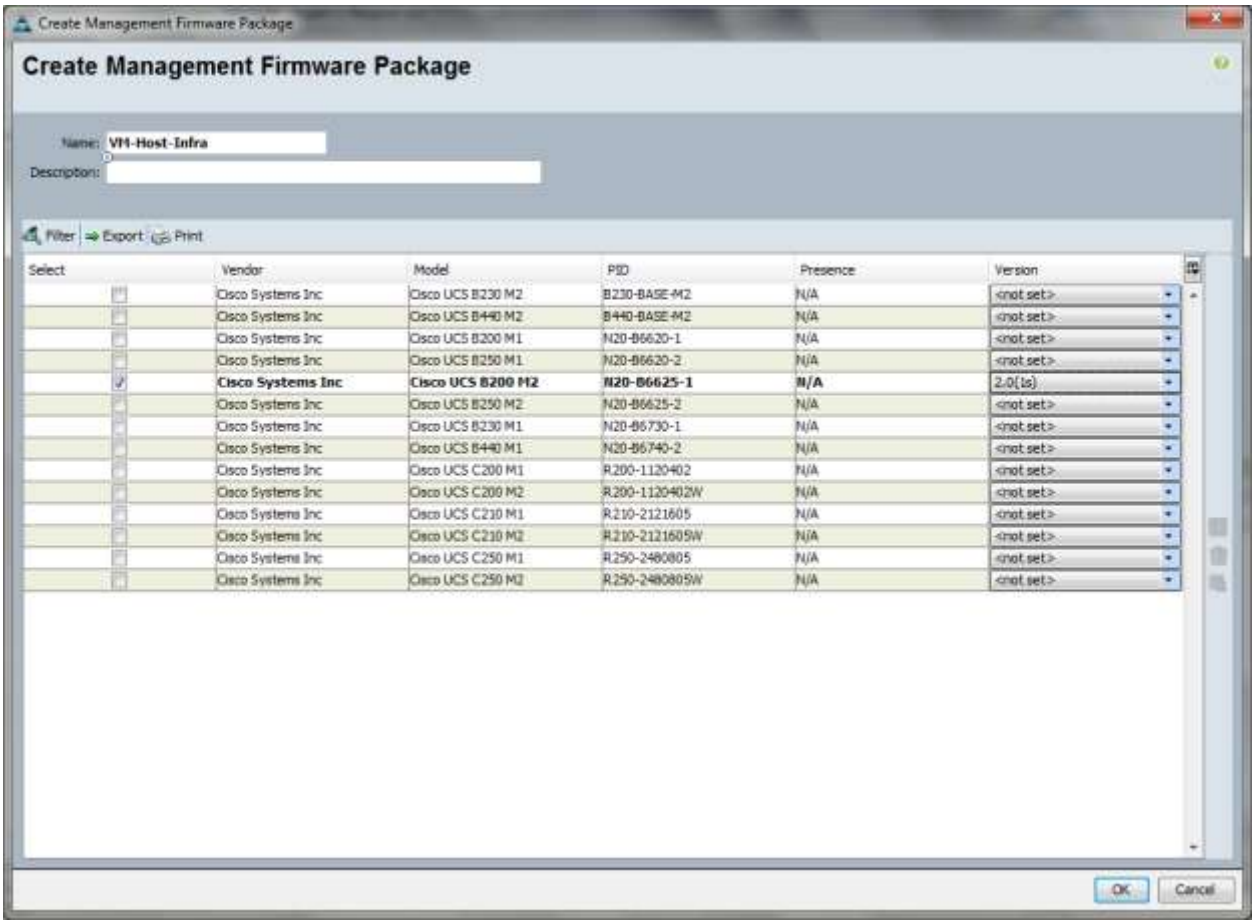
Create a Firmware Management Package

These steps provide details for a firmware management policy for n the Cisco UCS environment.

Cisco UCS Manager

1. Select the `Servers` tab at the top left of the window.
2. Select `Policies > root`.
3. Right Click `Management Firmware Packages`
4. Select `create Management Firmware Package`.
5. Enter `VM-Host-Infra` as the management firmware package name.
6. Select the appropriate packages and versions of the Server Management Firmware For servers that you have.
7. Click `OK` to complete creating the management firmware package.
8. Click `OK`.



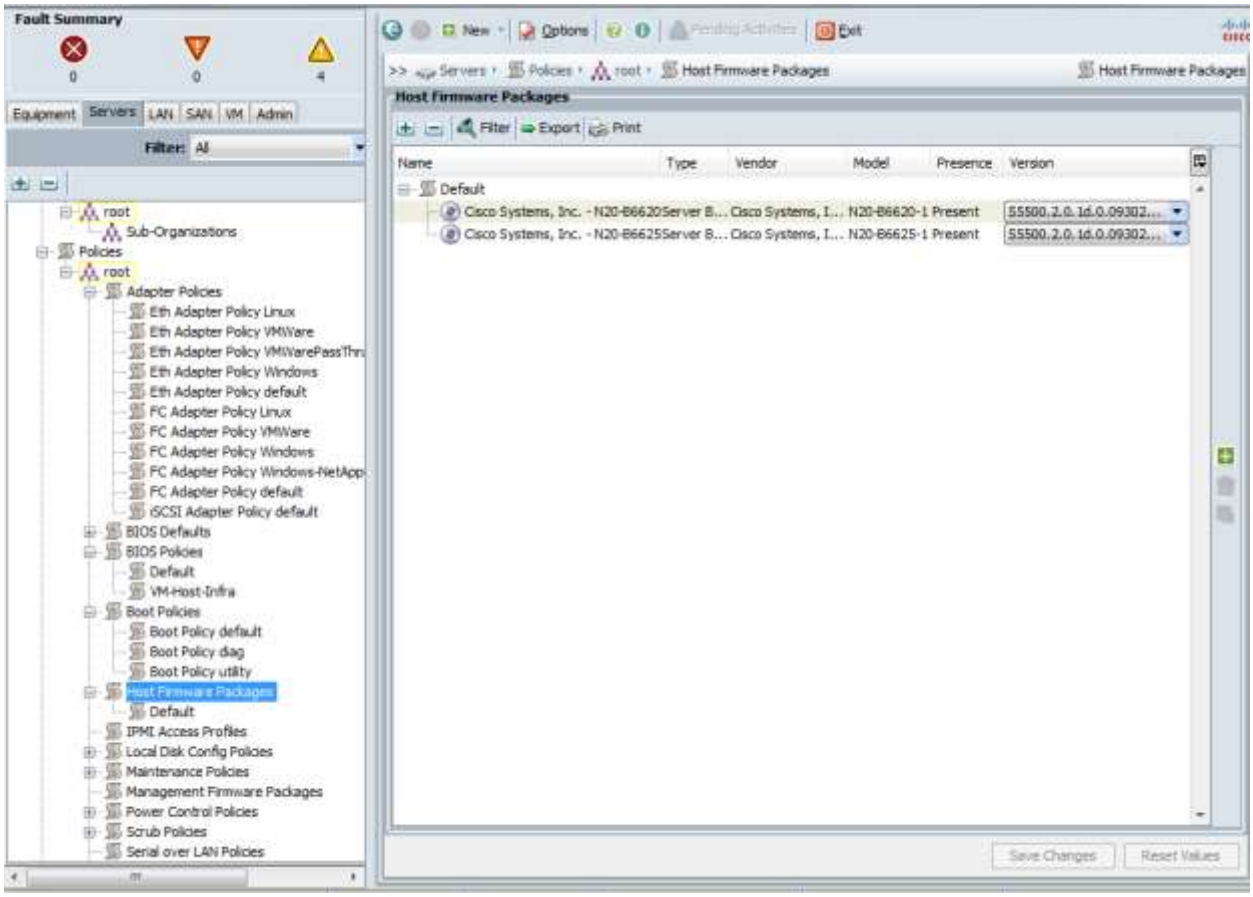


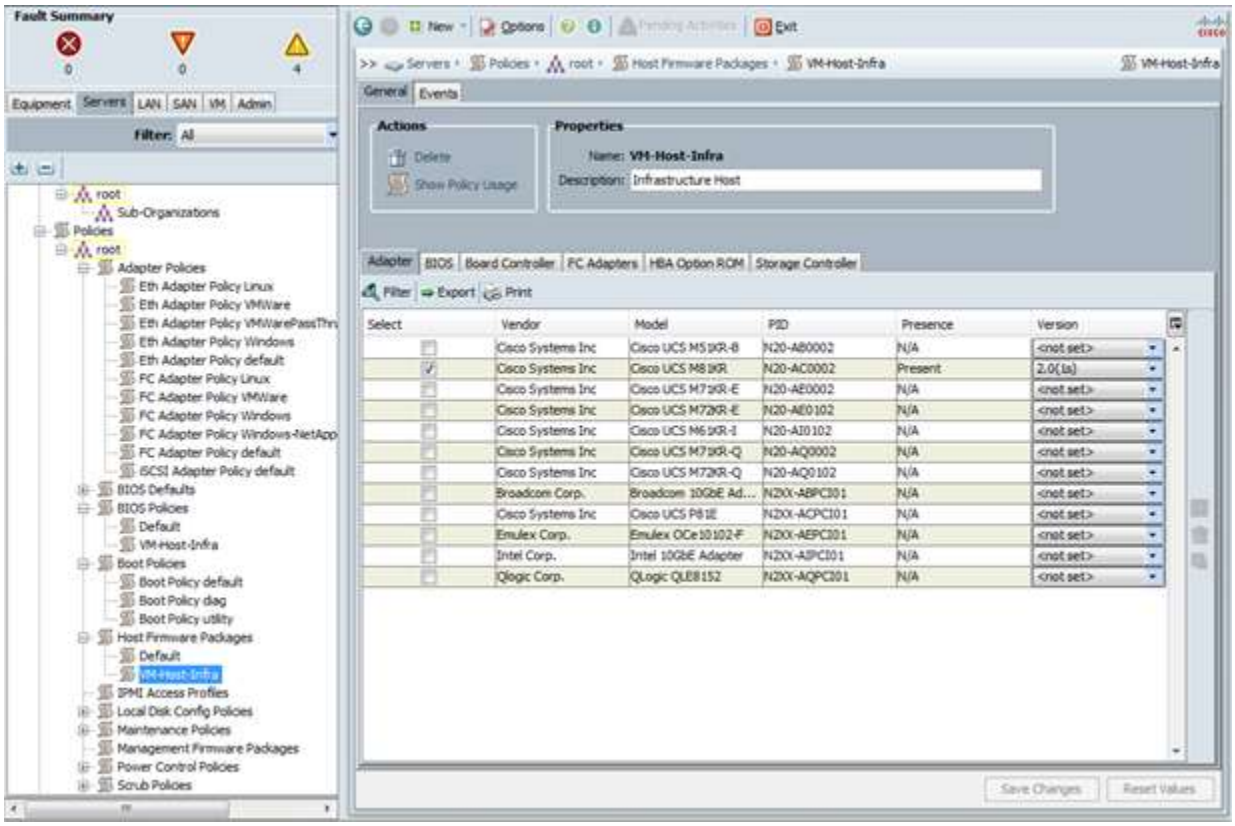
Create Firmware Package Policy

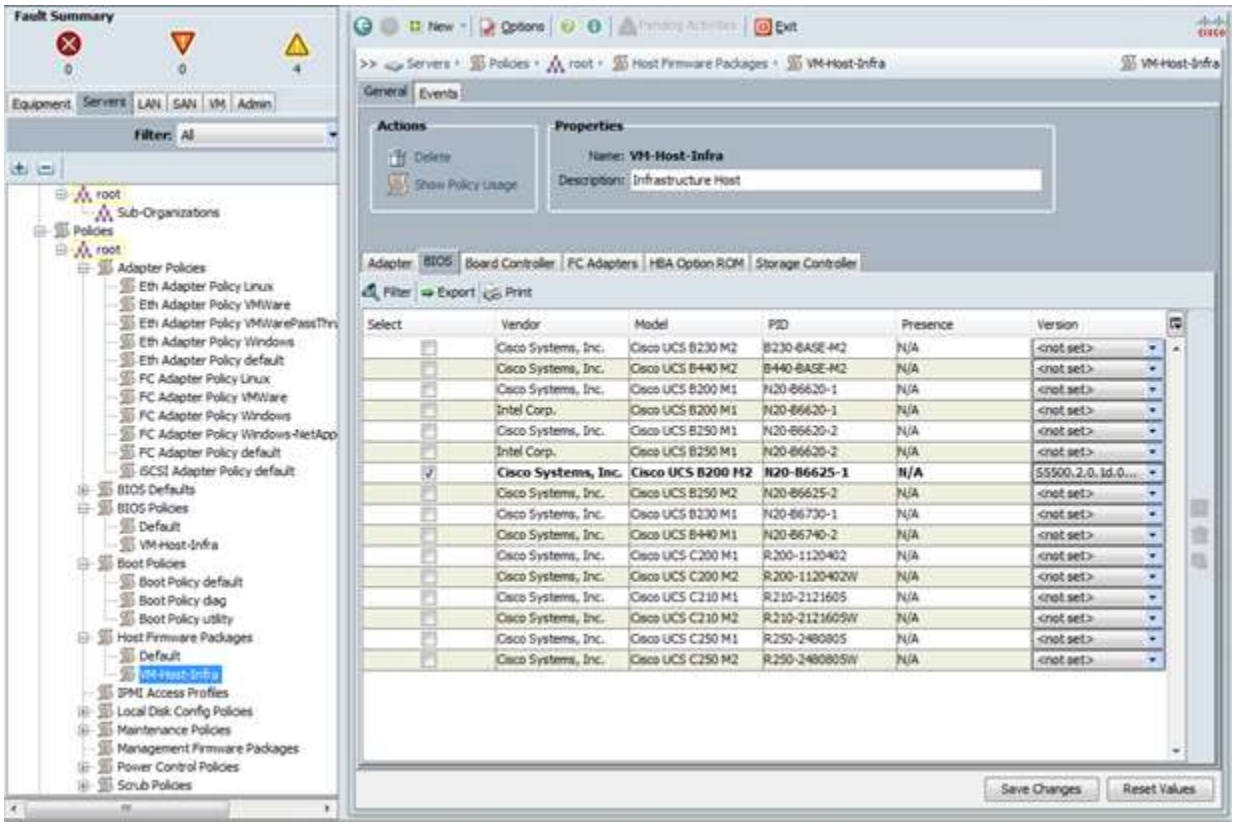
These steps provide details for creating a firmware management policy for a given server configuration in the Cisco UCS environment. Firmware management policies allow the administrator to select the corresponding packages for a given server configuration. These often include adapter, BIOS, board controller, FC adapters, HBA option ROM, and storage controller properties.

Cisco UCS Manager

1. Select the `Servers` tab at the top left of the window.
2. Select `Policies > root`.
3. Right Click `Host Firmware Packages`.
4. Select `Create Host Firmware Package`.
5. Enter the name of the host firmware package for the corresponding server configuration.
6. Navigate the tabs of the `Create Host Firmware Package` Navigator and select the appropriate packages and versions for the server configuration.
7. Click `OK` to complete creating the host firmware package.
8. Click `OK`.







Set Jumbo Frames and Enable Quality of Service in Cisco UCS Fabric

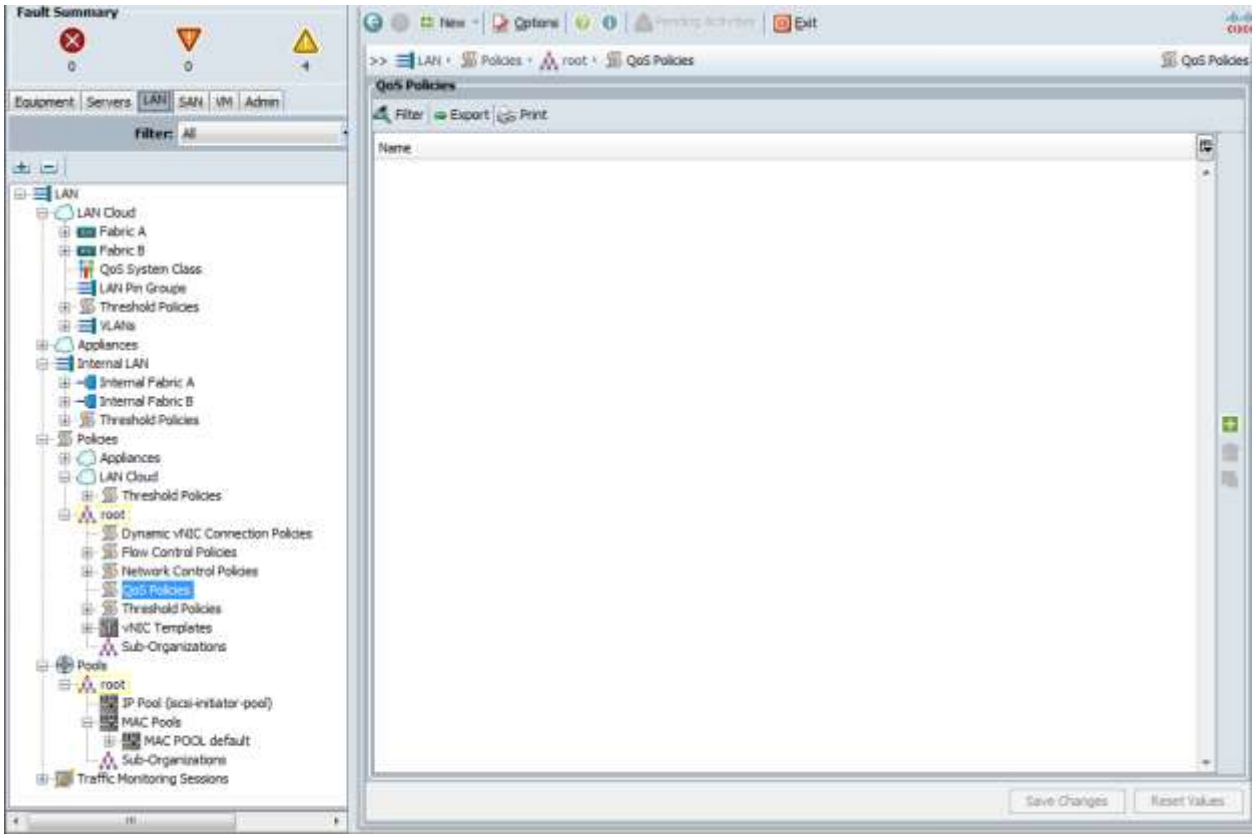
These steps provide details for setting Jumbo frames and enabling the quality of server in the Cisco UCS Fabric.

Cisco UCS Manager

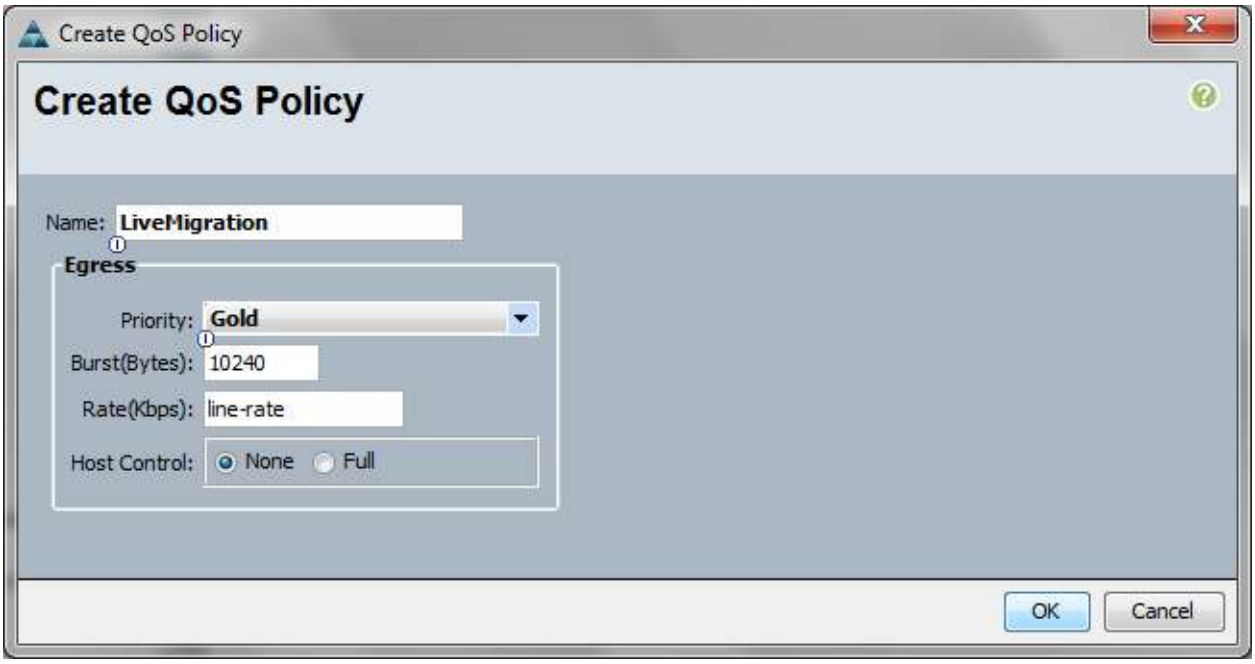
1. Select the `LAN` tab at the top left of the window.
2. Go to `LAN Cloud > QoS System Class`.
3. In the right pane, click the `General` tab
4. On the `Gold and Silver Priority, and Best Efforts row`, type `9000` in the `MTU` boxes.
5. Click `Save Changes` in the bottom right corner.
6. Click `OK` to continue.

7. Select the `LAN` tab on the left of the window.

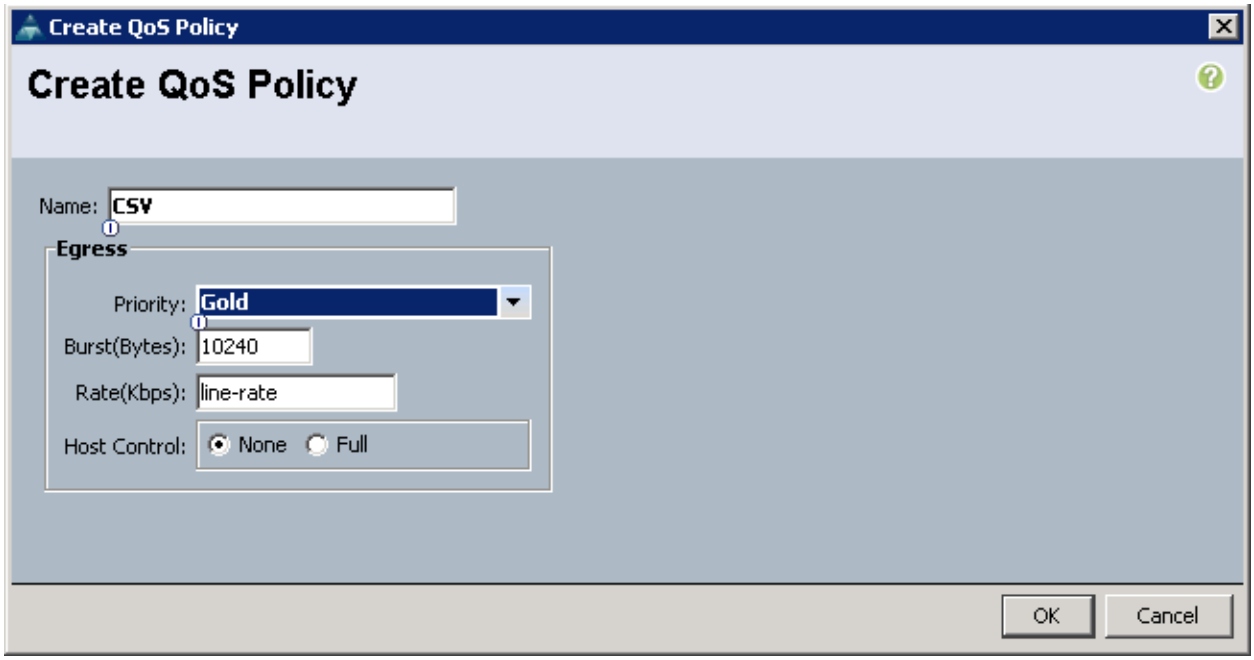
8. Go to `LAN > Policies > Root >`



9. Right-click `QoS Policies`.
10. Select `Create QoS Policy`.
11. Enter `LiveMigration` as the QoS Policy name.
12. Change the `Priority` to `Gold`. Leave `Burst(Bytes)` set to `10240`. Leave `Rate(Kbps)` set to `line-rate`. Leave `Host Control` set to `None`.
13. Click `OK` in the bottom right corner.

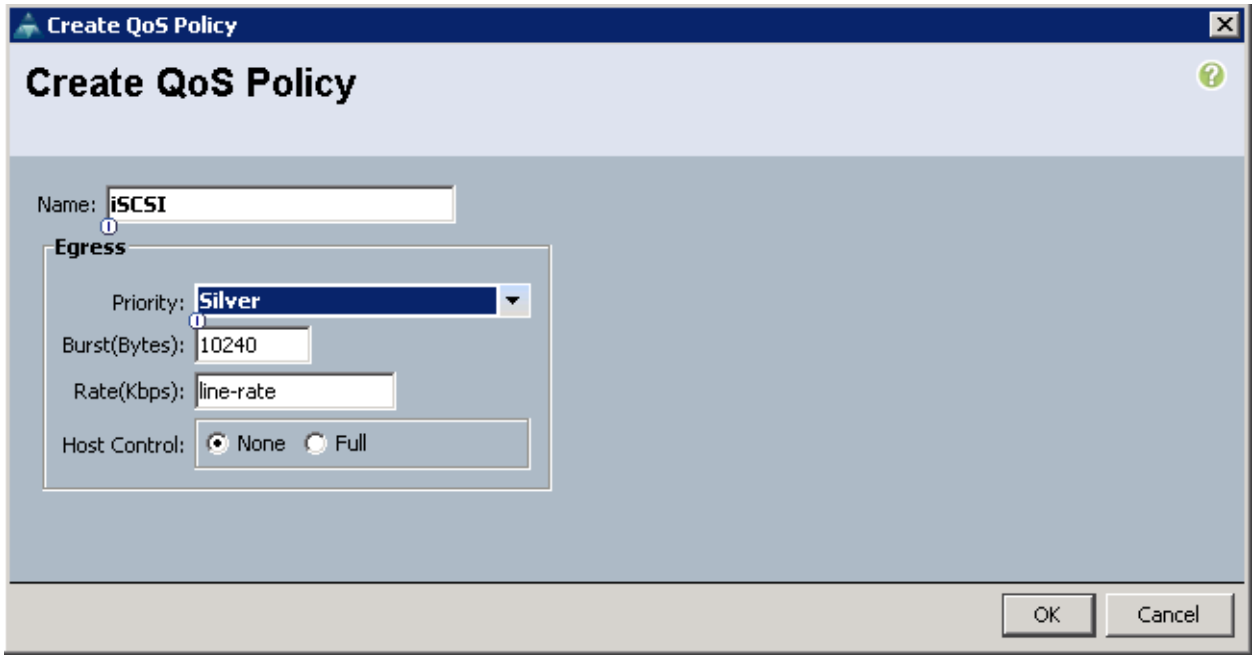


14. Right-click `QoS Policies`.
15. Select `Create QoS Policy`.
16. Enter `CSV` as the QoS Policy name.
17. Change the `Priority` to `Gold`. Leave `Burst(Bytes)` set to `10240`. Leave `Rate(Kbps)` set to `line-rate`. Leave `Host Control` set to `None`.
18. Click `OK` in the bottom right corner.



19. Right-click `QoS Policies`.

20. Select `Create QoS Policy`.
21. Enter `iSCSI` as the QoS Policy name.
22. Change the `Priority` to `Silver`. Leave `Burst(Bytes)` set to `10240`. Leave `Rate(Kbps)` set to `line-rate`. Leave `Host Control` set to `None`.
23. Click `OK` in the bottom right corner.

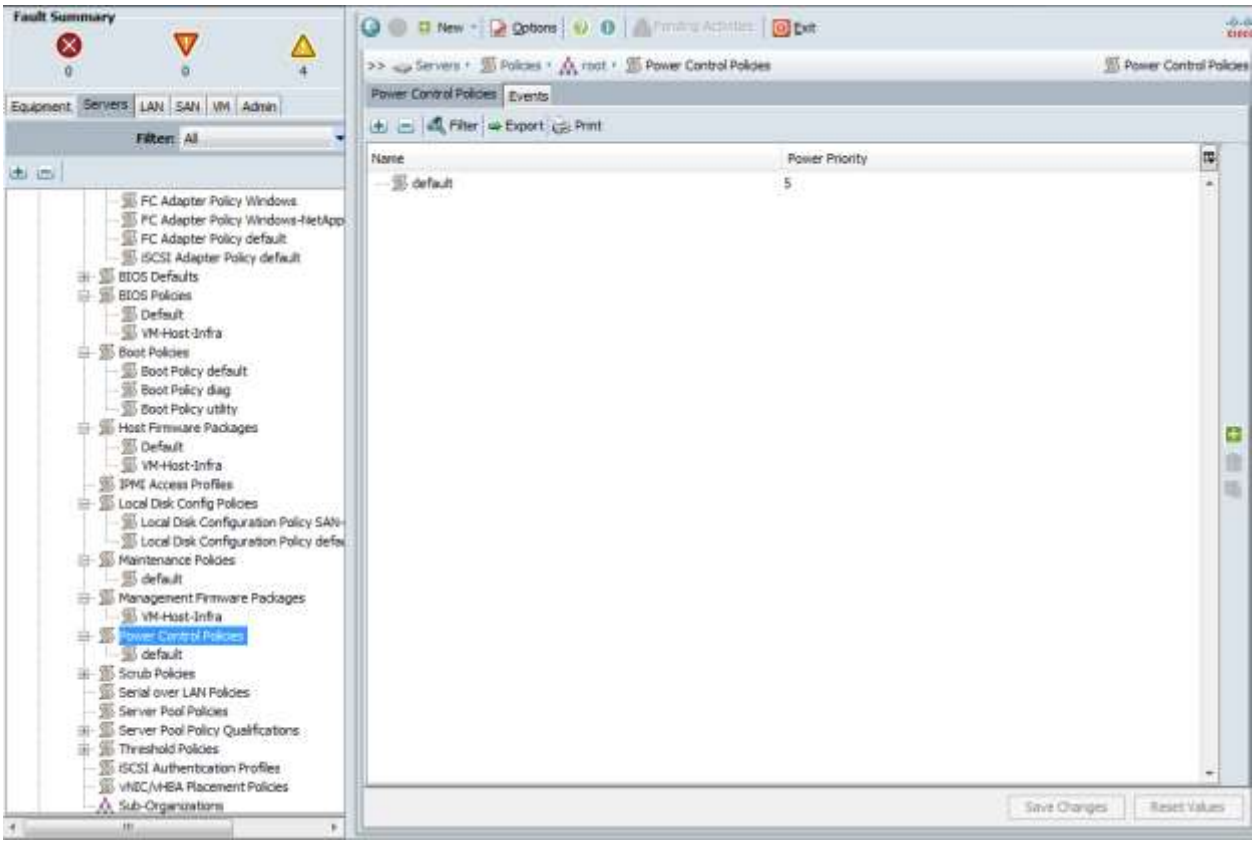


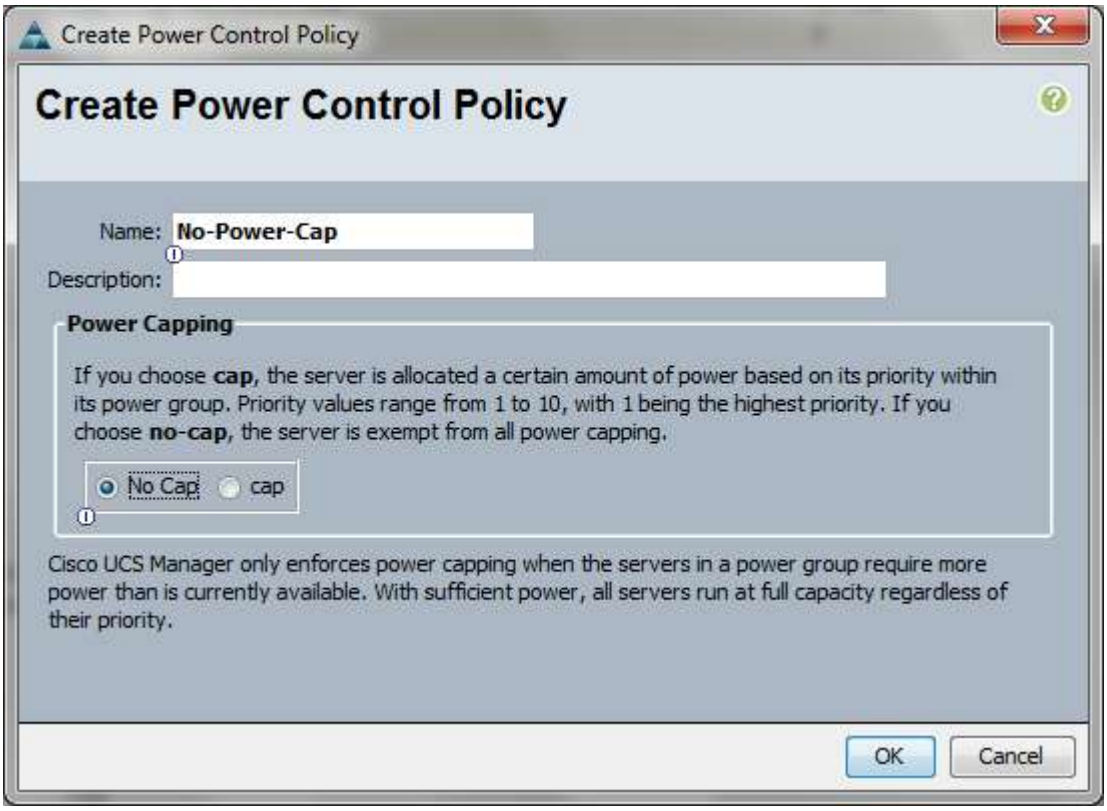
Create a Power Control Policy

These steps provide details for creating a Power Control Policy for the Cisco UCS environment.

Cisco UCS Manager

1. Select the `Servers` tab at the top left of the window.
2. Go to `Policies > root`.
3. Right-click `Power Controller Policies`.
4. Select `Create Power Control Policy`.
5. Enter `No-Power-Cap` as the power control policy name.
6. Change the `Power Capping` to `No Cap`.
7. Click `OK` to complete creating the host firmware package.
8. Click `OK`.





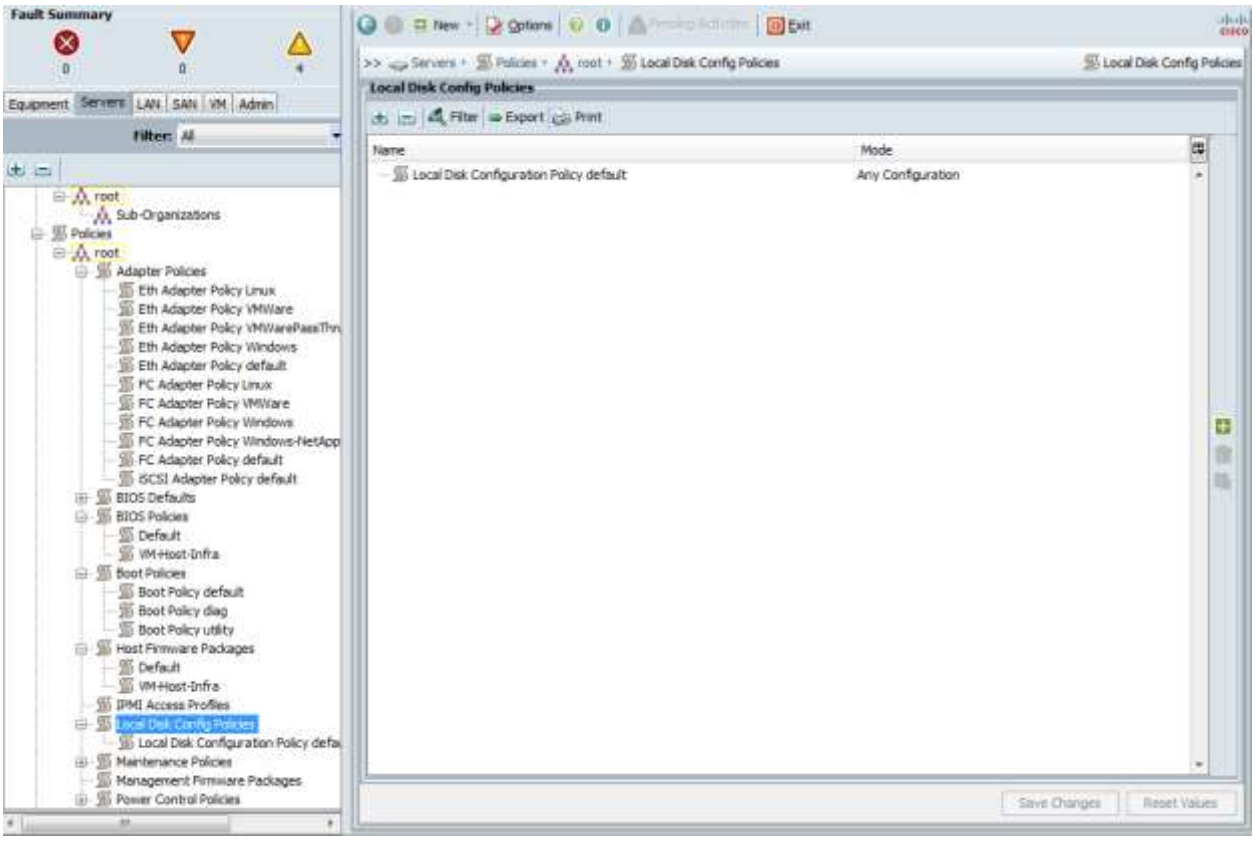
Create a Local Disk Configuration Policy

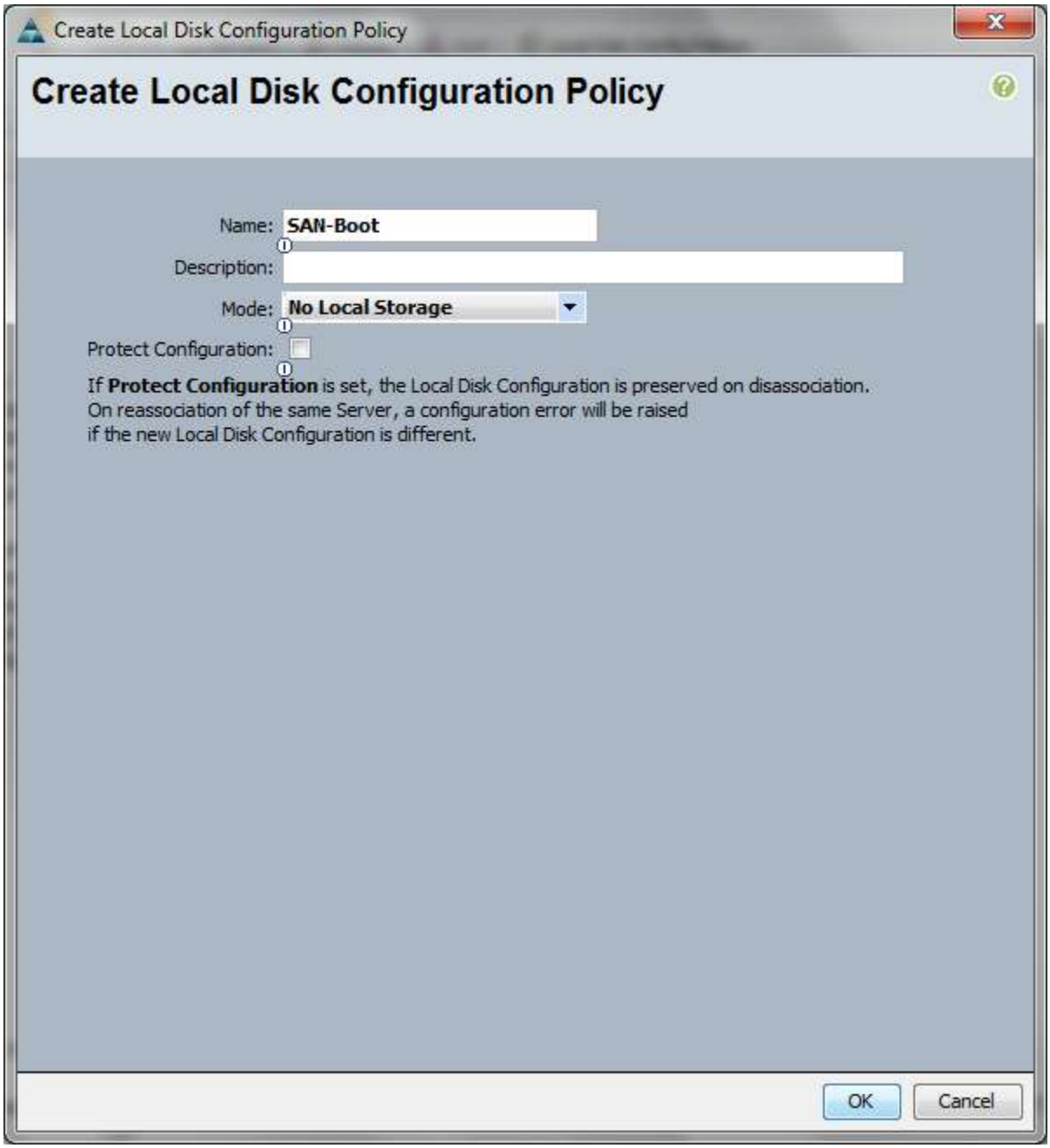
These steps provide details for creating a local disk configuration for the Cisco UCS environment, which is necessary if the servers in question do not have a local disk.

Note: This policy should not be used on blades that contain local disks.

Cisco UCS Manager

1. Select the `Servers` tab on the left of the window.
2. Go to `Policies > root.`
3. Right-click `Local Disk Config Policies.`
4. Select `Create Local Disk Configuration Policy.`
5. Enter `SAN Boot` as the local disk configuration policy name.
6. Change the `Mode` to `No Local Storage.` Uncheck the `Protect Configuration` box.
7. Click `OK` to complete creating the host firmware package.
8. Click `OK.`





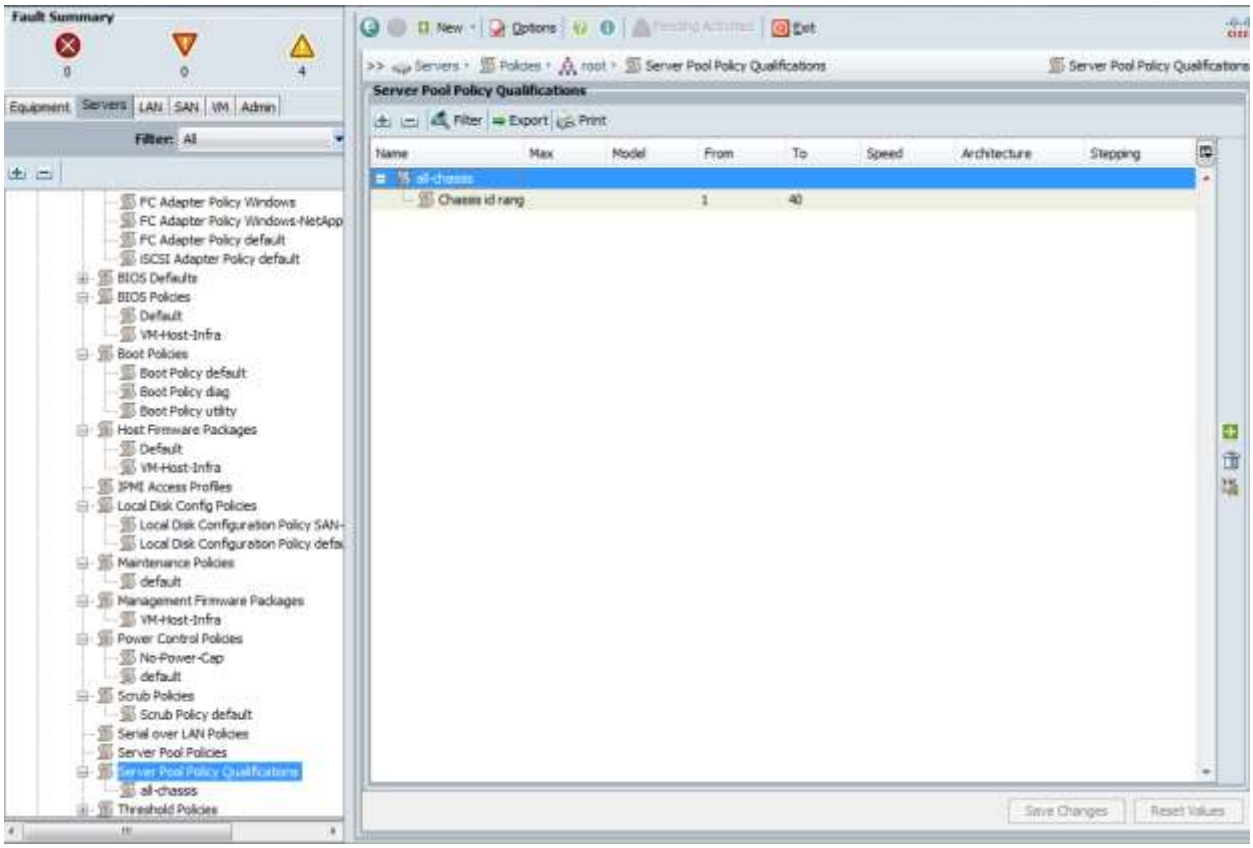
Create a Server Pool Qualification Policy

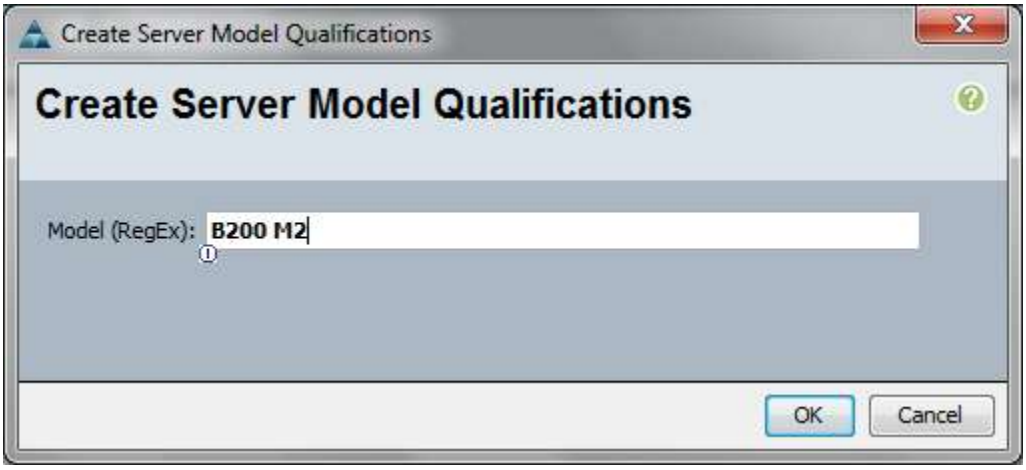
These steps provide details for creating a server pool qualification policy for the Cisco UCS environment.

Cisco UCS Manager

1. Select the `Servers` tab on the left of the window.
2. Go to `Policies > root`.
3. Right-click `Server Pool Qualification Policies`.

4. Select `Create Server Pool Policy Qualification`.
5. Select `Server Model Qualifications`.
6. Enter `B200 M2` as the Model(RegEx).
7. Click `OK` to complete creating the host firmware package.
8. Click `OK`.



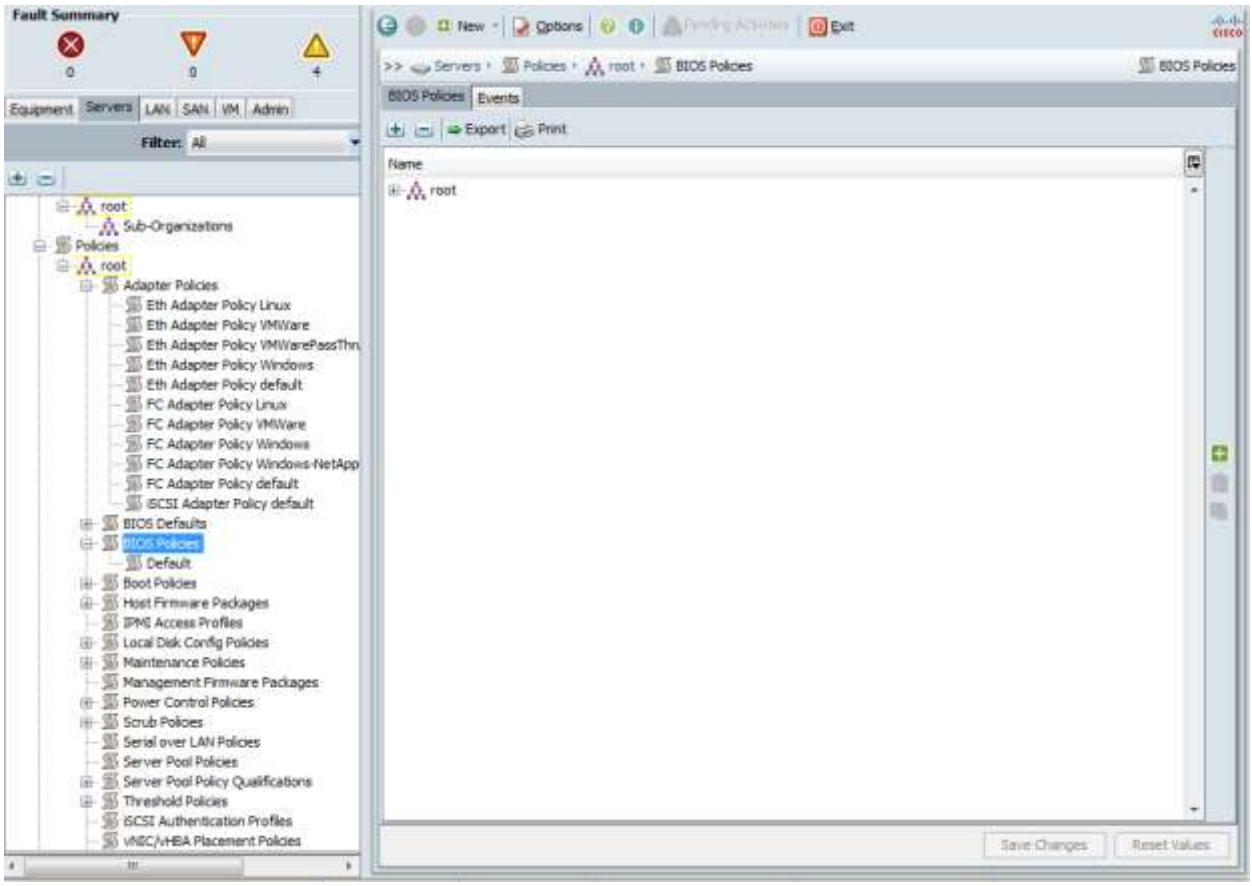


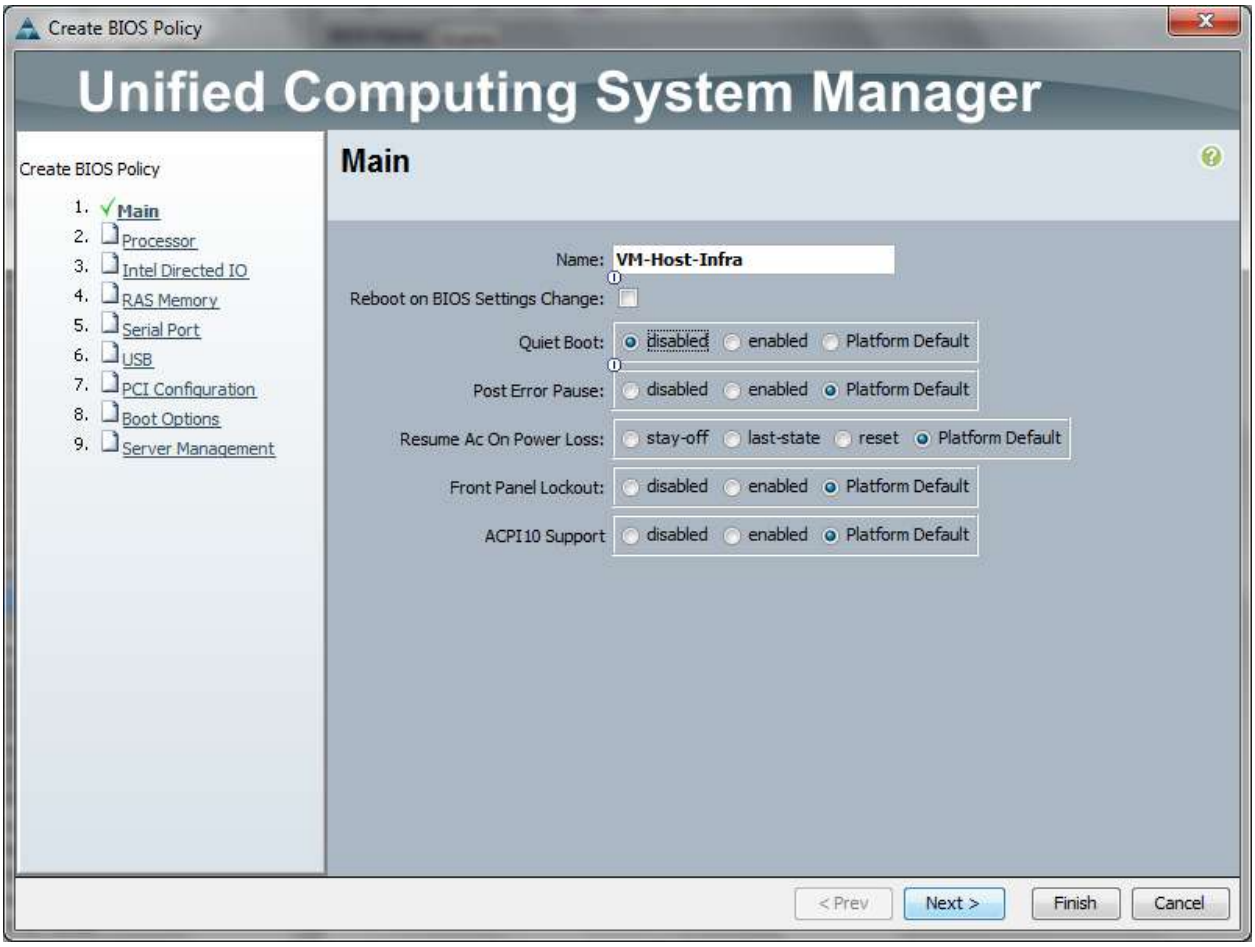
Create a Server BIOS Policy

These steps provide details for creating a server BIOS policy for the Cisco UCS environment.

Cisco UCS Manager

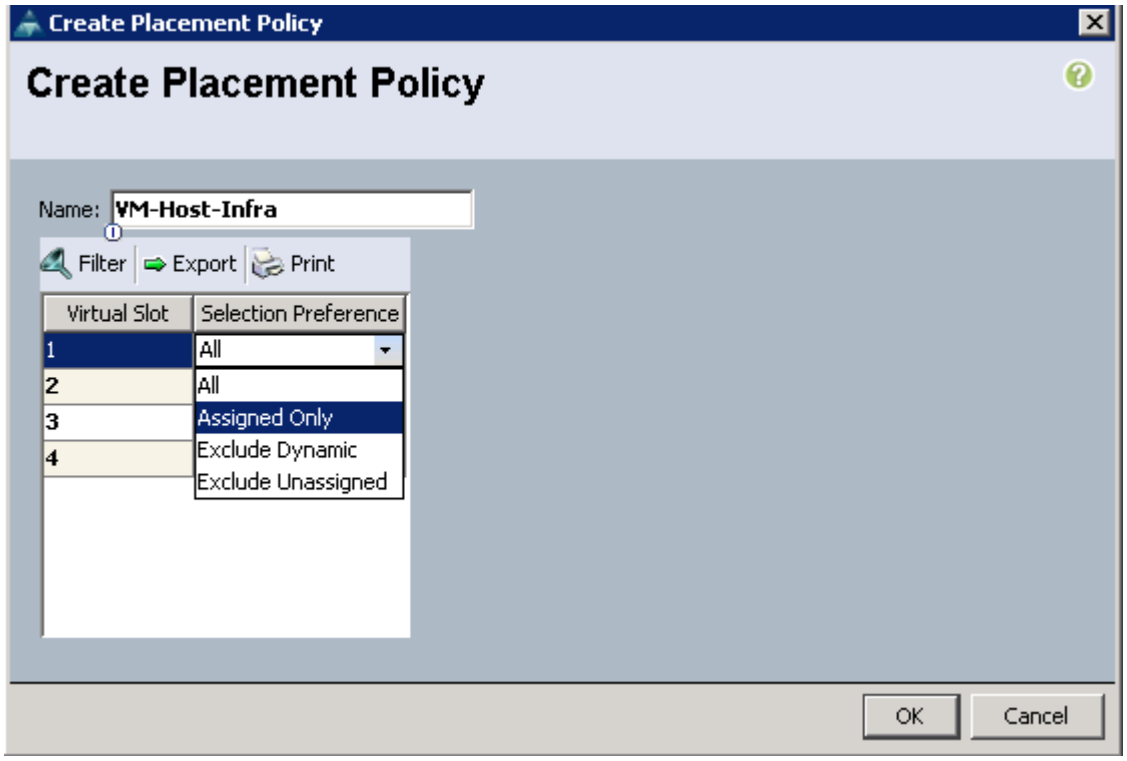
1. Select the `Servers` tab on the left of the window.
2. Go to `Policies > root`.
3. Right-click `BIOS Policies`.
4. Select `Create BIOS Policy`.
5. Enter `VM-Host-Infra` as the BIOS policy name.
6. Change the Quiet Boot property to `Disabled`.
7. Click `Finish` to complete creating the BIOS policy.
8. Click `OK`.





Create vNIC/HBA Placement Policy for Virtual Machine Infrastructure Hosts

1. Right-click vNIC/HBA Placement policy and select `create`.
2. Enter the name `VM-Host-Infra`.
3. Click `1` and select `Assign Only`.
4. Click `OK`.

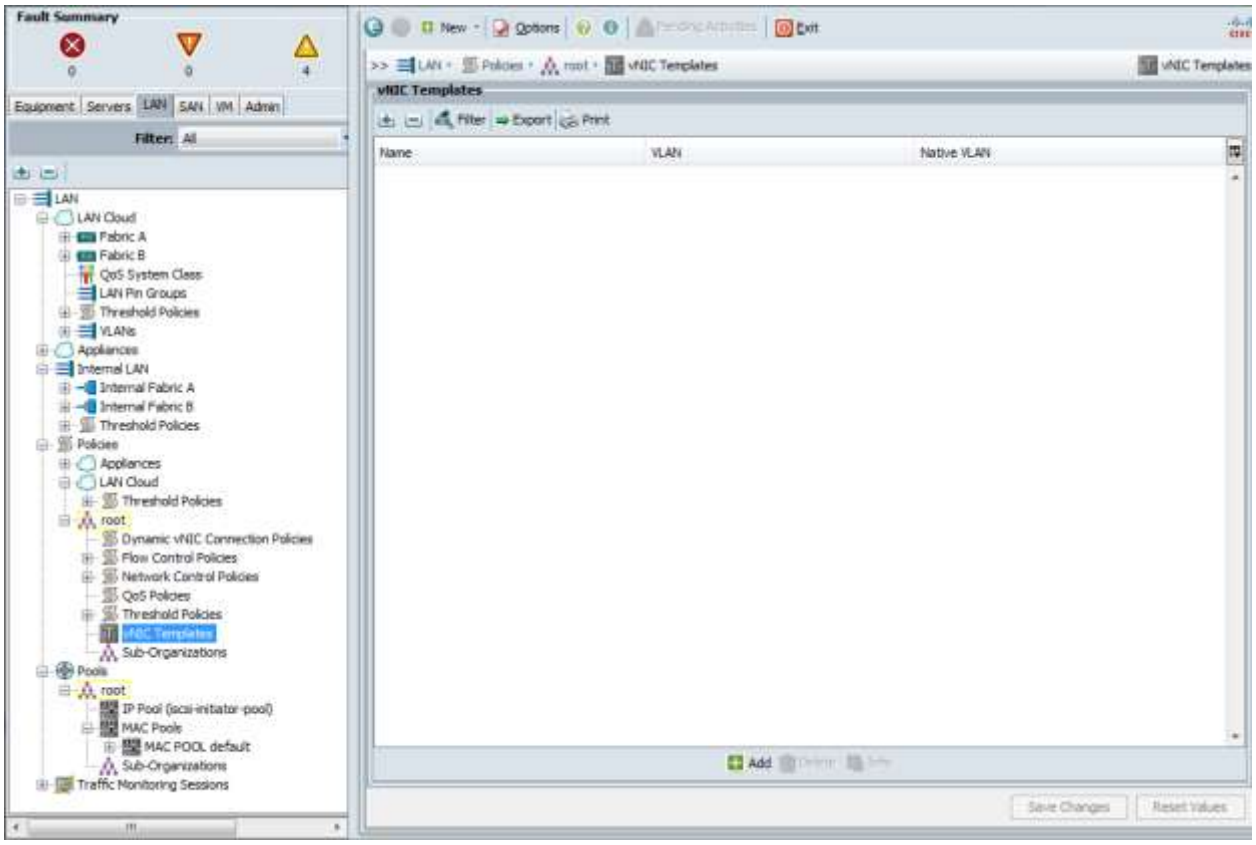


Create a vNIC Template

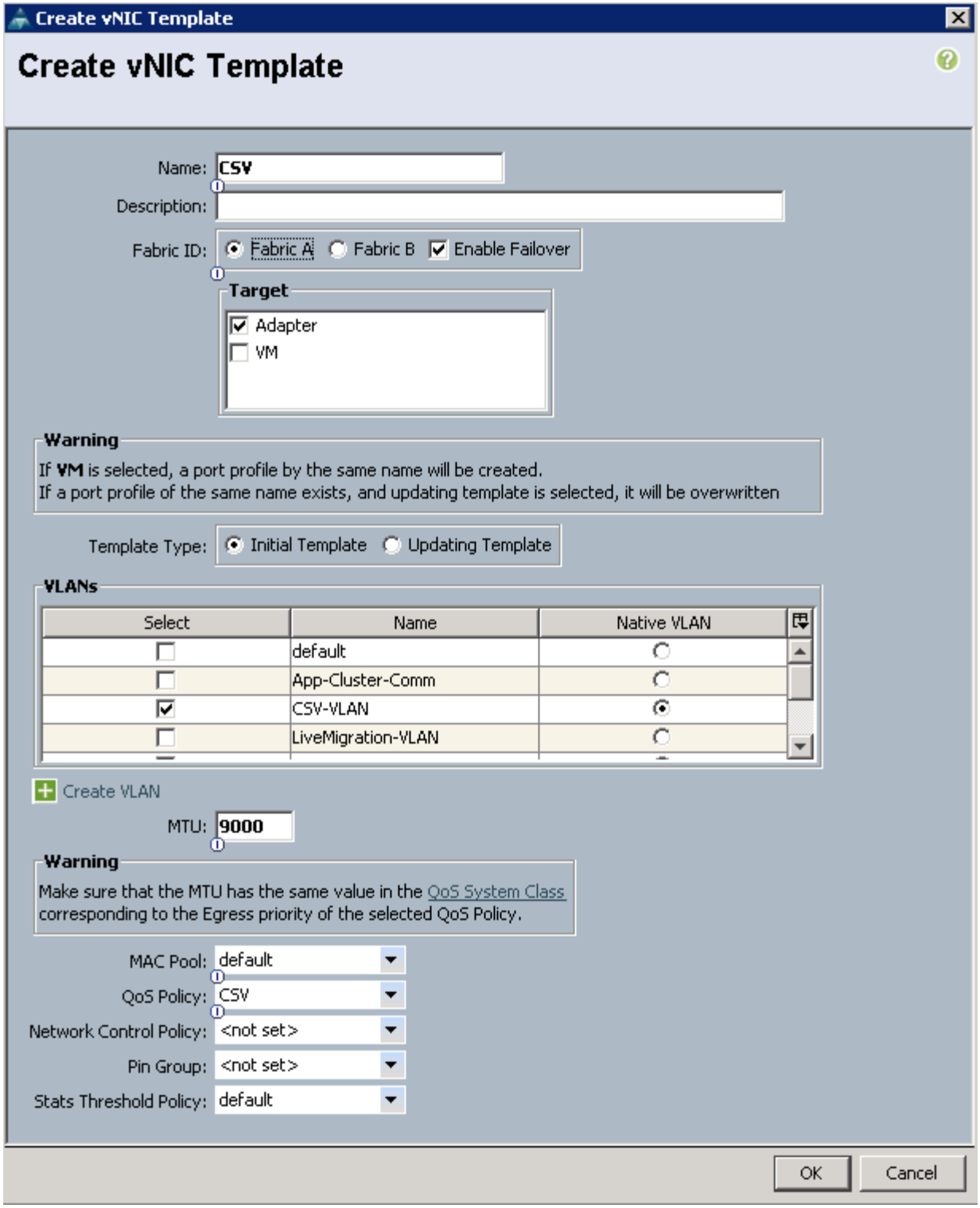
These steps provide details for creating multiple vNIC templates for the Cisco UCS environment.

Cisco UCS Manager

1. Select the `LAN` tab on the left of the window.
2. Go to `Policies > root.`
3. Right-click `vNIC Templates.`

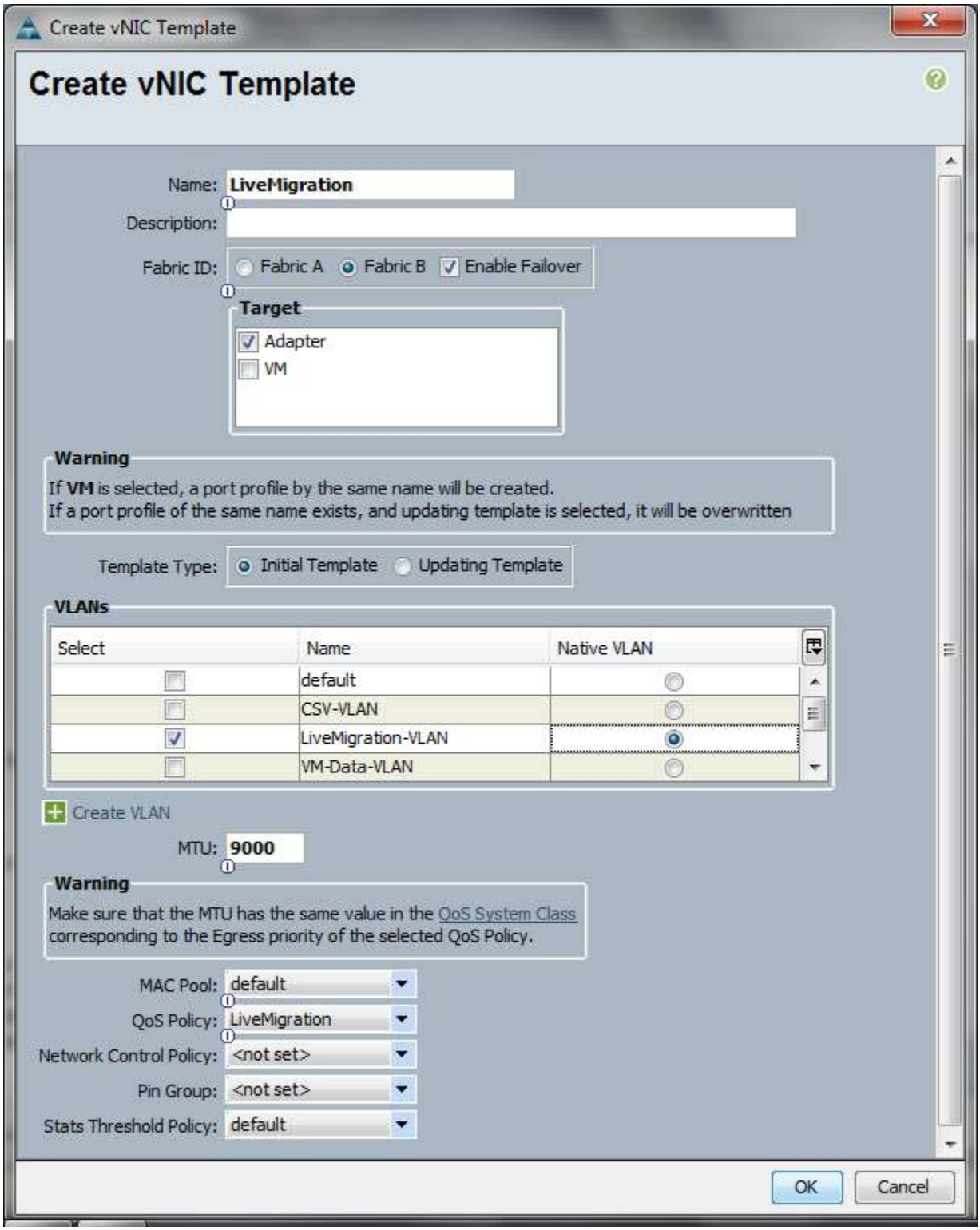


4. Select `Create vNIC Template.`
5. Enter `CSV` as the vNIC template name.
6. Leave `Fabric A` checked. Check the `Enable Failover` box. Under target, unselect the `VM` box. Select `Updating Template` as the `Template Type.` Under `VLANs,` select `CSV VLAN` and set as `Native VLAN. Under MTU, enter 9000.` Under `MAC Pool:,` select `default. Under QOS Policy: select CSV.`
7. Click `OK` to complete creating the vNIC template.
8. Click `OK.`



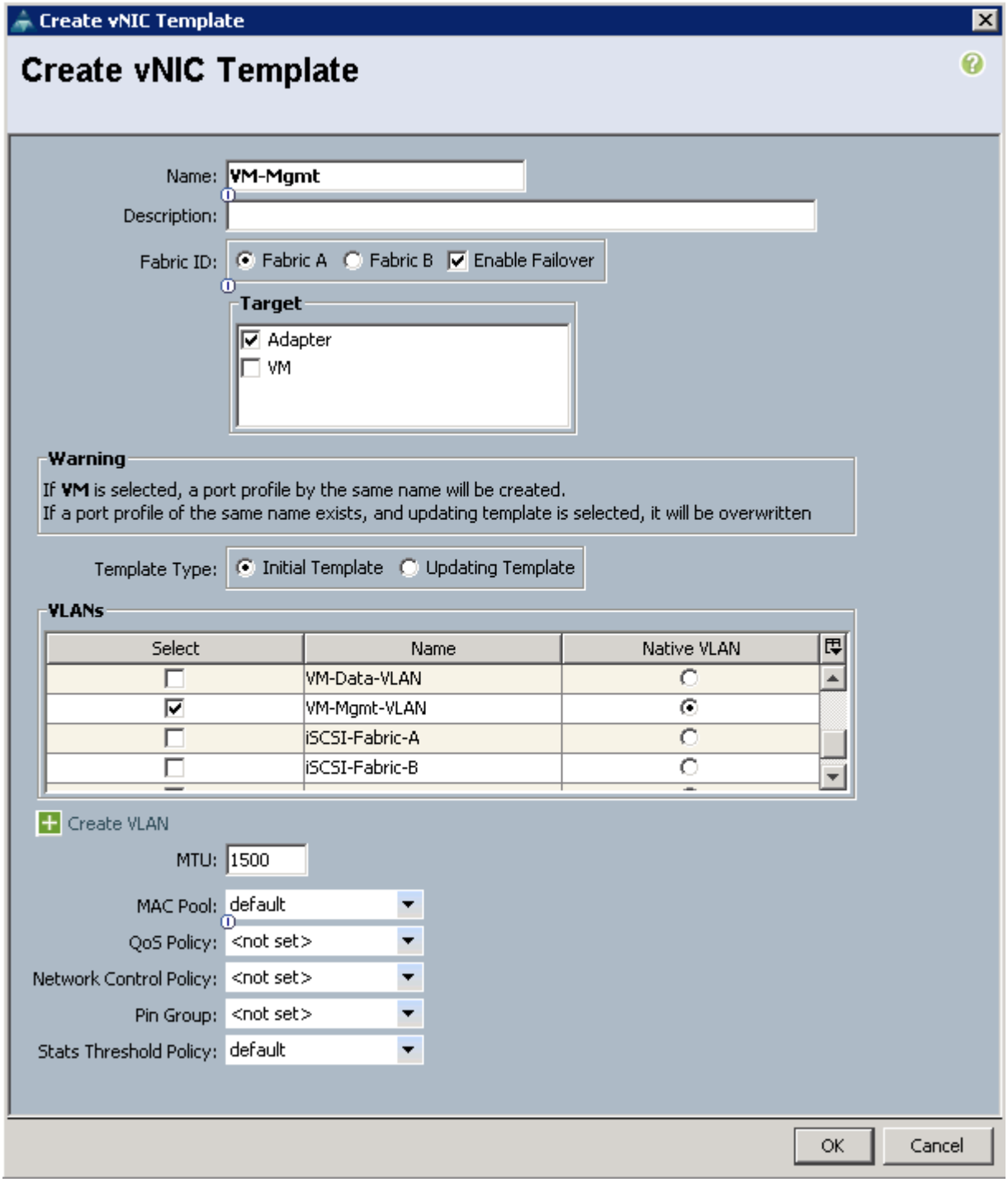
9. Select the `LAN` tab on the left of the window.
10. Go to `Policies > root`.
11. Right-click `vNIC Templates`.

12. Select Create vNIC Template.
13. Enter LiveMigration as the vNIC template name.
14. Check Fabric B. Check the Enable Failover box. Under target, unselect the VM box. Select Updating Template as the Template Type. Under VLANs, select Live-Migration-VLAN and set as Native VLAN. Under MTU, enter 9000. Under MAC Pool:, select Default. Under QoS Policy, select Live-Migration.
15. Click OK to complete creating the vNIC template.
16. Click OK.



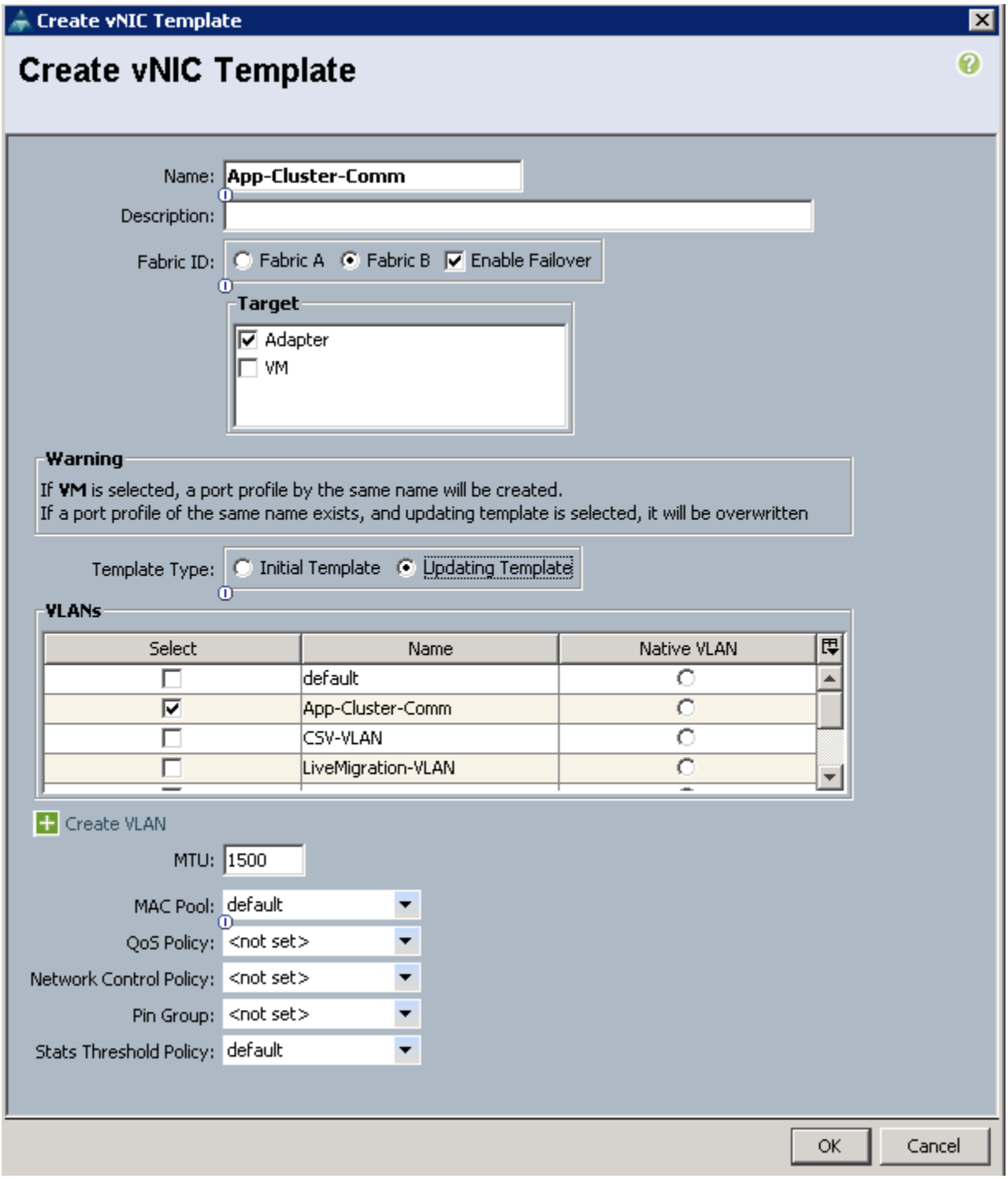
17. Select the `LAN` tab on the left of the window.
18. Go to `Policies > root`.

19. Right-click vNIC Templates.
20. Select Create vNIC Template.
21. Enter VM-MGMT as the vNIC template name.
22. Check Fabric A. Check the Enable Failover box. Under target, unselect the VM box. Select Updating Template as the Template Type. Under VLANs, select MGMT-VLAN. Set as Native VLAN. Under MAC Pool:, select MAC_Pool.
23. Click OK to complete creating the vNIC template.
24. Click OK.



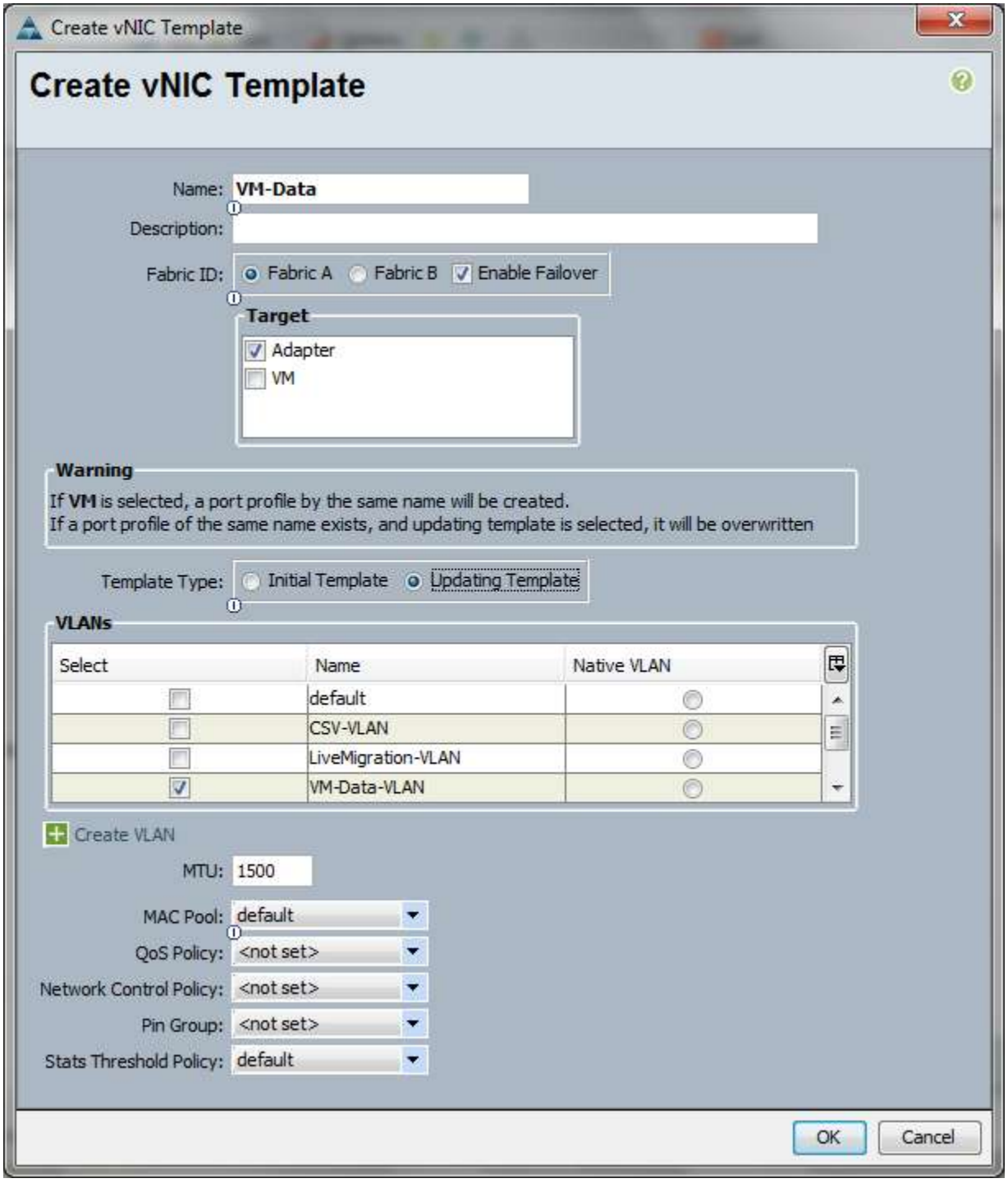
25. Select the `LAN` tab on the left of the window.
26. Go to `Policies > root`.
27. Right-click `vNIC Templates`.
28. Select `Create vNIC Template`.

29. Enter App-Cluster-Comm as the vNIC template name.
30. Check Fabric B. Check the Enable Failover box. Under target, unselect the VM box. Select Updating Template as the Template Type. Under VLANs, select App-Cluster-Comm. Do not set a Native VLAN. Under MTU, enter 1500. Under MAC Pool, select default.
31. Click OK to complete creating the vNIC template.
32. Click OK.

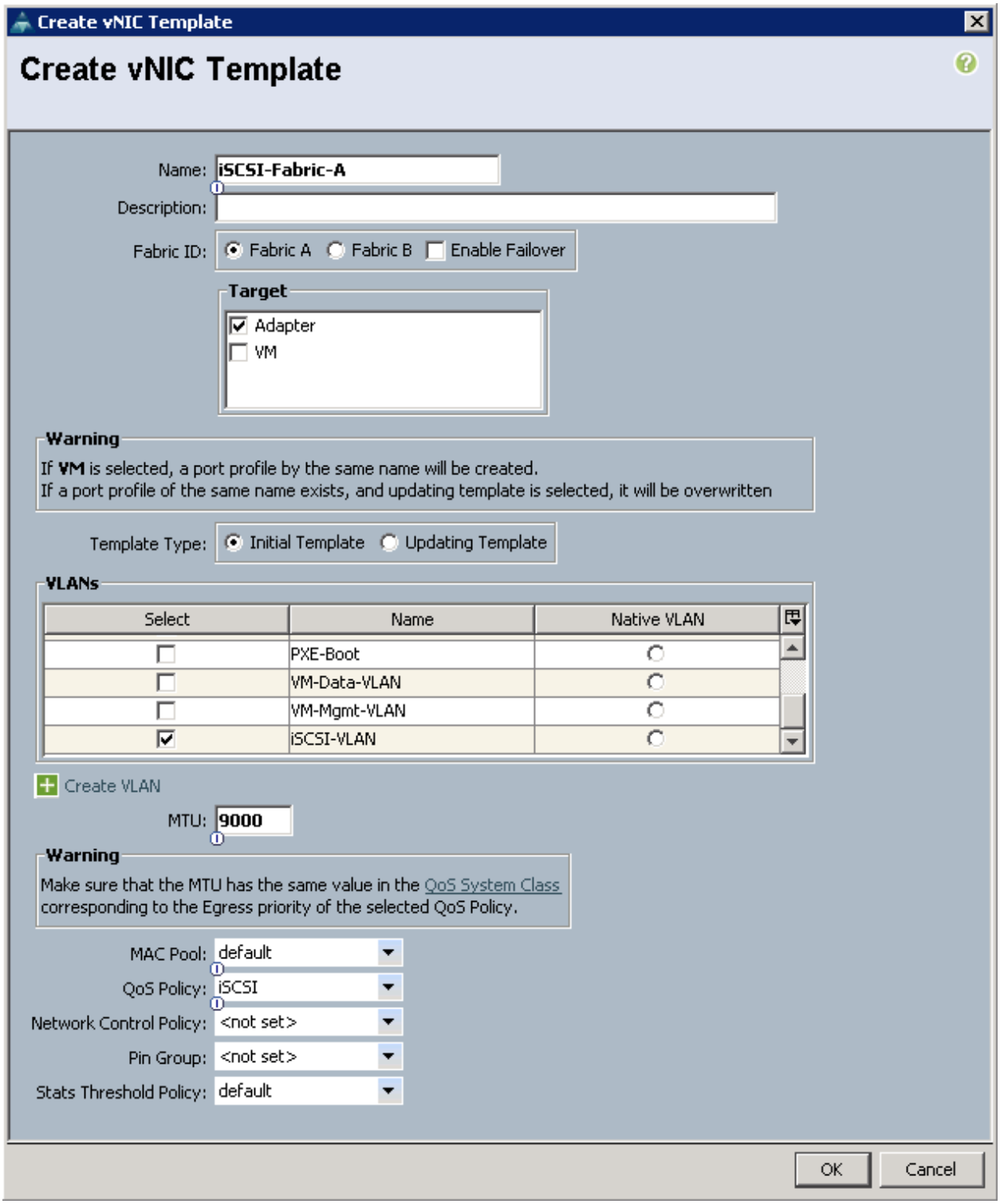


33. Select the `LAN` tab on the left of the window.
34. Go to `Policies > root.`
35. Right-click `vNIC Templates.`
36. Select `Create vNIC Template.`
37. Enter `VM-Data` as the vNIC template name.

38. Check Fabric A. Check the Enable Failover box. Under target, unselect the VM box. Select Updating Template as the Template Type. Under VLANs, select VM. Do not set a Native VLAN. Under MAC Pool, select Default.
39. Click OK to complete creating the vNIC template.
40. Click OK.

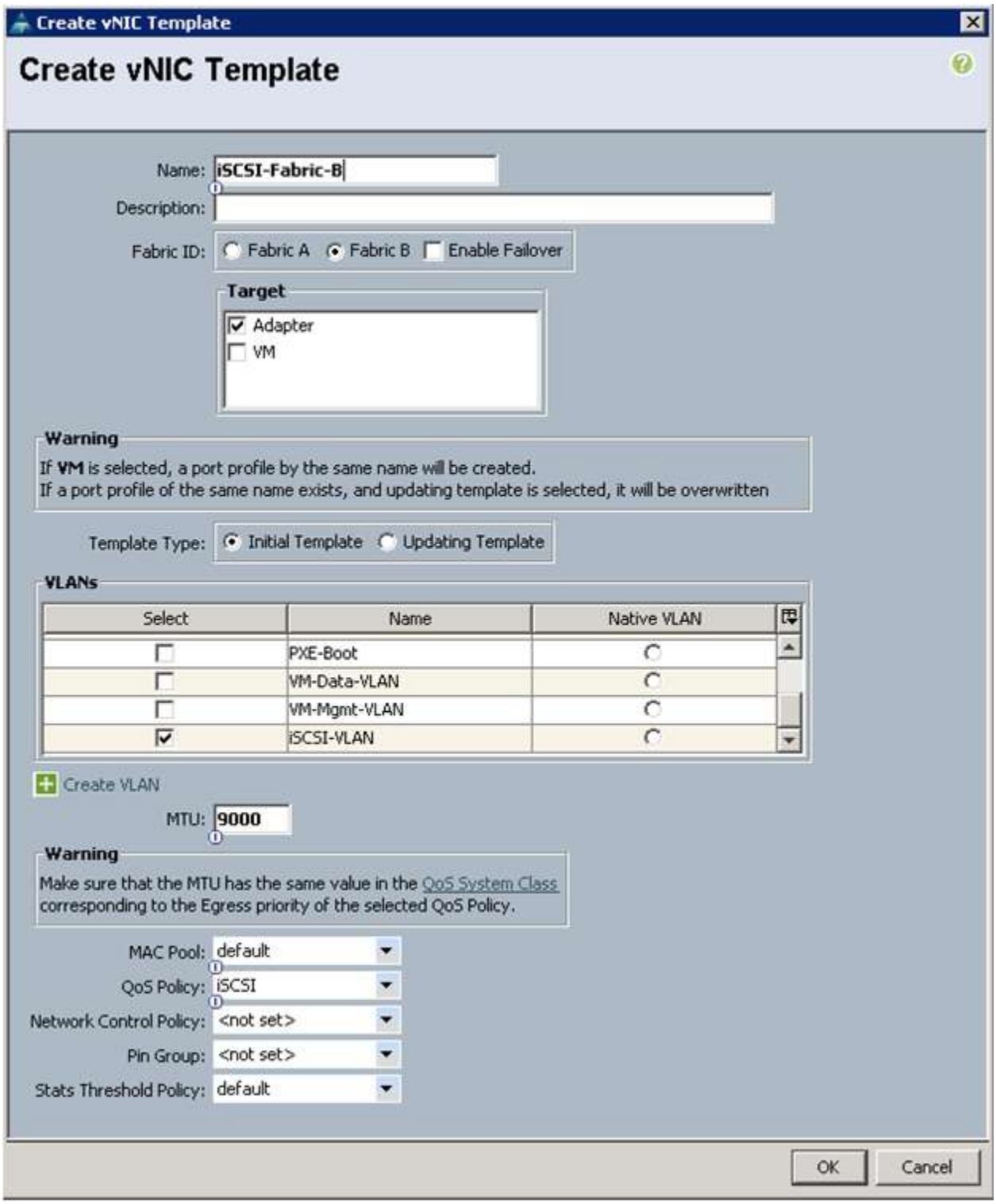


41. Select the LAN tab on the left of the window.
42. Go to Policies > root.
43. Right-click vNIC Templates.
44. Select Create vNIC Template.
45. Enter iSCSI-A as the vNIC template name.
46. Check Fabric A. Uncheck the Enable Failover box. Under target, unselect the VM box. Select Updating Template as the Template Type. Under VLANs, select iSCSI-VLAN-A. Do not set a Native VLAN. Under MTU, enter 9000. Under MAC Pool, select MAC_Pool. Under QoS Policy, select iSCSI.
47. Click OK to complete creating the vNIC template.
48. Click OK.



49. Select the `LAN` tab on the left of the window.
50. Go to `Policies > root`.
51. Right-click `vNIC Templates`.

52. Select Create vNIC Template.
53. Enter iSCSI-B as the vNIC template name.
54. Check Fabric B. Uncheck the Enable Failover box. Under target, unselect the VM box. Select Updating Template as the Template Type. Under VLANs, select iSCSI-VLAN-B. Do not set a Native VLAN. Under MTU, enter 9000. Under MAC Pool, select MAC_Pool. Under QoS Policy, select iSCSI.
55. Click OK to complete creating the vNIC template.
56. Click OK.

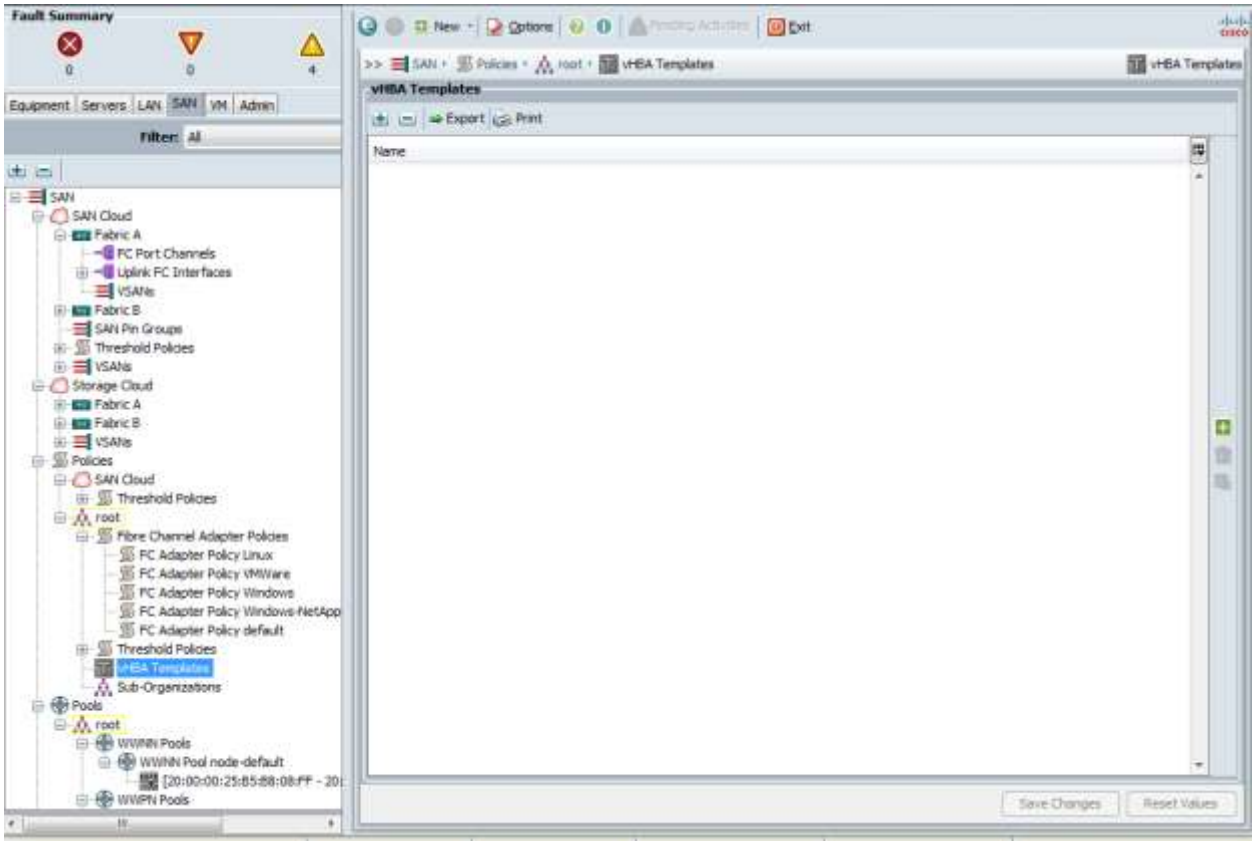


Create vHBA Templates for Fabric A and B

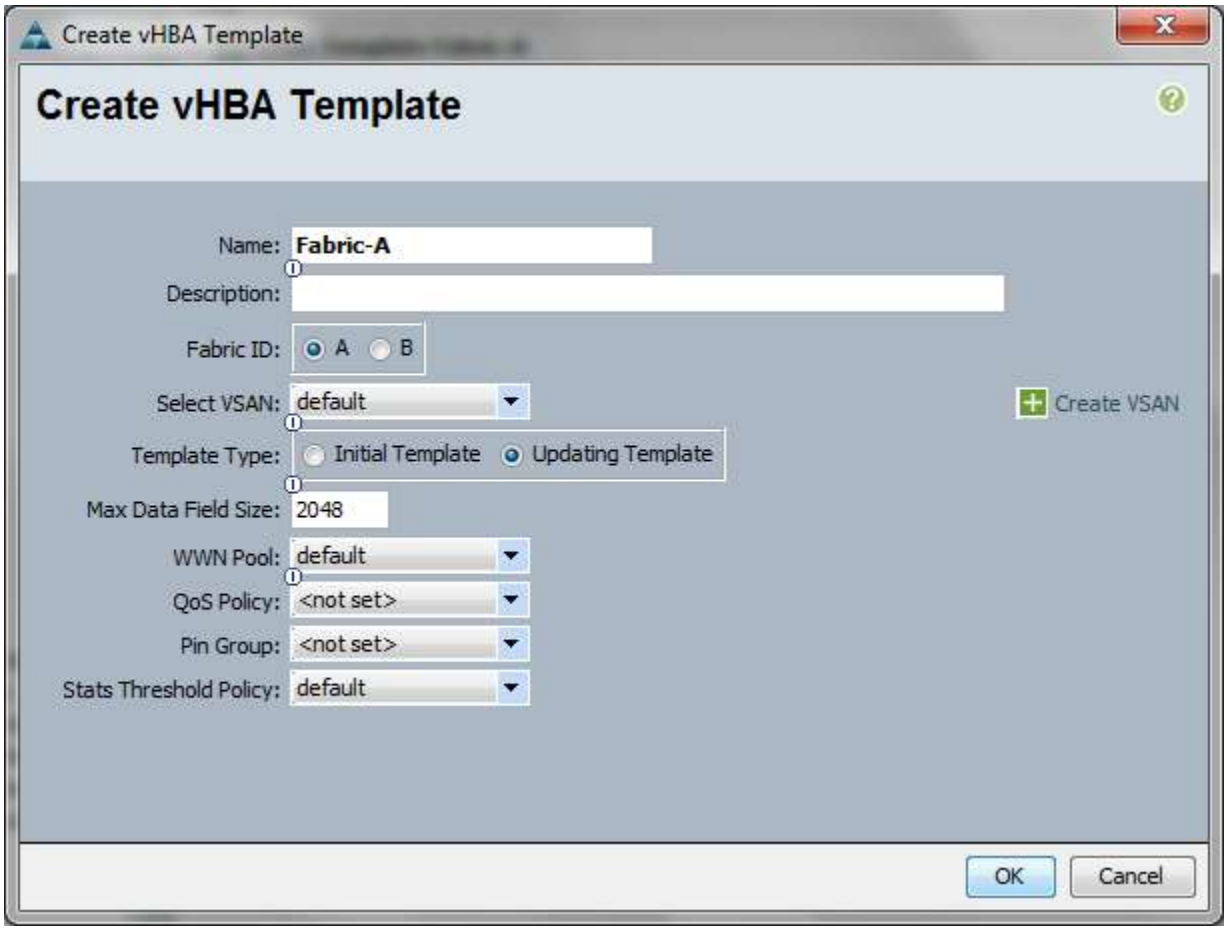
These steps provide details for creating multiple vHBA templates for the Cisco UCS environment.

Cisco UCS Manager

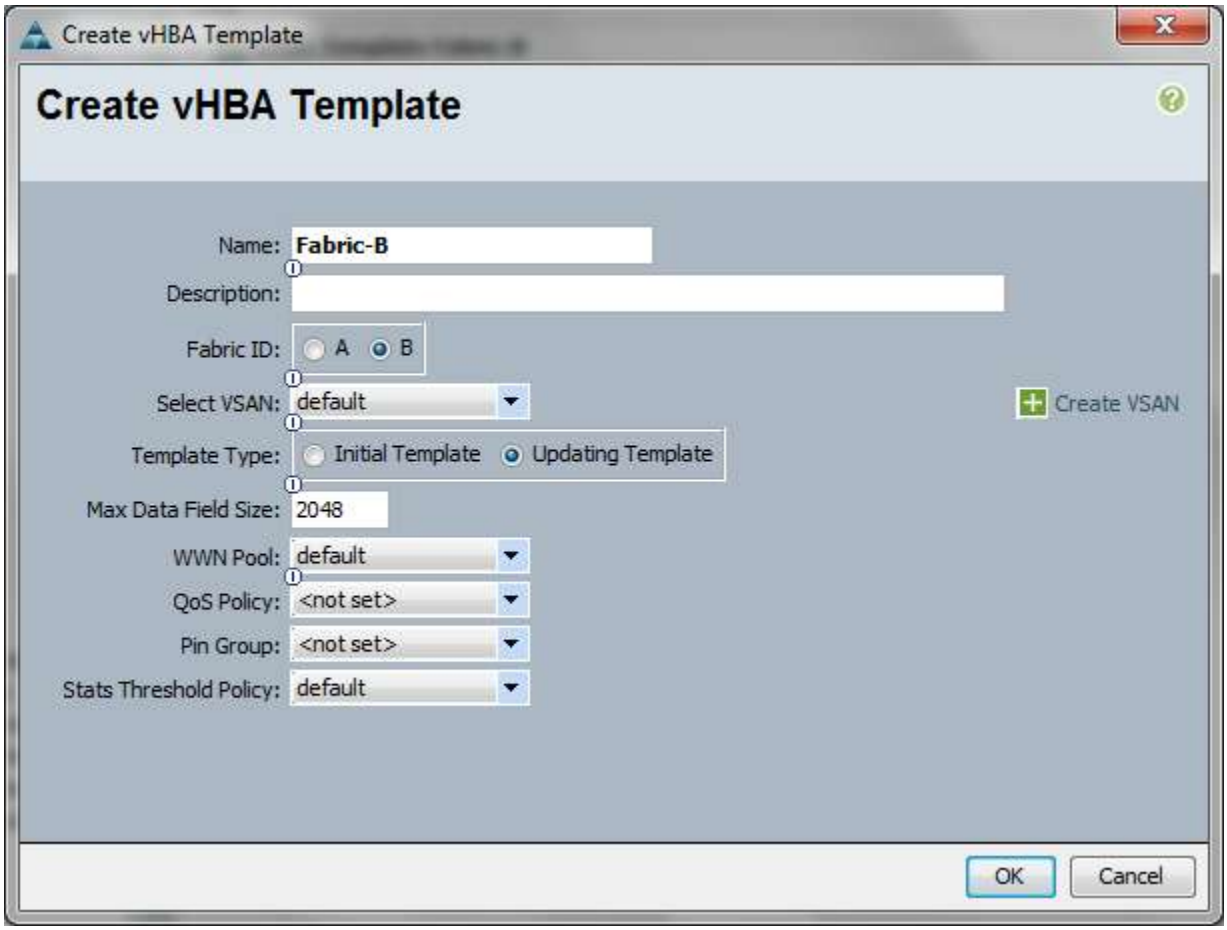
1. Select the VSAN tab on the left of the window.
2. Go to Policies > root.
3. Right-click vHBA Templates.



4. Select Create vNIC Template.
5. Enter VHBA-Template-A as the vHBA template name.
6. Select Fabric A. Under Select VSAN, select VSAN_A. Under WWN Pool, select WWPN_Pool.
7. Click OK to complete creating the vHBA template.
8. Click OK.



9. Select the `VSAN` tab on the left of the window.
10. Go to `Policies > root.`
11. Right-click `vHBA Templates.`
12. Select `Create vHBA Template.`
13. Enter `VHBA-Template-B` as the vHBA template name.
14. Select `Fabric B.` Under `Select VSAN,` select `VSAN_B.` Under `WWN Pool,` select `WWPN_Pool.`
15. Click `OK` to complete creating the vHBA template.
16. Click `OK.`



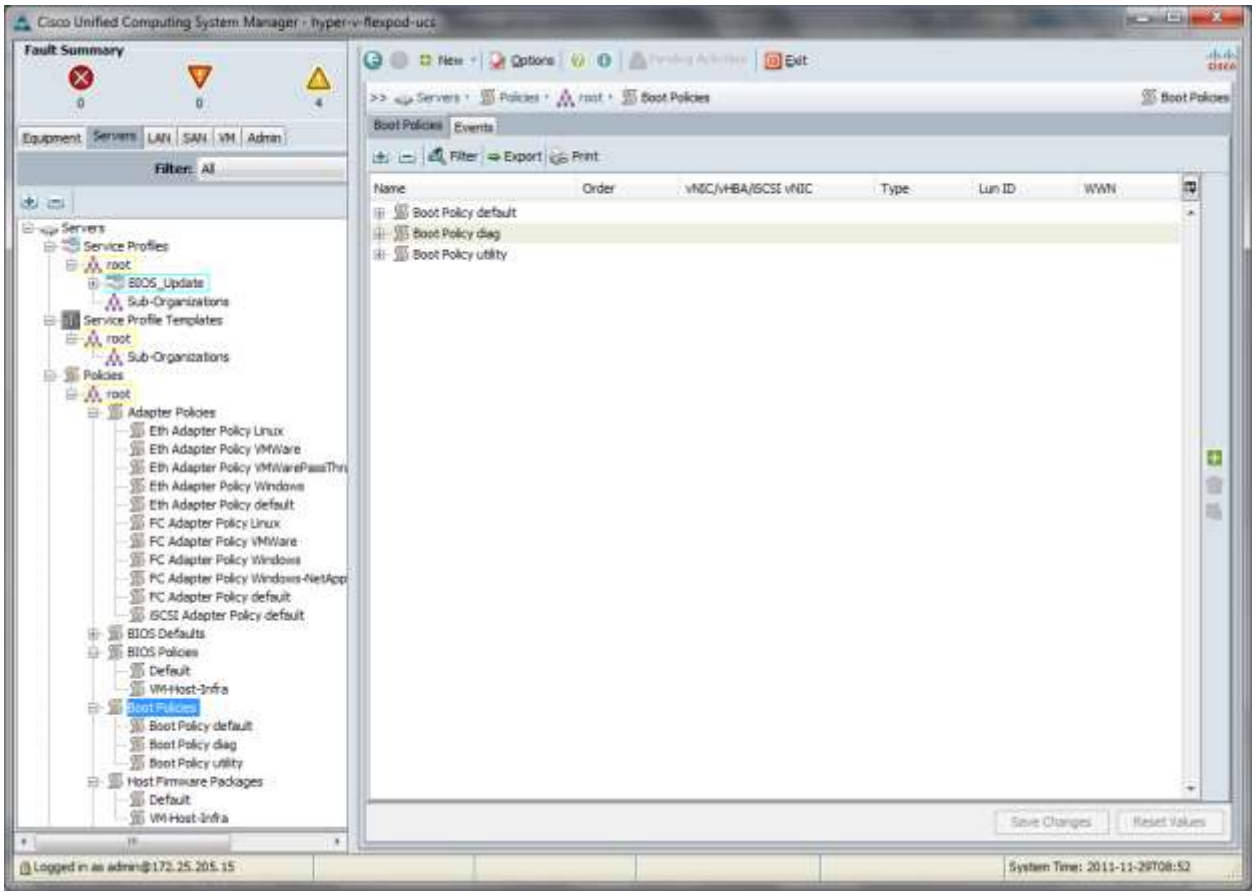
Create Boot Policies

These steps provide details for creating boot policies for the Cisco UCS environment. These directions apply to an environment in which each storage controller 0c port is connected to fabric A and each storage controller 0d port is connected to fabric B. In these steps, 2 boot policies will be configured. The first policy will configure the primary target to be controller A port 0c and the second boot policy primary target will be controller B port 0d.

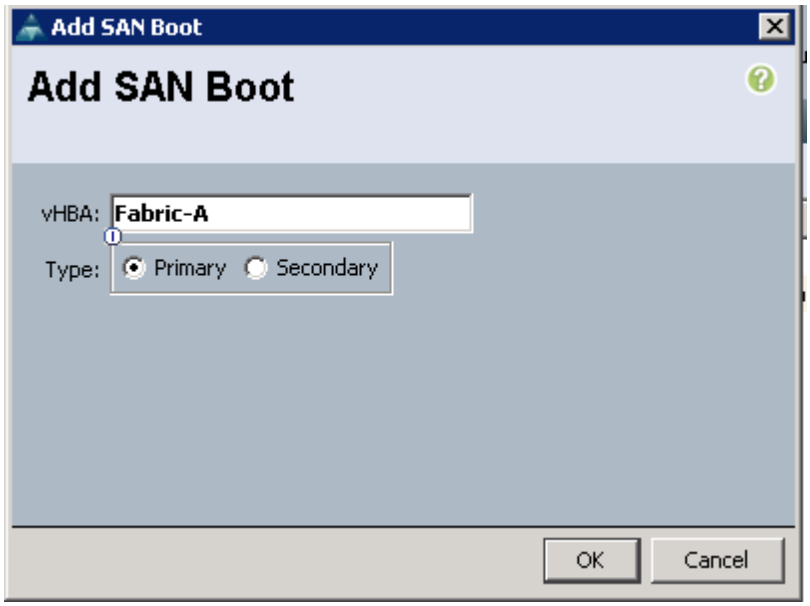
Note: If you are using FCoE between the Nexus 5548 and the NetApp Storage systems to substitute port 2a for port 0c and port 2b for port 0d in this procedure

Cisco UCS Manager

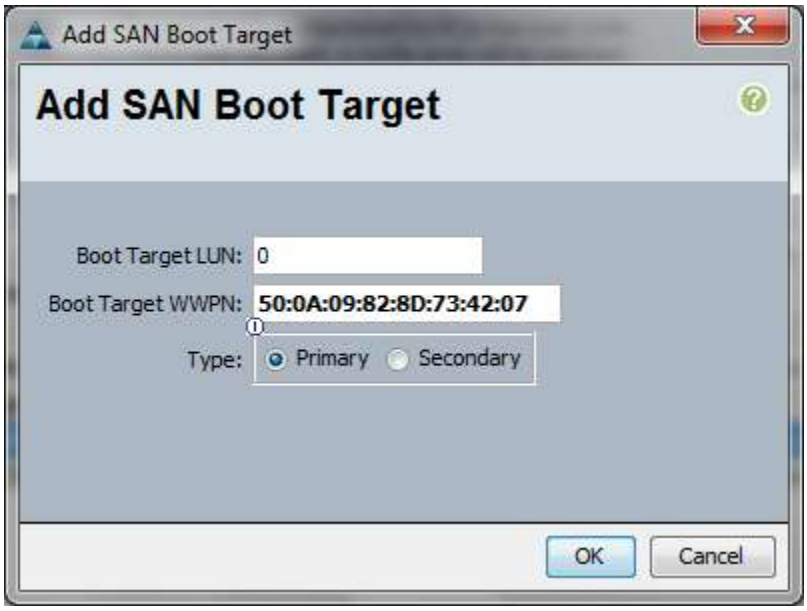
1. Select the `Servers` tab at the top left of the window.
2. Go to `Policies > root.`
3. Right-click `Boot Policies.`



4. Select `Create Boot Policy`.
5. Name the boot policy Boot-Fabric-A.
6. (Optional) Give the boot policy a description.
7. Leave `Reboot on Boot Order Change and Enforce vNIC/vHBA Name` unchecked.
8. Expand the Local Devices drop-down menu and select `Add CD-ROM`.
9. Expand the vHBAs drop-down menu and select `Add SAN Boot`.
10. Enter `Fabric-A` in the vHBA field in the Add SAN Boot window that displays.
11. Make sure that Primary is selected as the type.
12. Click `OK` to add the SAN boot initiator.

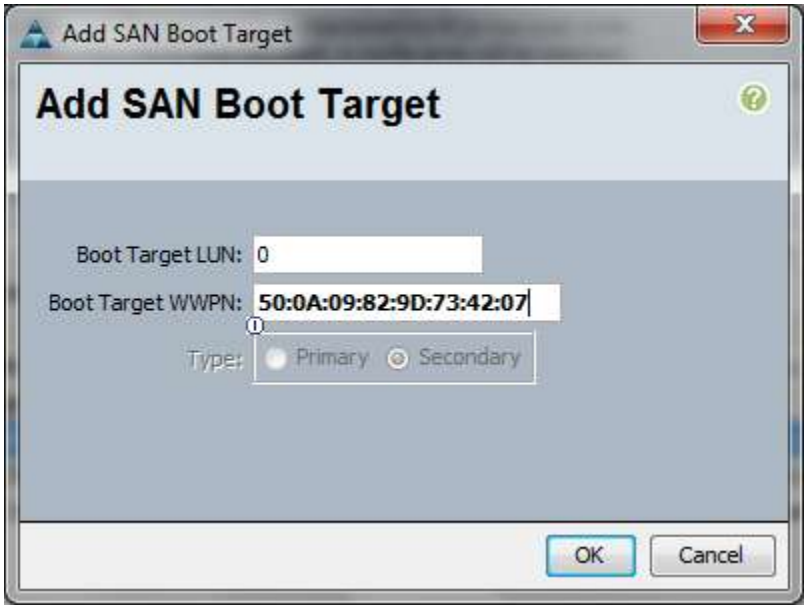


13. Under the vHBA drop-down menu, select `Add SAN Boot Target`. Keep the value for Boot Target LUN as `0`.
14. Enter the WWPN for the primary FC adapter interface `0c` of controller A. To obtain this information, log in to controller A and run the `fcp show adapters` command.
15. Be sure to use the FC portname for 0c and not the FC node name.
16. Keep the type as `Primary`.
17. Click `OK` to add the SAN boot target.

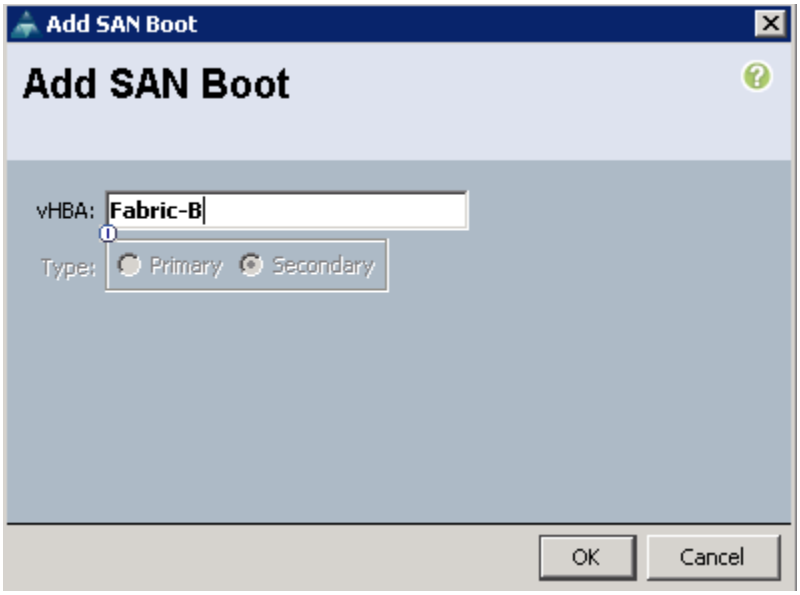


18. Under the vHBA drop-down menu, select `Add SAN Boot Target`. Keep the value for Boot Target LUN as `0`.
19. Enter the WWPN for the primary FC adapter interface `0c` of controller B. To obtain this information, log in to the controller B and run the `fcp show adapters` command.

20. Be sure to use the FC portname for port 0c and not the FC node name.
21. Click `OK` to add the SAN boot target.

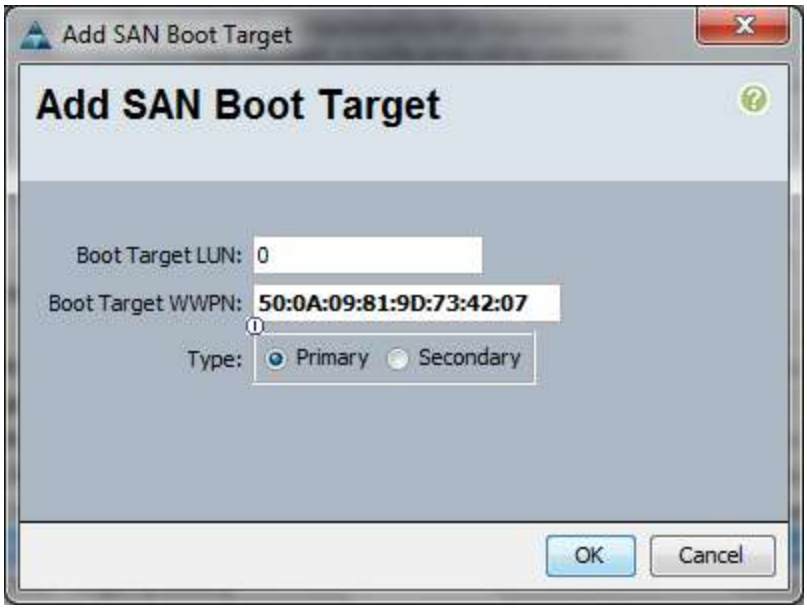


22. Select `Add SAN Boot` under the vHBA drop-down menu.
23. Enter `Fabric-B` in the vHBA field in the Add SAN Boot window that displays.
24. The type should automatically be set to `Secondary` and it should be grayed out. This is fine.
25. Click `OK` to add the SAN boot target.

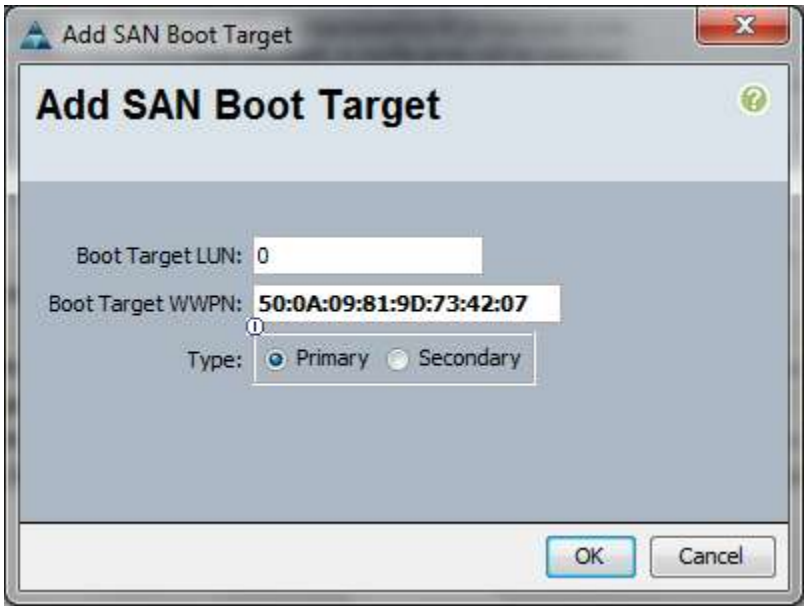


26. Select `Add SAN Boot Target` under the vHBA drop-down menu.
27. The Add SAN Boot Target window displays. Keep the value for Boot Target LUN as `0`.
28. Enter the WWPN for the primary FC adapter interface 0d of the controller B. To obtain this information, log in to controller B and run the `fcp show adapters` command.

29. Be sure to use the FC portname for port 0d and not the FC node name.
30. Keep the type as Primary.
31. Click `OK` to add the SAN boot target.

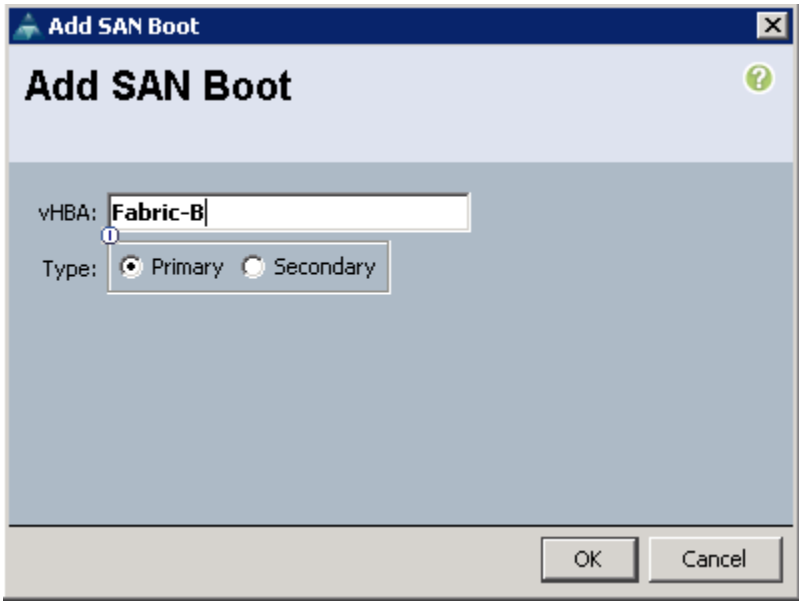


32. Under the vHBA drop-down menu, select `Add SAN Boot Target`. Keep the value for Boot Target LUN as `0`.
33. Enter the WWPN for the primary FC adapter interface `0d` of controller A. To obtain this information, log in to controller A and run the `fcp show adapters` command.
34. Be sure to use the FC portname for port 0d and not the FC node name.
35. Click `OK` to add the SAN boot target.

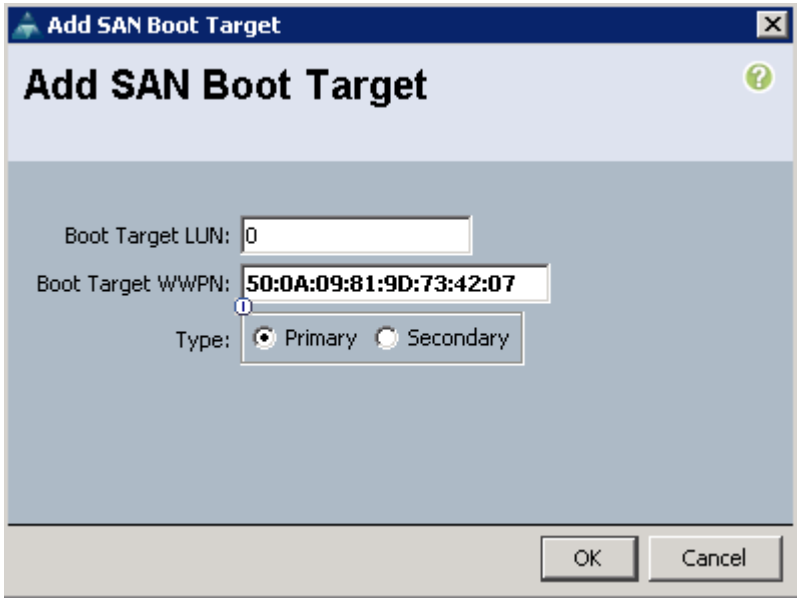


Creating Boot Policy for Fabric -B

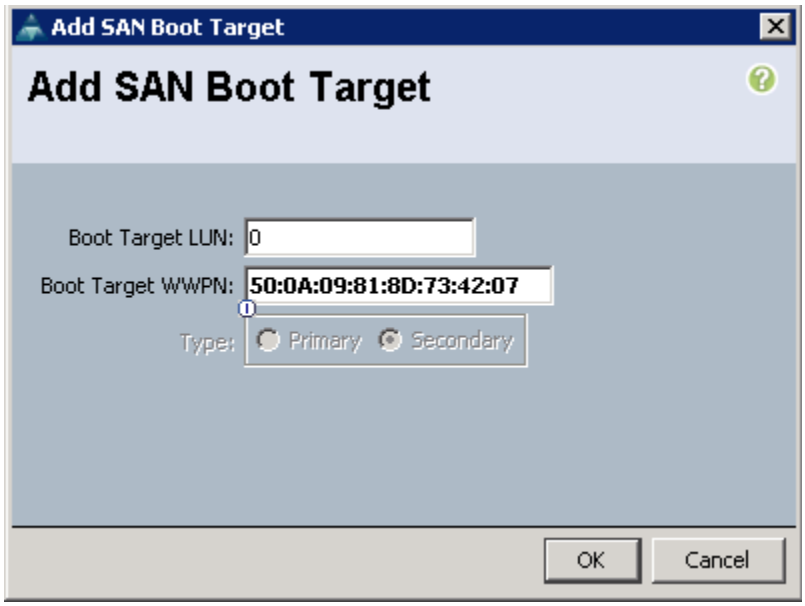
1. Right-click `Boot Policies again.`
2. Select `Create Boot Policy.`
3. Name the boot policy Boot-Fabric-B.
4. (Optional) Give the boot policy a description.
5. Leave `Reboot on Boot Order Change and Enforce vNIC/vHBA Name` unchecked.
6. Expand the Local Devices drop-down menu and select `Add CD-ROM`.
7. Click the vHBA drop-down menu and select `Add SAN Boot`.
8. Enter `Fabric-B` in the vHBA field in the Add SAN Boot window that displays.
9. Make sure that `Primary` is selected as the type.
10. Click `OK` to add the SAN boot target.



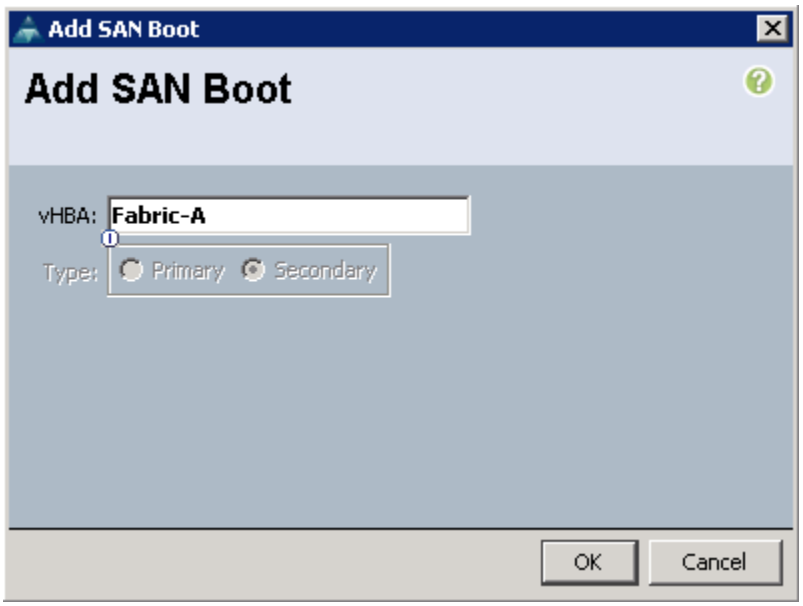
11. Under the vHBA drop-down menu, select `Add SAN Boot Target`. Keep the value for Boot Target LUN as `0`.
12. Enter the WWPN for the primary FC adapter interface `0d` of controller B. To obtain this information, log in to controller B and run the `fcp show adapters` command.
13. Be sure to use the FC portname for port `0d` and not the FC node name.
14. Keep the type as `Primary`.
15. Click `OK` to add the SAN boot target.



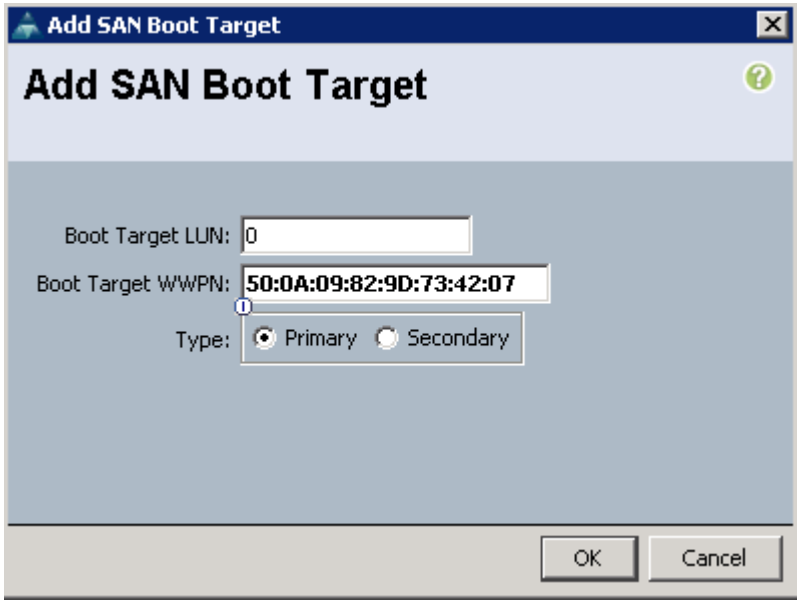
16. Under the vHBA drop-down menu, select Add SAN Boot Target. Keep the value for Boot Target LUN as 0.
17. Enter the WWPN for the primary FC adapter interface `0d` of controller A. To obtain this information, log in to controller A and run the `fcp show adapters` command.
18. Be sure to use the FC portname for port `0d` and not the FC node name.
19. Click `OK` to add the SAN boot target.



20. Select `Add SAN Boot` under the vHBA drop-down menu.
21. Enter `Fabric-A` in the vHBA field in the Add SAN Boot window that displays.
22. The type should automatically be set to `Secondary` and it should be grayed out. This is fine.
23. Click `OK` to add the SAN boot target.

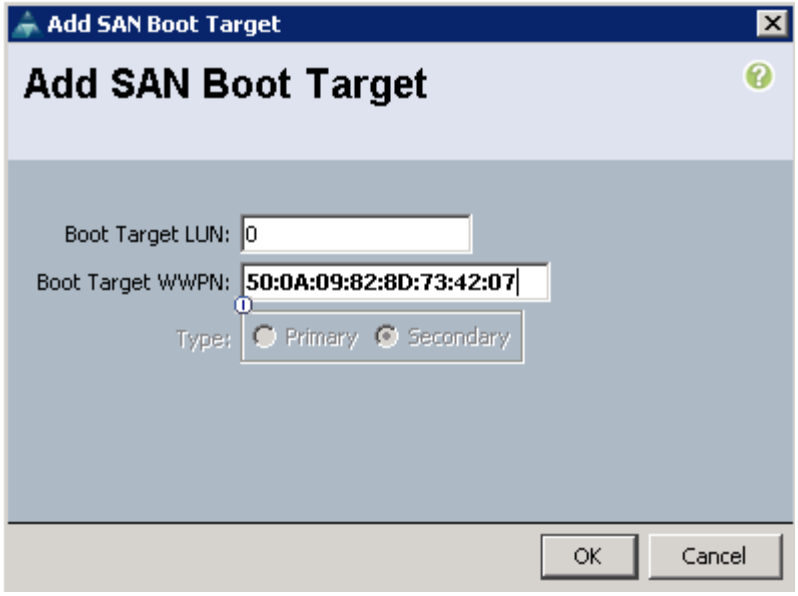


24. Select `Add SAN Boot Target` under the vHBA drop-down menu.
25. The Add SAN Boot Target window displays. Keep the value for Boot Target LUN as `0`.
26. Enter the WWPN for the primary FC adapter interface `0c` of controller A. To obtain this information, log in to controller A and run the `fcp show adapters` command.
27. Be sure to use the FC portname for port 0c and not the FC node name.
28. Keep the type as `Primary`.
29. Click `OK` to add the SAN boot target.



30. Under the vHBA drop-down menu, select `Add SAN Boot Target`. Keep the value for Boot Target LUN as `0`.

31. Enter the WWPN for the primary FC adapter interface `0c` of controller B. To obtain this information, log in to controller B and run the `fcp show adapters` command.
32. Be sure to use the FC portname for port 0c and not the FC node name.
33. Click `OK` to add the SAN boot target.



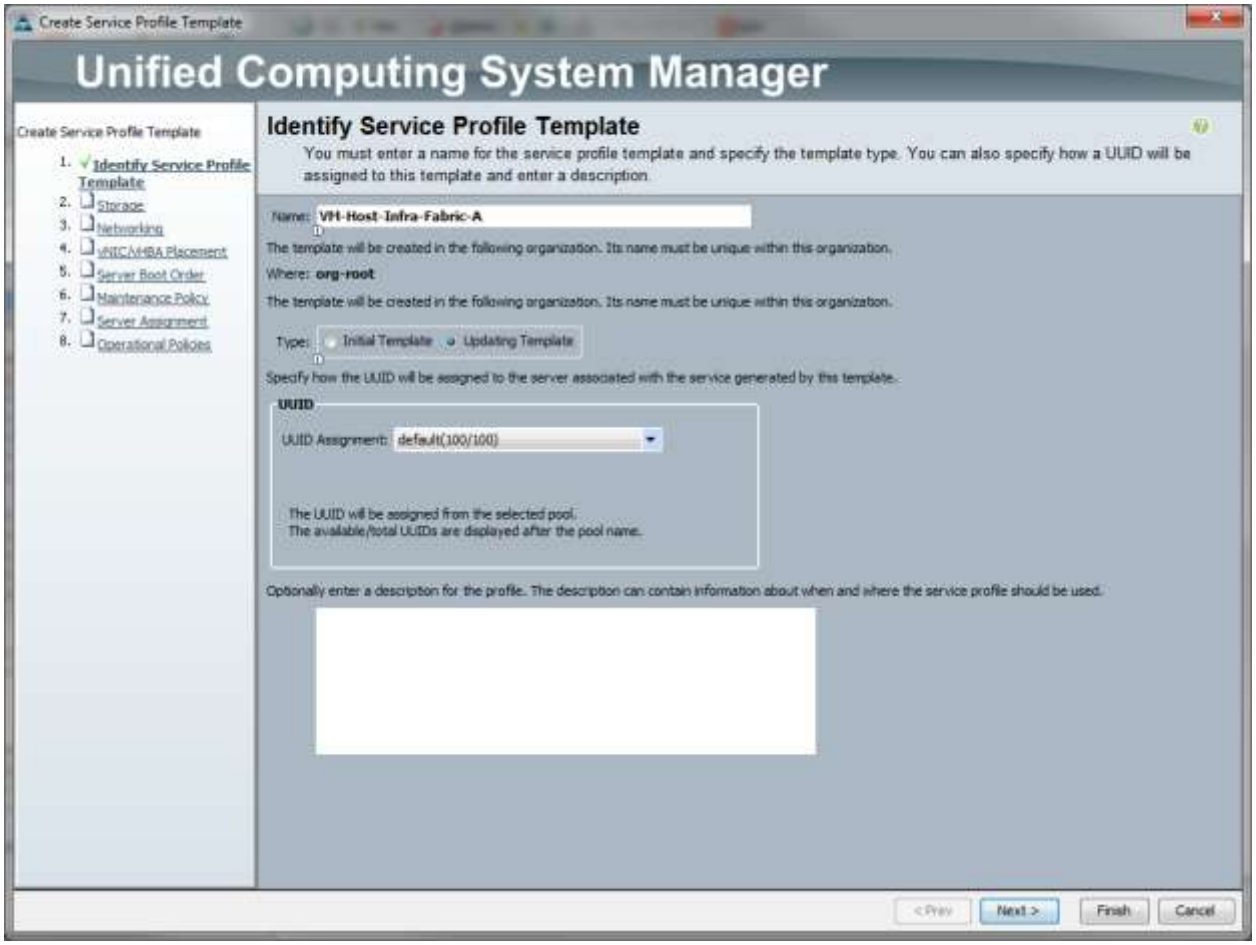
34. Click `OK` to create the boot policy in the Create Boot Policy pop-up window.

Create Service Profile Templates

This section details the creation of two service profile templates: one for fabric A and one for fabric B.

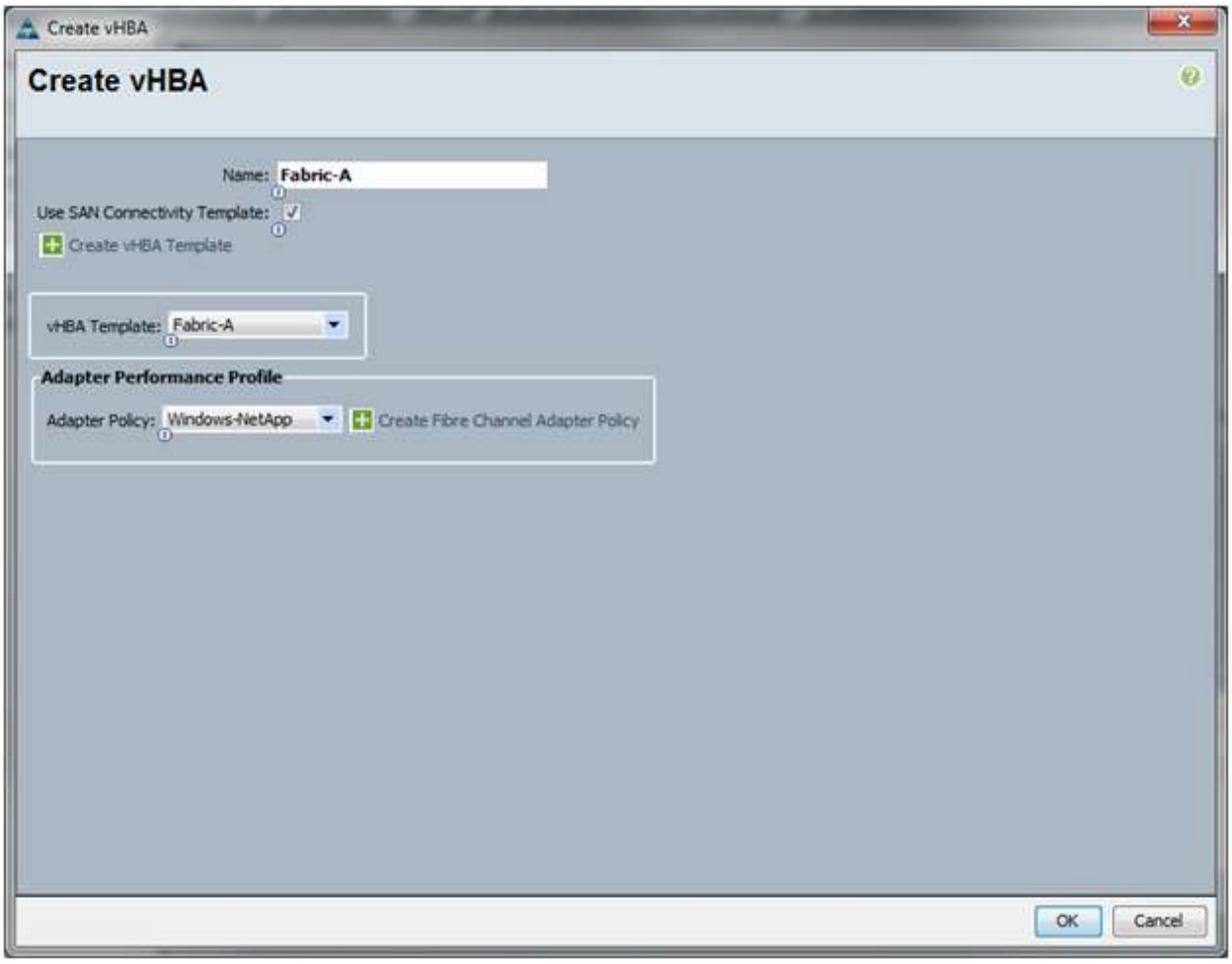
Cisco UCS Manager

1. Select the `Servers` tab at the top left of the window.
2. Go to `Service Profile Templates > root.`
3. Right-click `root`.
4. Select `Create Service Profile Template`.
5. The Create Service Profile Template window displays.
   a. These steps detail configuration info for the `Identify the Service Profile Template` Section.
   b. Name the service profile template `VM-Host-Infra-Fabric-A`. This service profile template is configured to boot from controller A port 0c.
   c. Select `Updating Template`.
   d. In the `UUID section`, select `UUID_Pool` as the UUID pool.
   e. Click `Next` to continue to the next section.



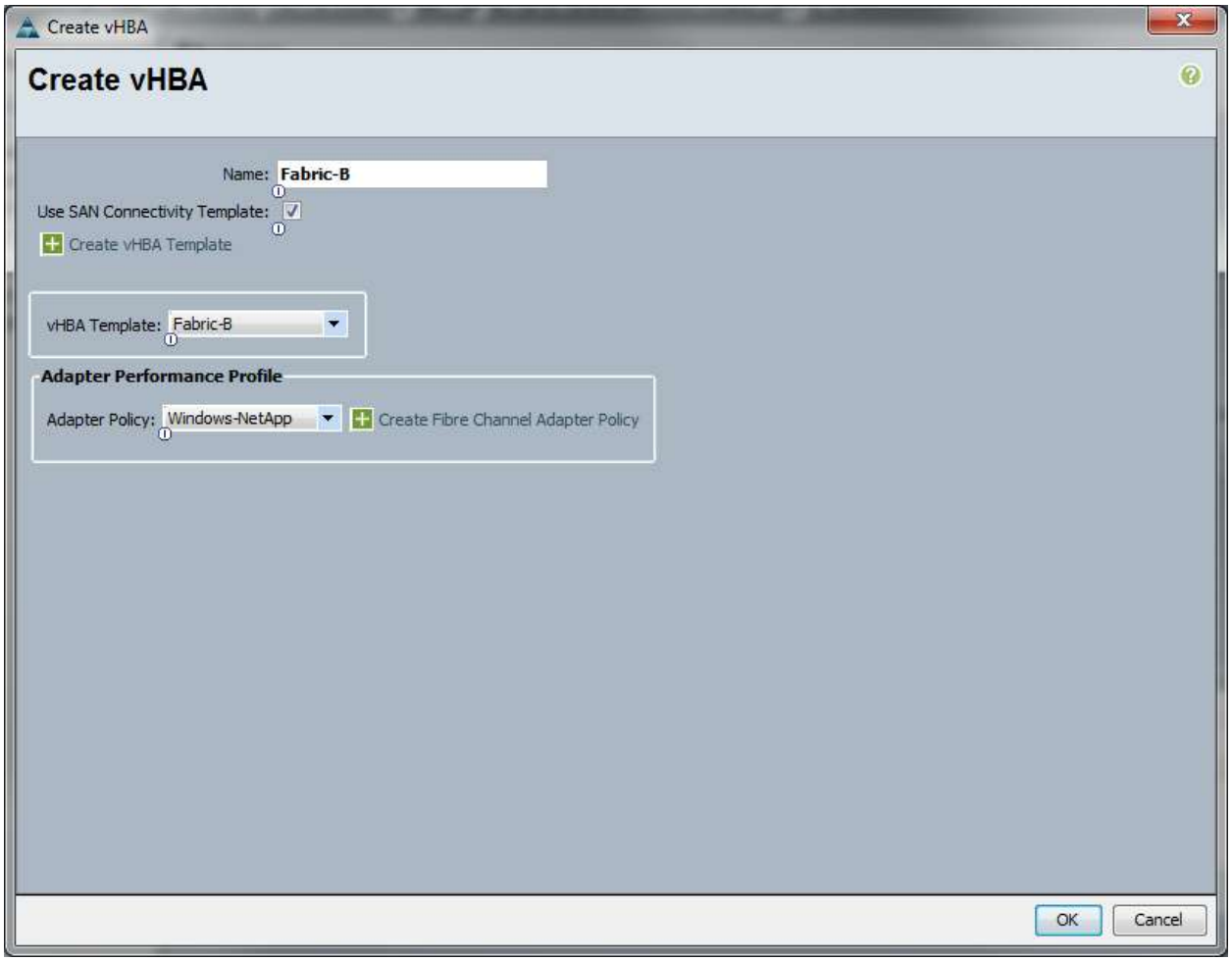
6. Storage section

a. Select `Default` for the Local Storage field.
b. Select the appropriate local storage policy if the server in question does not have local disk.
c. Select `SAN-Boot` for the local disk configuration policy.
d. Select the `Expert` option for the How would you like to configure SAN connectivity field.
e. In the `WWNN Assignment` field, select `WWNN_Pool`.
f. Click the `Add` button at the bottom of the window to add vHBAs to the template.
g. The `Create vHBA` window displays. Name the vHBA `Fabric-A`.
h. Check the box for `Use SAN Connectivity Template`.
i. Select `Fabric-A` in the `vHBA Template` field.
j. Select `Windows-NetApp` in the Adapter Policy field.
k. Click `OK` to add the vHBA to the template.

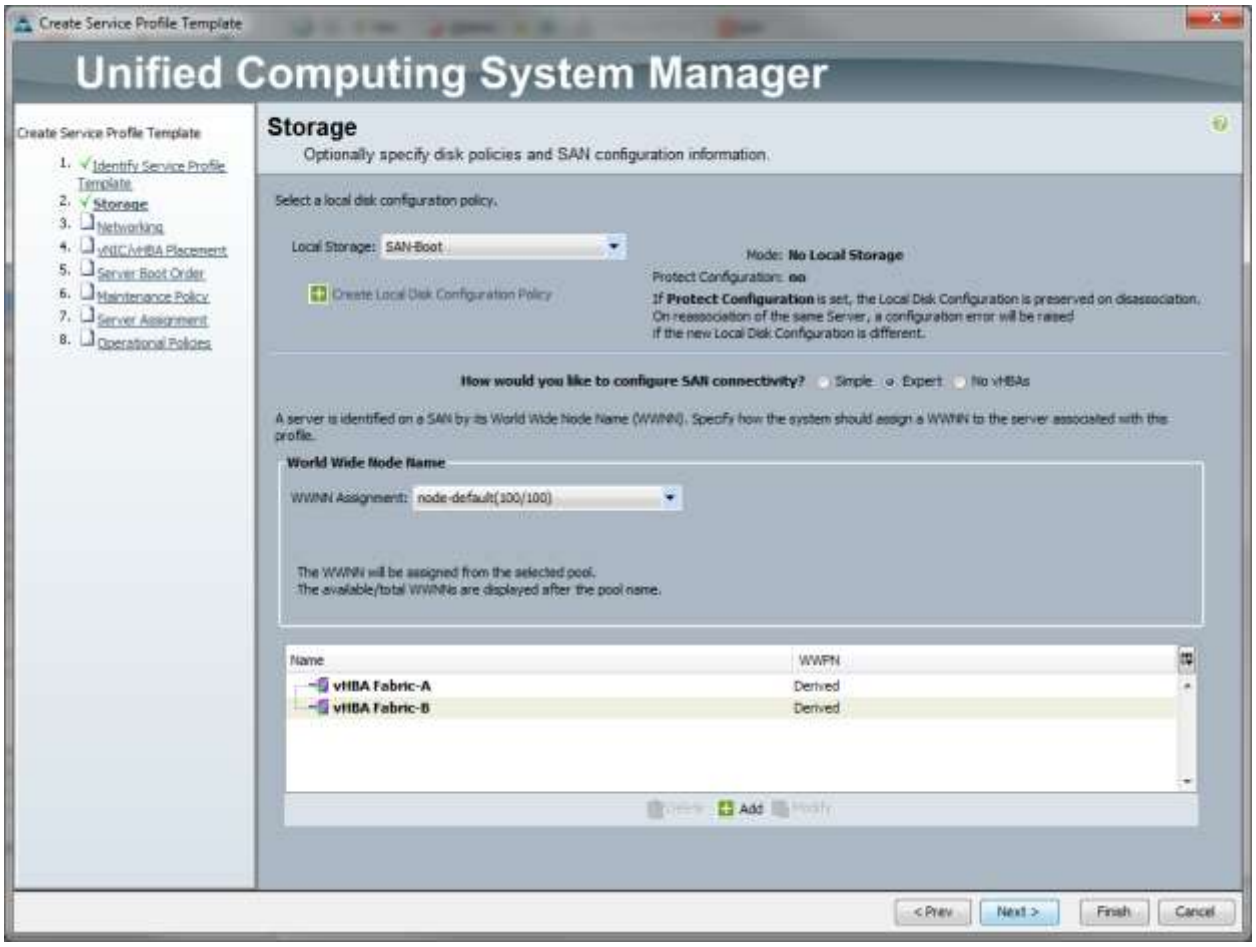


7. Click the `Add` button at the bottom of the window to add vHBAs to the template.
8. The `Create vHBA` window displays. Name the vHBA `Fabric-B`.
9. Check the box for `Use SAN Connectivity Template`.
10. Select `Fabric-B` in the `vHBA Template` field.

11. Select `Windows-NetApp` in the Adapter Policy field.
12. Click `OK` to add the vHBA to the template.



13. Verify – Review the table to make sure that both of the vHBAs were created.



14. Click `Next` to continue to the next section.
15. Networking Section
    a. Leave the `Dynamic vNIC Connection Policy` field at the default.
    b. Select `Expert` for the `How would you like to configure LAN connectivity?` option.

c. Click `Add` to add a vNIC to the template.

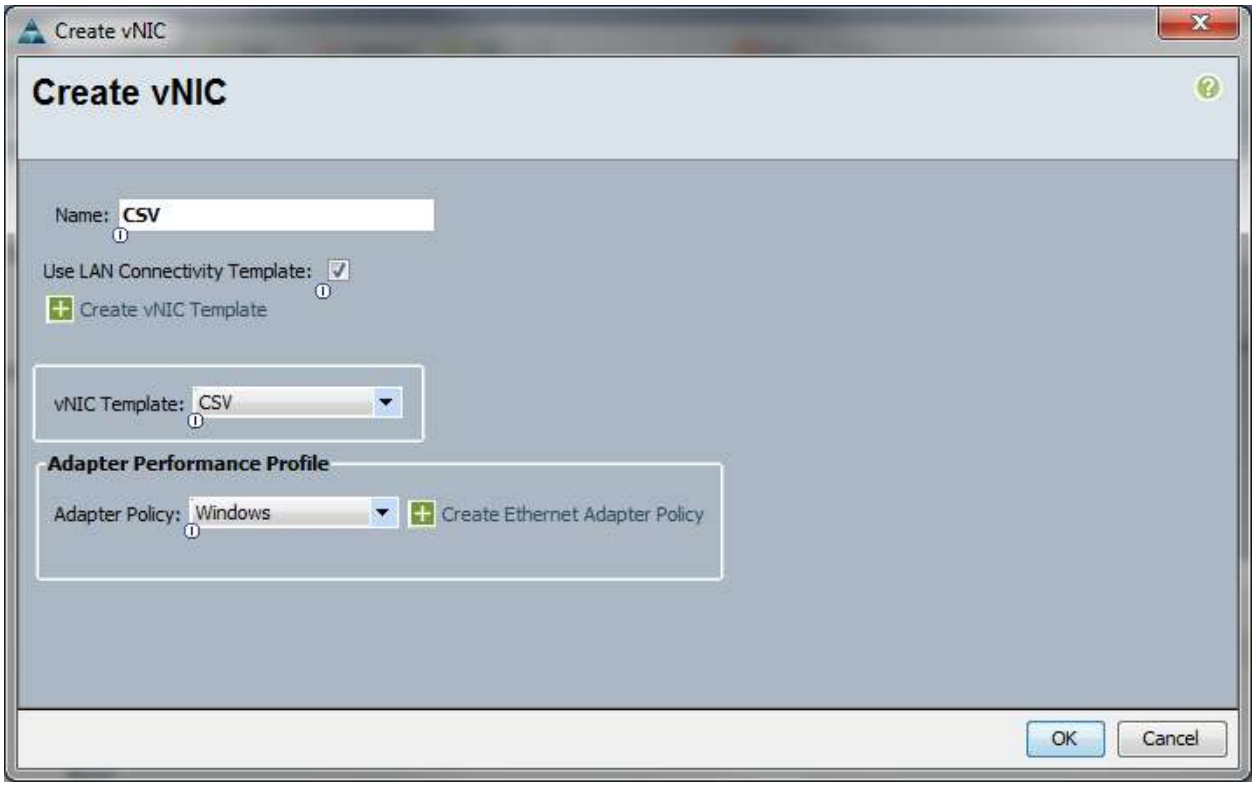
d. The `Create vNIC window` displays. Name the vNIC `CSV`.

e. Check the `Use LAN Connectivity Template` checkbox.

f. Select `CSV` for the vNIC Template field.

g. Select `Windows` in the Adapter Policy field.

h. Click `OK` to add the vNIC to the template.



i. Click `Add` to add a vNIC to the template.

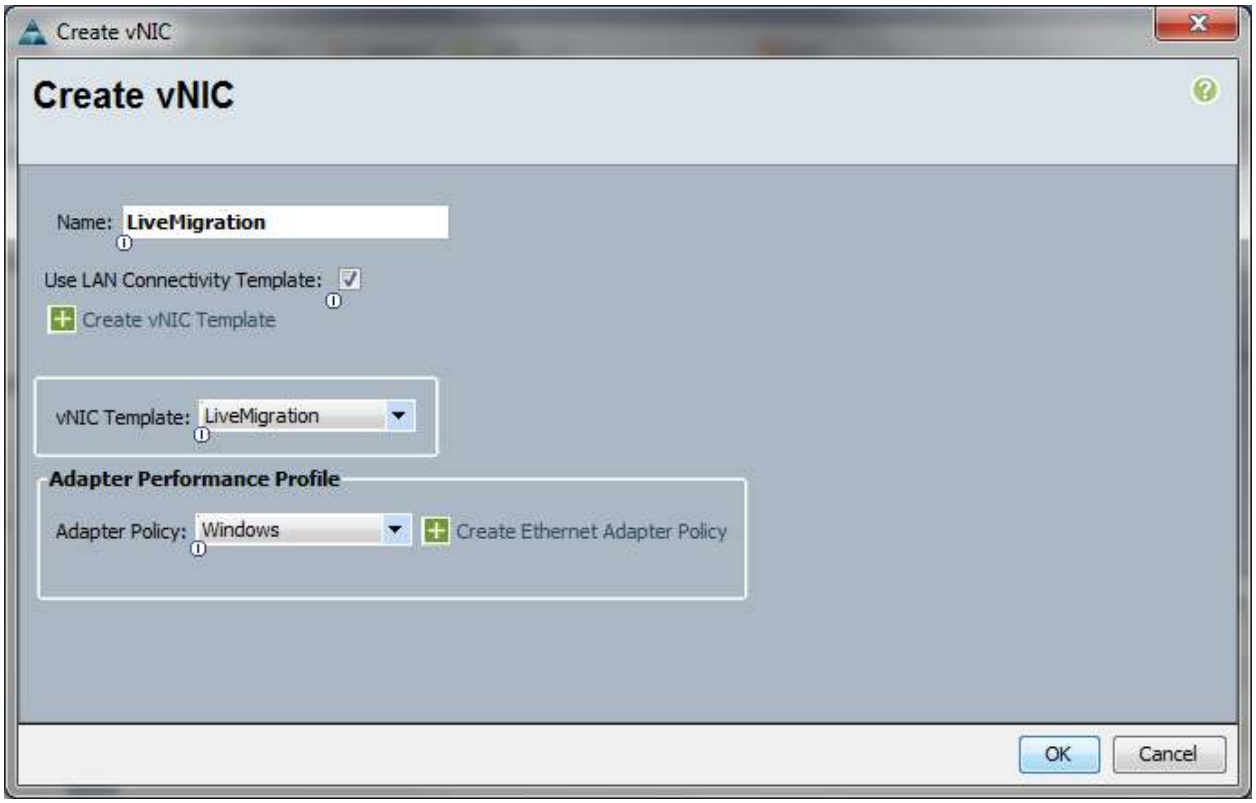
j. The `Create vNIC window` displays. Name the vNIC `LiveMigration`.

k. Check the `Use LAN Connectivity Template` checkbox.

l. Select `LiveMigration` for the vNIC Template field.

m. Select `Windows` in the Adapter Policy field.

n. Click `OK` to add the vNIC to the template.



o. Click `Add` to add a vNIC to the template.

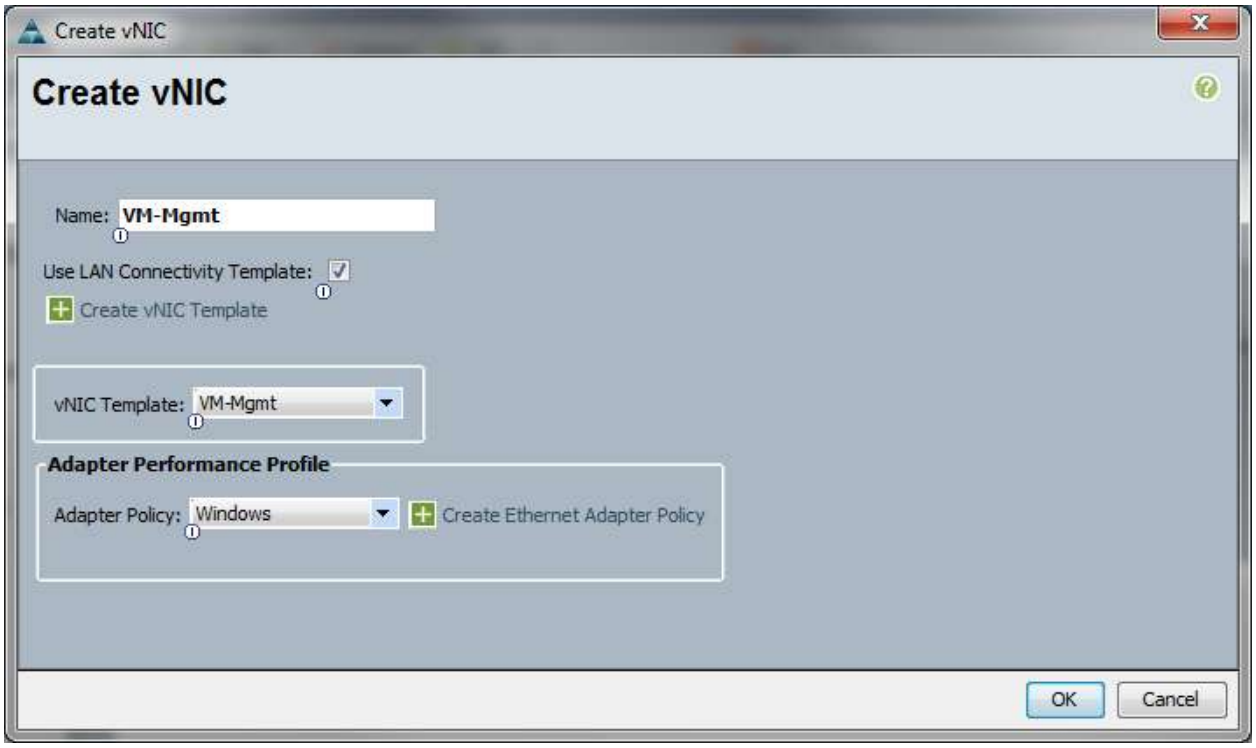
p. The `Create vNIC window` displays. Name the vNIC VM-`MGMT`.

q. Check the `Use LAN Connectivity Template` checkbox.

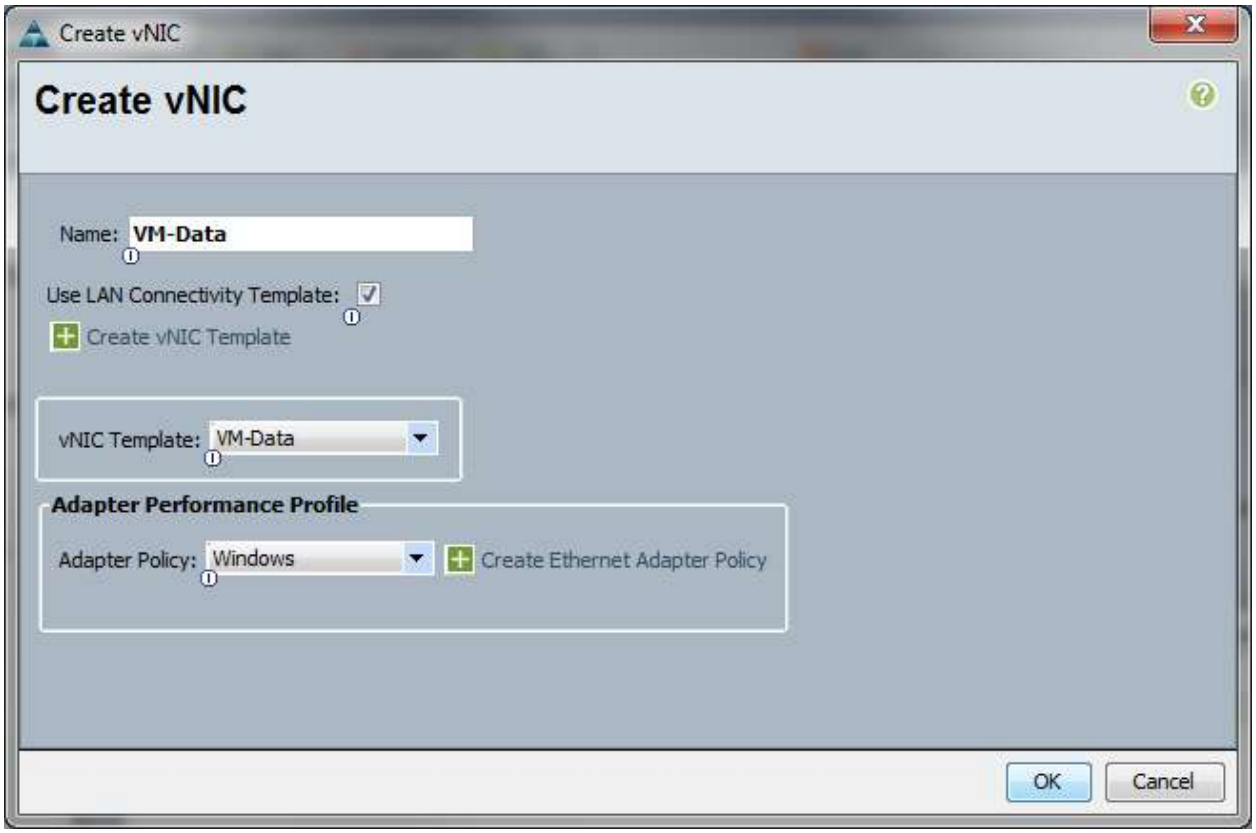
r. Select `VM-MGMT` for the vNIC Template field.

s. Select `Windows` in the Adapter Policy field.

t. Click `OK` to add the vNIC to the template.



u. Click `Add` to add a vNIC to the template.
v. The `Create vNIC window` displays. Name the vNIC `AppApp-Cluster-Comm`.
w. Check the `Use LAN Connectivity Template` checkbox.
x. Select `AppApp-Cluster-Comm` for the vNIC Template field.
y. Select `Windows` in the Adapter Policy field.
z. Click `OK` to add the vNIC to the template.
aa. Click `Add` to add a vNIC to the template.
bb. The `Create vNIC window` displays. Name the vNIC `VM-Data`.
cc. Check the `Use LAN Connectivity Template` checkbox.
dd. Select `VM-Data` for the vNIC Template field.
ee. Select `Windows` in the Adapter Policy field.
ff. Click `OK` to add the vNIC to the template.



gg. Click `Add` to add a vNIC to the template.

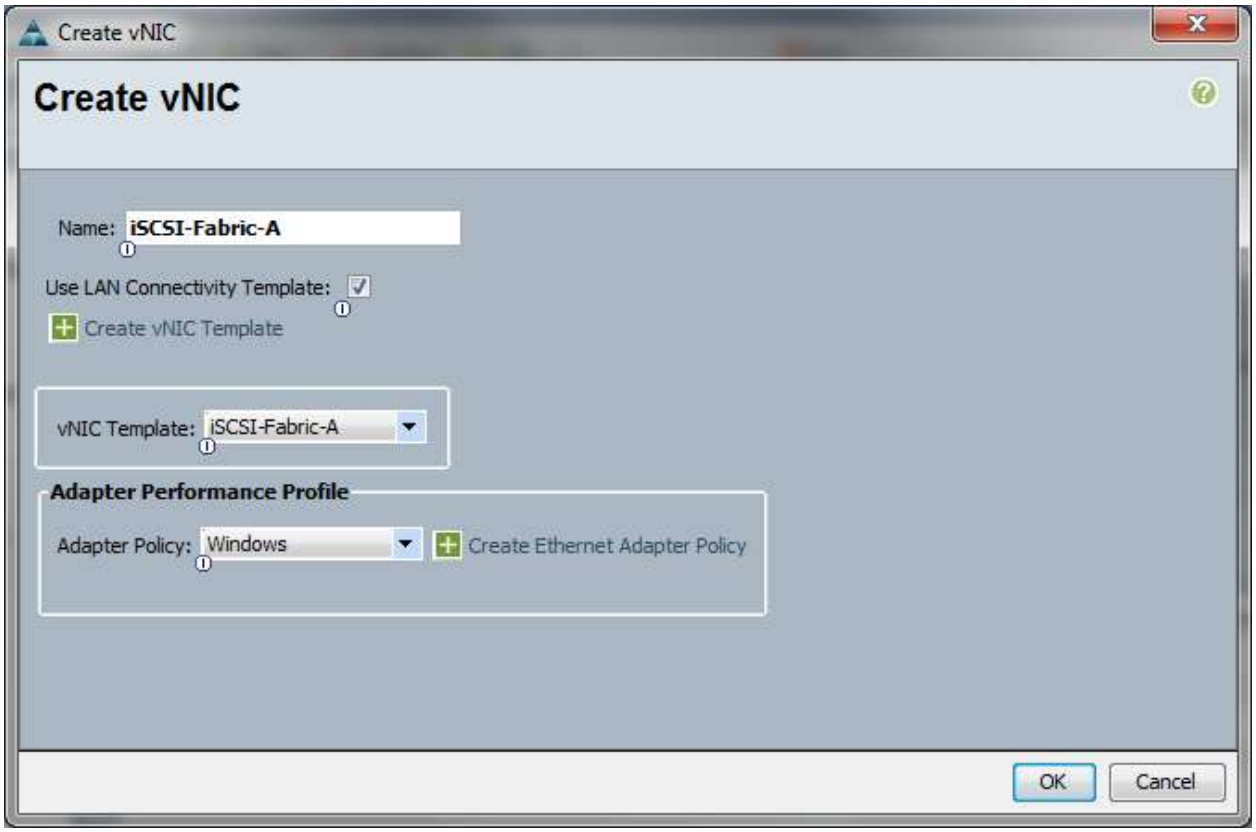
hh. The `Create vNIC window` displays. Name the vNIC `iSCSI-Fabric-A`.

ii. Check the `Use LAN Connectivity Template` checkbox.

jj. Select `iSCSI-Fabric-A` for the vNIC Template field.

kk. Select `Windows` in the Adapter Policy field.

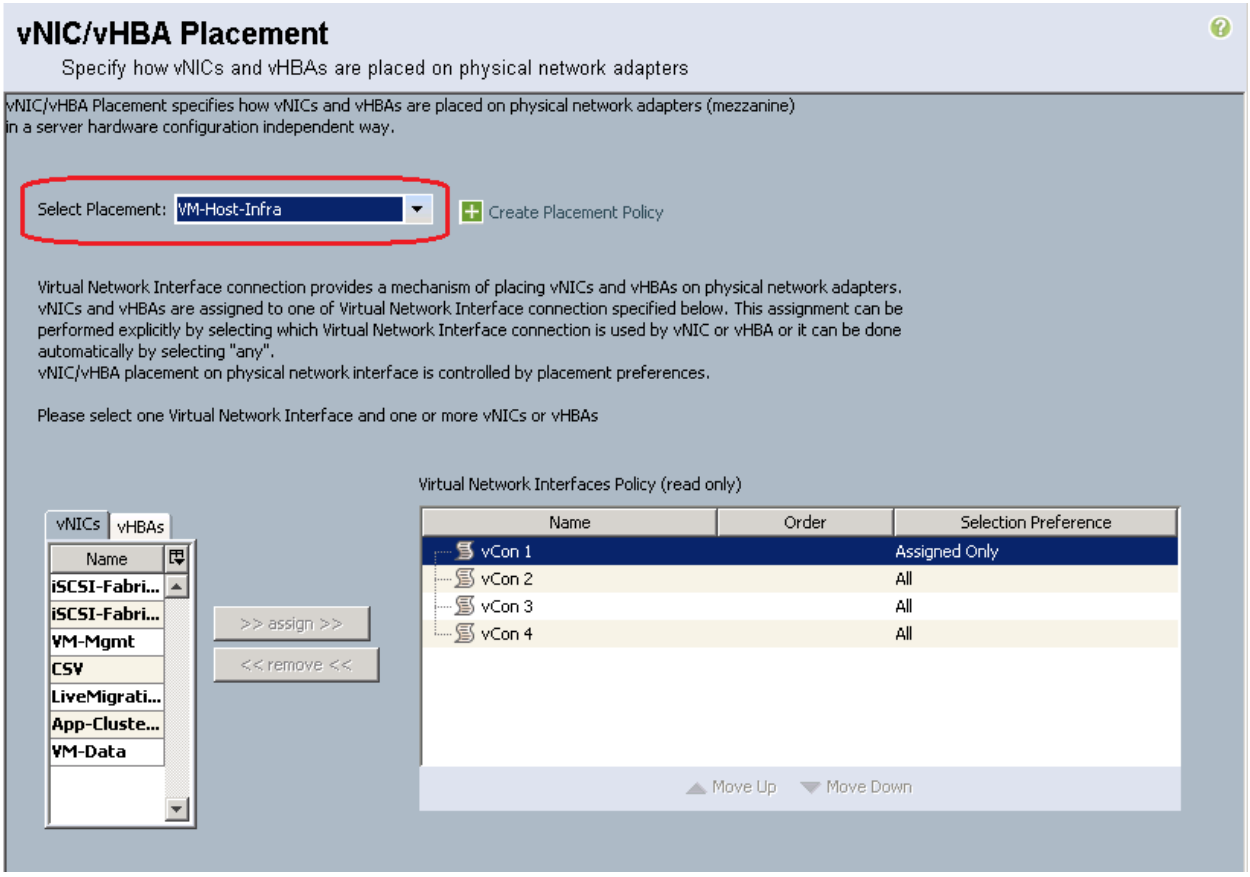
ll. Click `OK` to add the vNIC to the template.



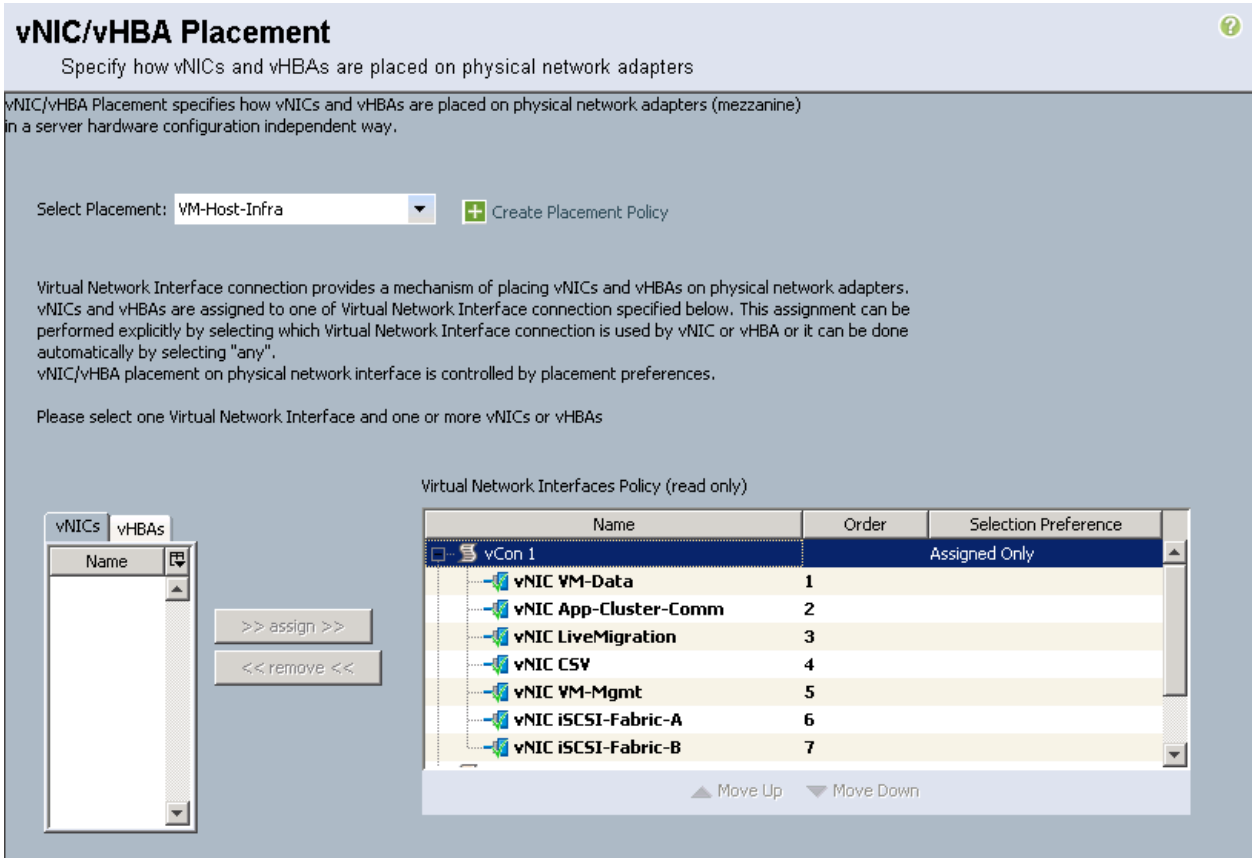
16. Click `Add` to add a vNIC to the template.
17. The `Create vNIC window` displays. Name the vNIC `iSCSI-Fabric-B`.
18. Check the `Use LAN Connectivity Template` checkbox.
19. Select `iSCSI-Fabric-B` for the vNIC Template field.
20. Select `Windows` in the Adapter Policy field.
21. Click `OK` to add the vNIC to the template.

22. Verify: Review the table to make sure that all of the vNICs were created.

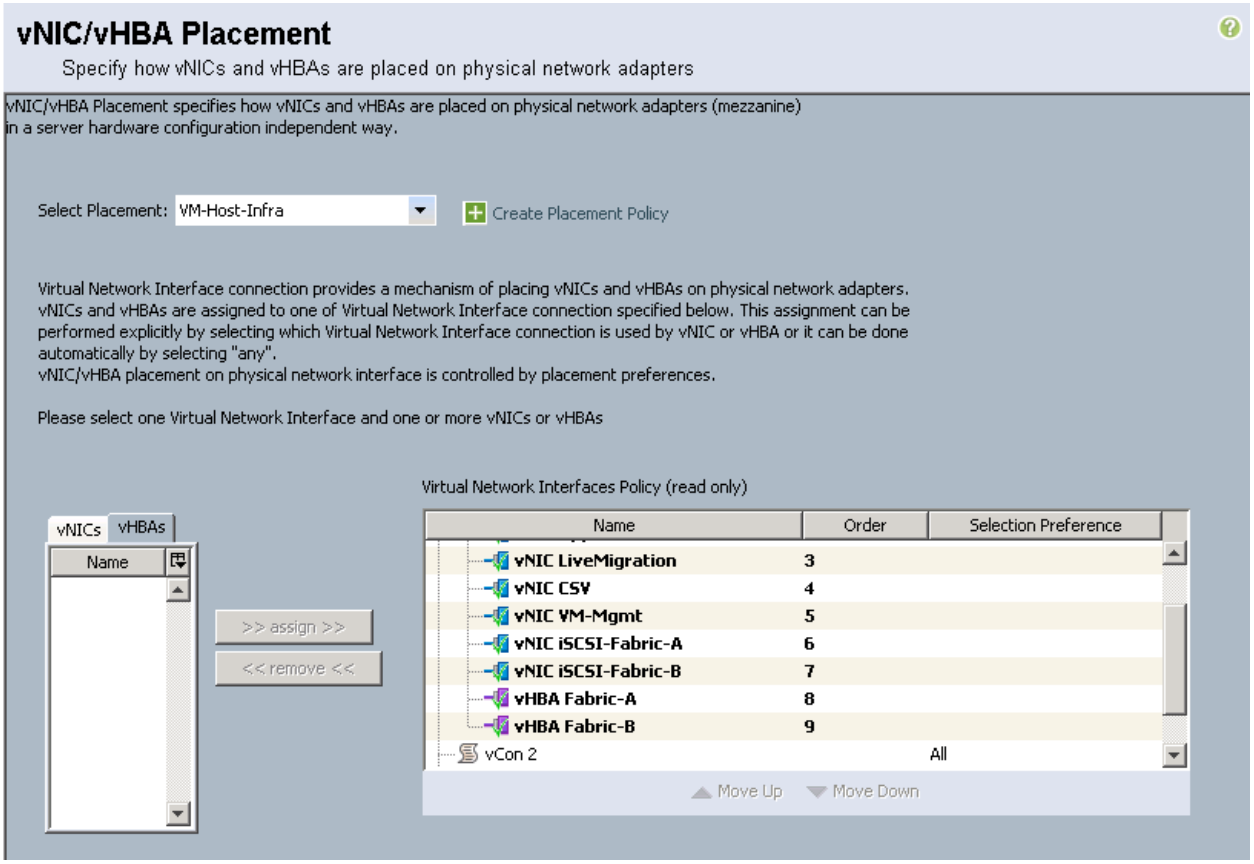
23. Click `Next` to continue to the next section.
24. vNIC/vHBA Placement Section
25. Select the `VM-Host-Infra` Placement Policy in the `Select Placement` field.



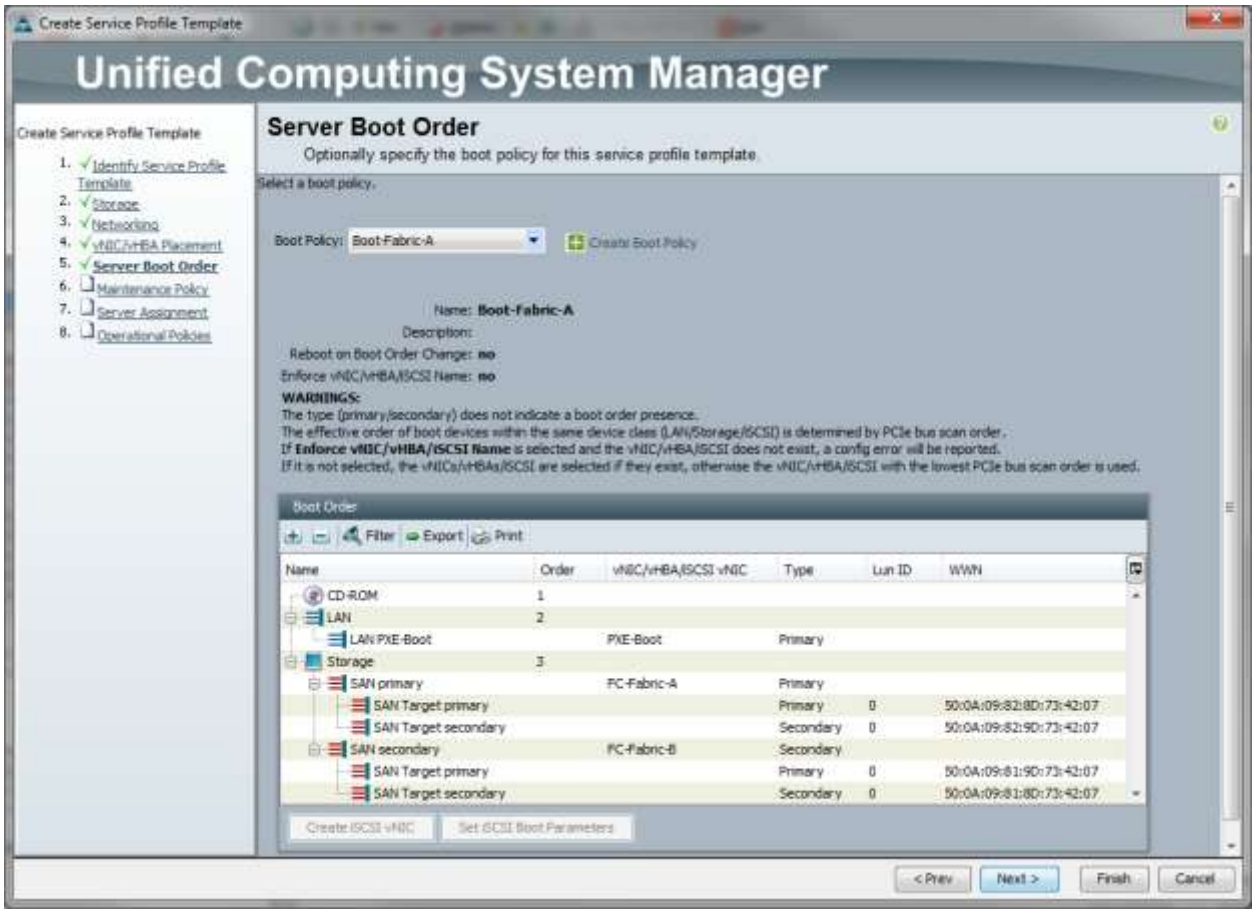
26. Select vCon1 assign the vNICs in the following order:
    a. VM-Data
    b. App-Cluster-Comm
    c. LiveMigration
    d. CSV
    e. VM-Mgmt
    f. iSCSI-Fabric-A
    g. iSCSI-Fabric-B



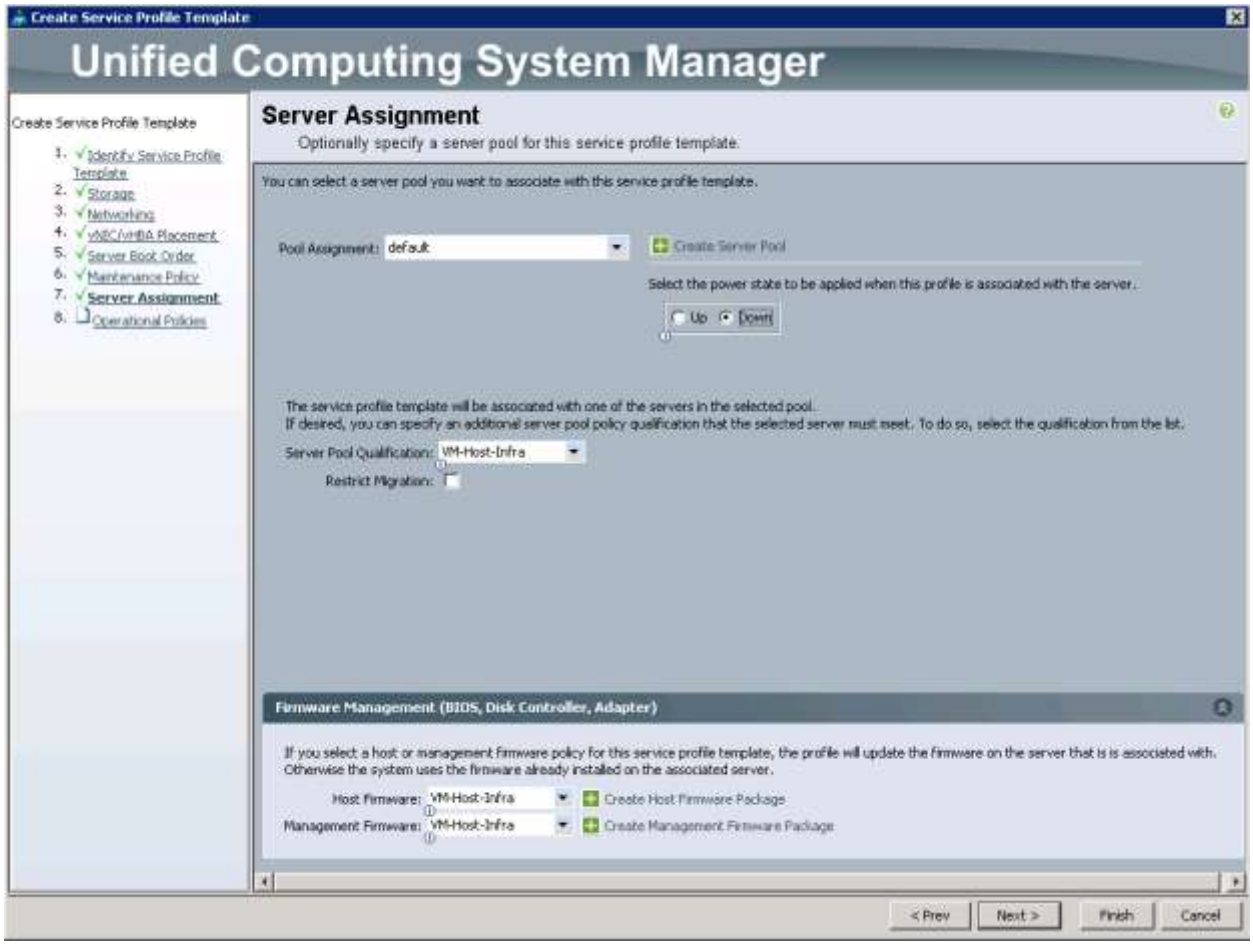
27. Click the vHBA tab and add the vHBAs in the following order:
    a. Fabric-A
    b. Fabric-B
28. Verify: Review the table to make sure that all of the vHBAs and vNICs were created. The order of the vNICs and vHBAs is not important.



29. Click `Next` to continue to the next section.
30. Server Boot Order Section
    a. Select `Boot Fabric-A` in the Boot Policy field.
    b. Verify: Review the table to make sure that all of the boot devices were created and identified. Verify that the boot devices are in the correct boot sequence.
    c. Click `Next` to continue to the next section.

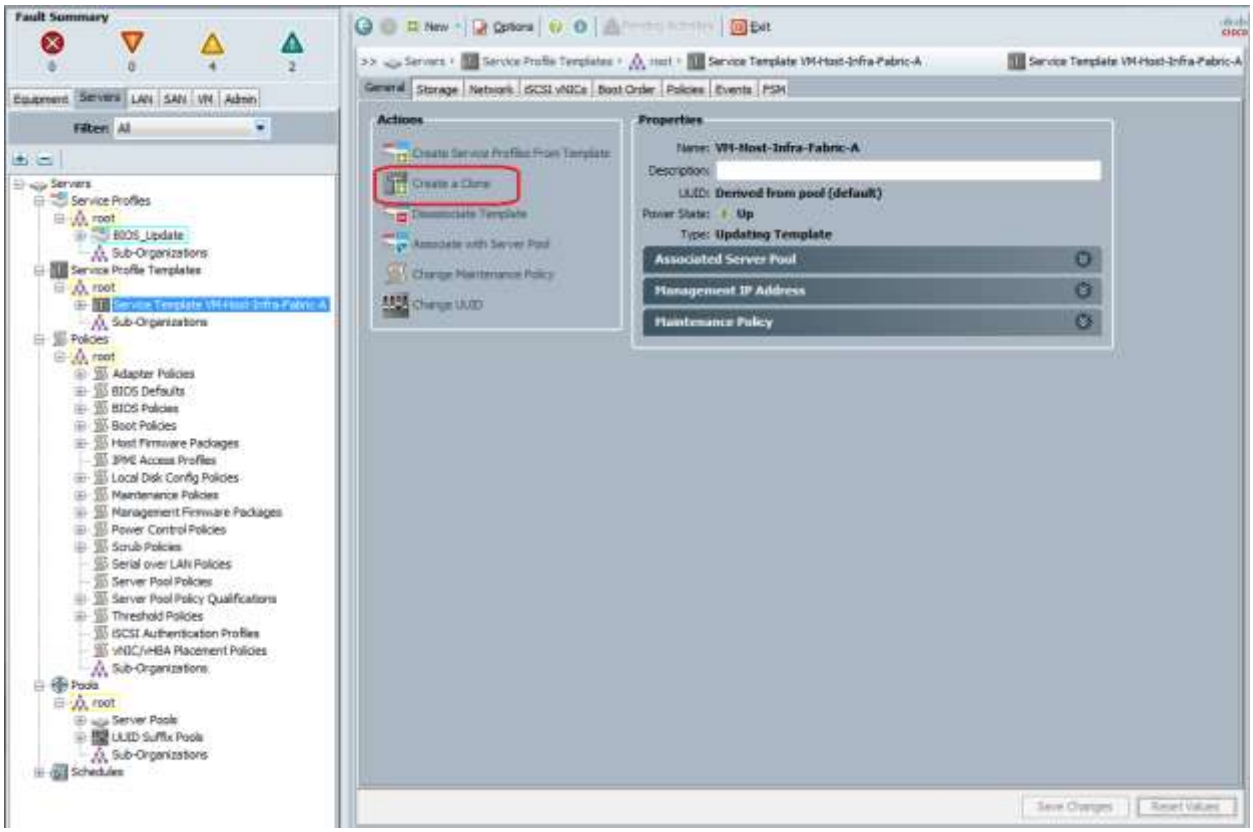


31. Maintenance Policy Section
    a. Keep the default of no policy used by default.
    b. Click `Next` to continue to the next section.
32. Server Assignment Section
    a. Select `Default` in the `Pool Assignment` field.
    b. Select `VM-Host-Infra` for the Server Pool Qualification field.
    c. Select `Up` for the power state.
    d. Select `VM-Host-Infra` in the `Host Firmware` field.
    e. Select `VM-Host-Infra` in the `Management Firmware` field.
    f. Click `Next` to continue to the next section.



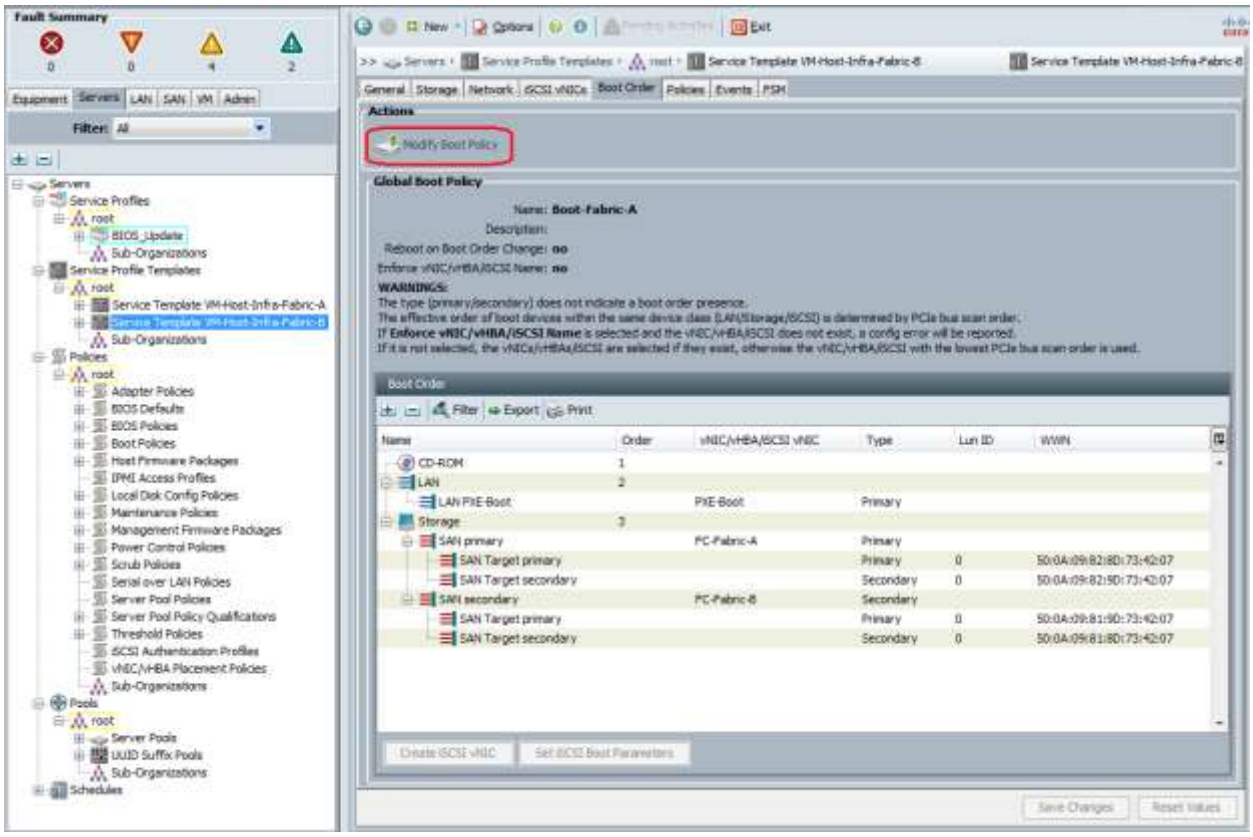
33. Operational Policies Section
    a. Select `VM-Hot-Infra` in the `BIOS Policy` field.
    b. Expand `Power Control Policy Configuration`.
    c. Select `No-Power-Cap` in the `Power Control Policy` field.
    d. Click `Finish` to create the Service Profile template.
    e. Click `OK` in the pop-up window to proceed.

34. Select the `Servers` tab at the top left of the window.
35. Go to `Service Profile Templates > root.`
36. Select the previously created `VM-Host-Infra-Fabric-A` template
37. Click `Create a Clone`.

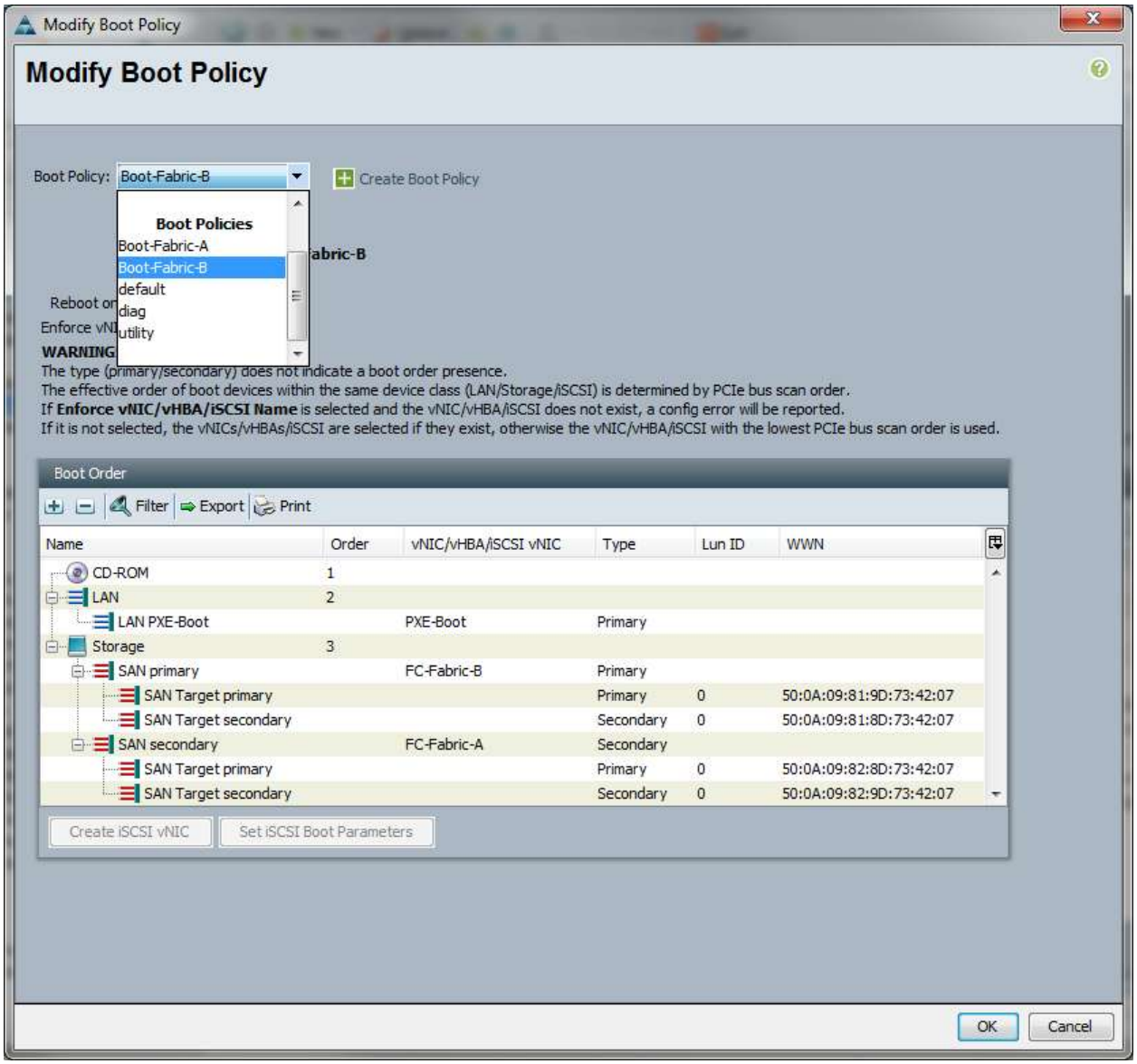


38. Enter `VM-Host-Infra-Fabric-B` in the Clone Name field and click `OK`.

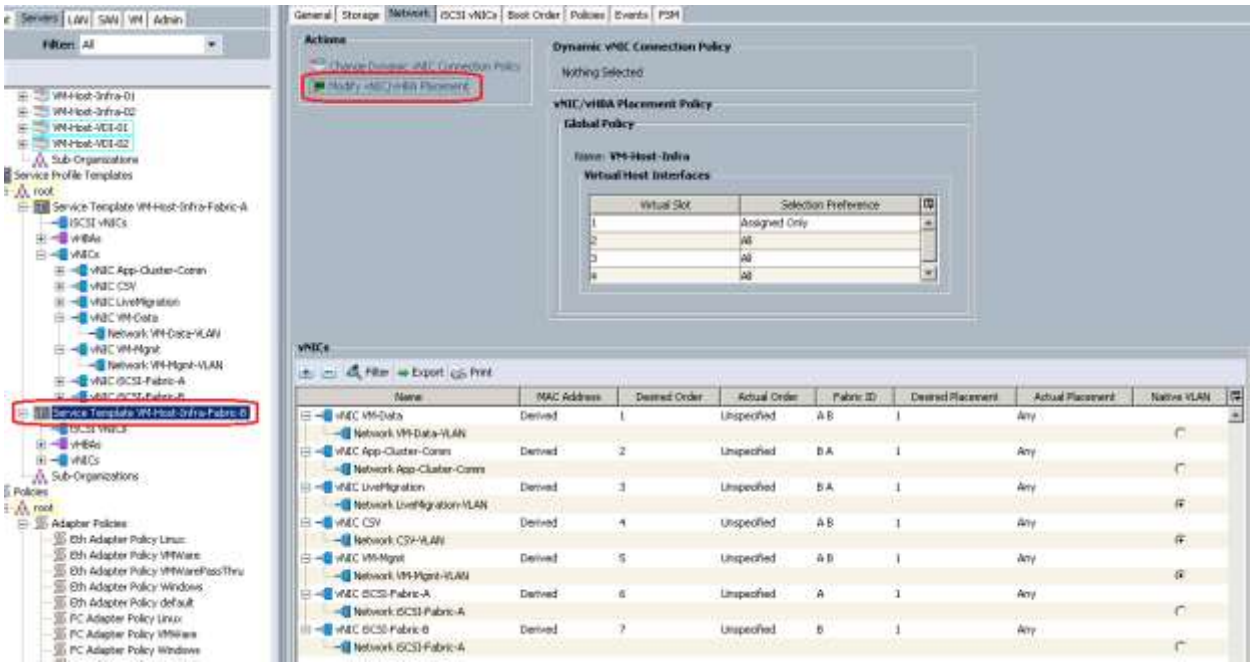
39. Select the newly created service profile template and select the `Boot Order` tab.
40. Click `Modify Boot Policy.`



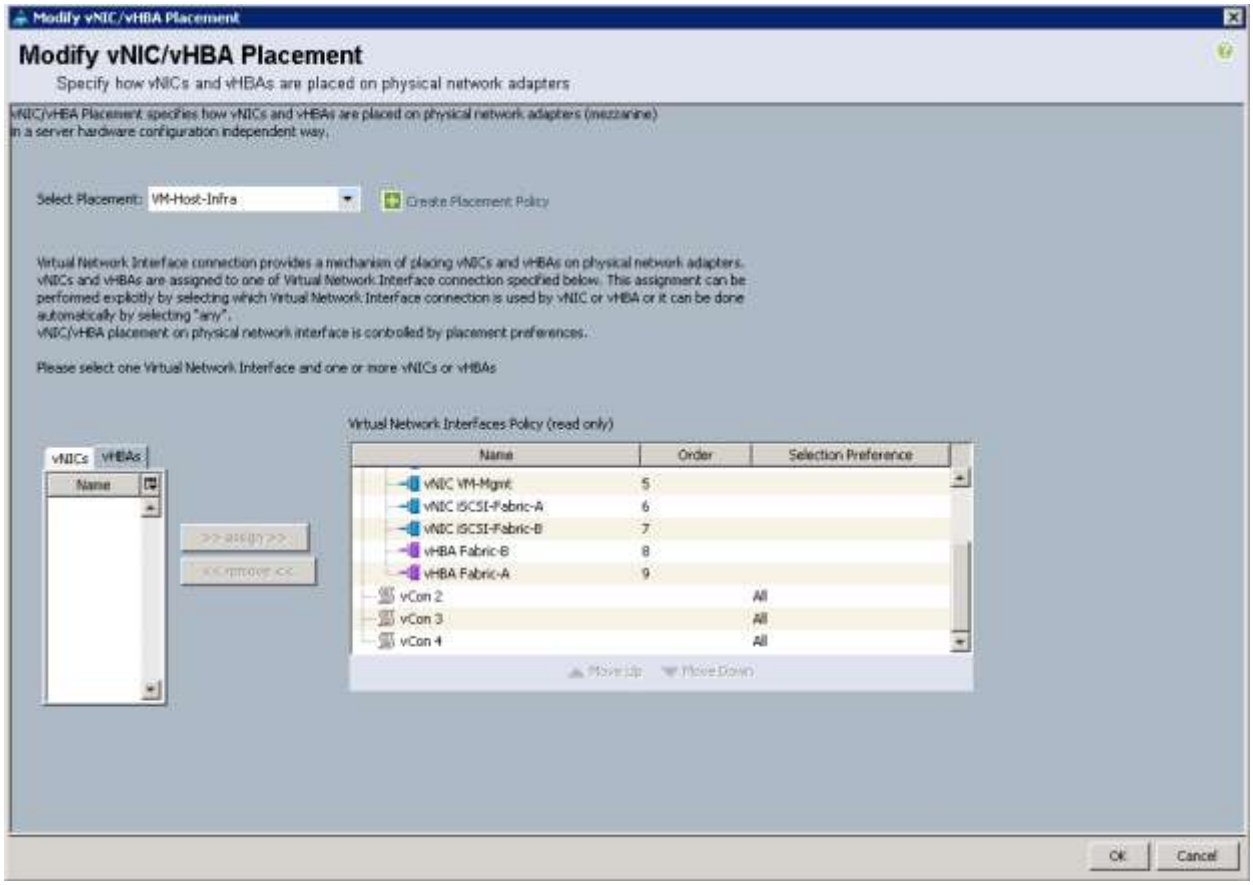
41. Select `Boot-Fabric-B` Boot Policy and click `OK`.



42. Select the `Network` tab and click `Modify vNIC/HBA Placement Policy`.



43. Move vHBA `Fabric-B` ahead of vHBA `Fabric-A` in the placement order and click `OK`.

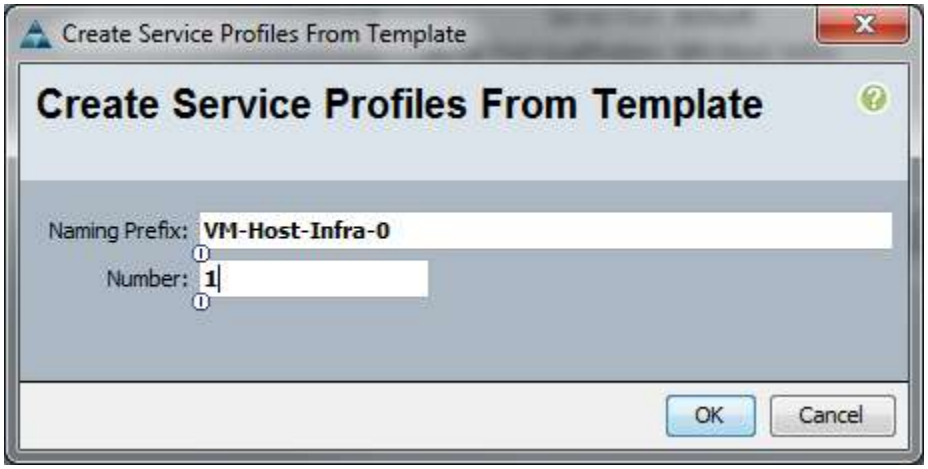


Create Service Profiles

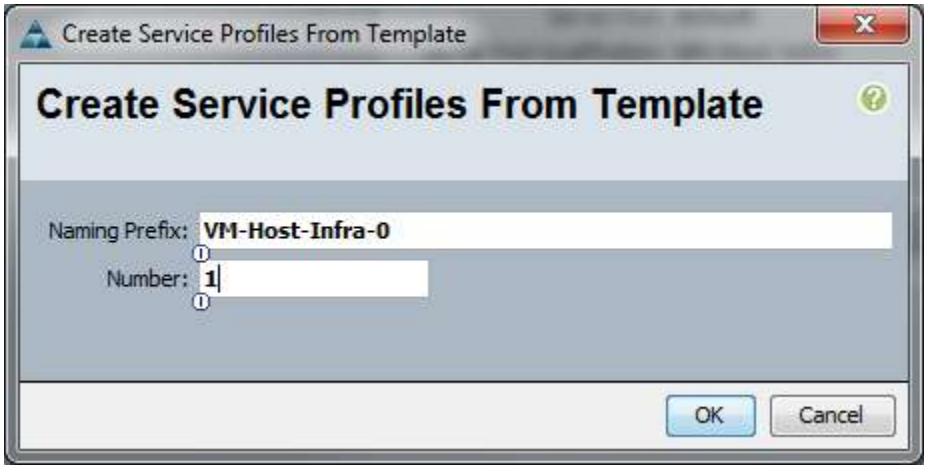
These steps provide details for creating a service profile from a template.

Cisco UCS Manager

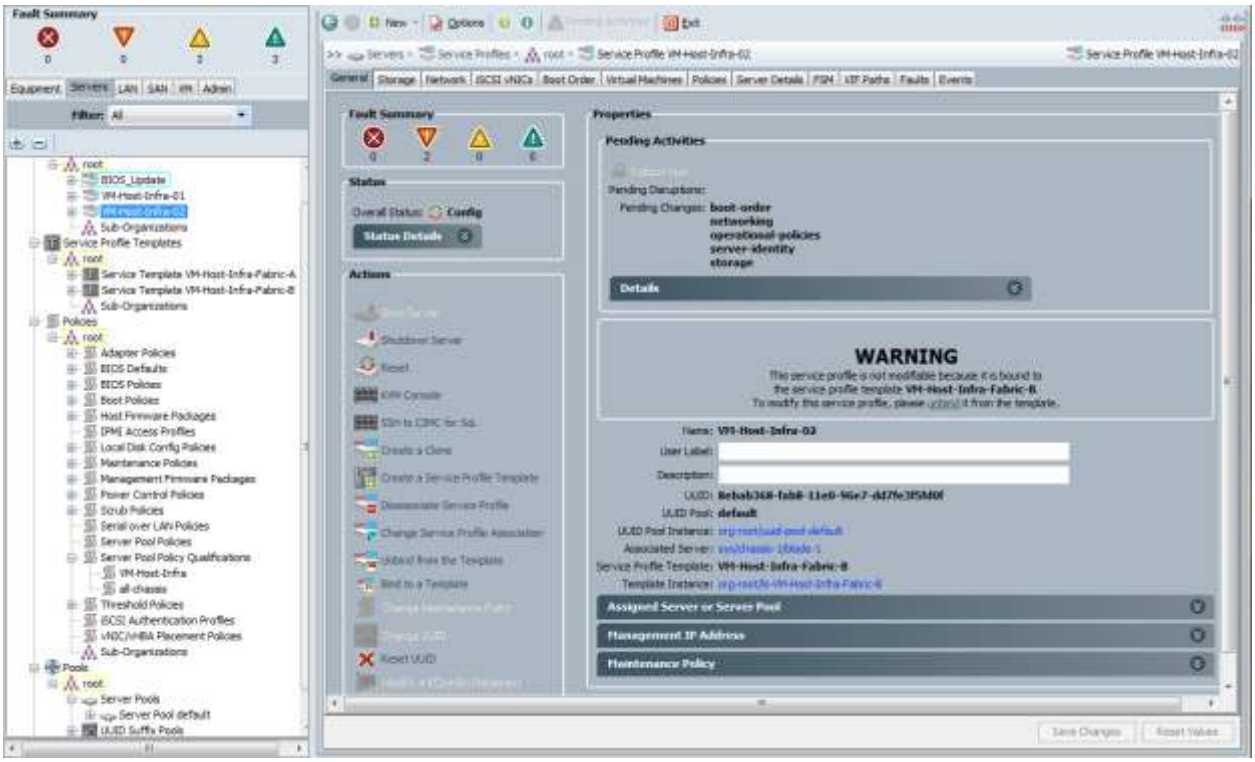
1. Select the `Servers` tab at the top left of the window.
2. Select `Service Profile Templates VM-Host-Infra-Fabric-A`
3. Right-click `and select Create Service Profile From Template.`
4. Enter `VM-Host-Infra-0` for the service profile prefix.
5. Enter `1` for the number of service profiles to create.
6. Click `OK` to create the service profile.



7. Click `OK` in the message box.
8. Select `Service Profile Templates VM-Host-Infra-Fabric-B`
9. Right-click `and select Create Service Profile From Template.`
10. Enter `VM-Host-Infra-0` for the service profile prefix.
11. Enter `1` for the number of service profiles to create.
12. Click `OK` to create the service profile.



13. Click OK in the message box.
14. Verify that Service Profiles VM-Host-Infra-01 and VM-Host-Infra-02 are created. The service profiles will automatically be associated with the servers in their assigned server pools.



Add a Block of IP Addresses for KVM Access

These steps provide details for creating a block of KVM ip addresses for server access in the Cisco UCS environment.

Cisco UCS Manager

1. Select the Admin tab at the top of the left window.
2. Select All > Communication Management.
3. Right-click Management IP Pool.
4. Select Create Block of IP Addresses.
5. Enter the starting IP address of the block and number of IPs needed as well as the subnet and gateway information.
6. Click OK to create the IP block.
7. Click OK in the message box.

Synchronize Cisco UCS to NTP

These steps provide details for synchronizing the Cisco UCS environment to the NTP server.

Cisco UCS Manager

1. Select the Admin tab at the top of the left window.

2. Select `All > Timezone Management`.
3. Right-click `Timezone Management`.
4. In the right pane, select the appropriate timezone in the Timezone drop-down menu.
5. Click `Save Changes` and then `OK`.
6. Click `Add NTP Server`.
7. Input the NTP server IP and click `OK`.

Add More Server Blades to the FlexPod Unit

Add server pools, service profile templates, and service profiles in the respective organizations to add more servers to the FlexPod unit. All other pools and policies are at the root level and can be shared among the organizations.

Gather Necessary Information

After the Cisco UCS service profiles have been created (in the previous steps), the infrastructure blades in the environment each have a unique configuration. To proceed with the FlexPod deployment, specific information must be gathered from each Cisco UCS blade and from the NetApp controllers. Insert the required information in the tables below.

NetApp Controller	FC Port	FC Portname
Controller A	0c	
	0d	
Controller B	0c	
	0d	

Note: On each NetApp controller use `show fcp adapters` to gather the information above. If using FCoE between storage and the Cisco Nexus 5548s, substitute 2a for 0c and 2b for 0d.

Cisco UCS Service Profile Name	Fabric-A WWPN	Fabric-B WWPN
VM-Host-Infra-01		
VM-Host-Infra-02		

Note: To gather the information in the table above, launch the Cisco UCS Manager GUI, and in the left pane select the `Servers` tab. From there, expand `Servers > Service Profiles > root >` . Click each service profile and then click the `Storage` tab on the right. While doing so, record the WWPN information in the right display window for both vHBA_A and vHBA_B for each service profile in the table above.

Cisco Nexus 5548 Deployment Procedure: Part 2

These steps provide details for completing the configuration of the Nexus infrastructure for the FlexPod environment.

Create VSANs, Assign FC Ports, Turn on FC Ports

These steps provide details for configuring VSANs, assigning FC ports and enabling FC ports.

Note: This procedure sets up Fibre Channel connections between the Nexus 5548s and the NetApp Storage Systems. If you want to use FCoE connections between the Nexus 5548s and the NetApp Storage Systems using the NetApp Unified Target Adapter (UTA). Use the Alternate Cisco Nexus 5548 Deployment Procedure: Part 2 in the Appendix.

Cisco Nexus 5548 A

1. From the global configuration mode, type `interface san-port-channel 1`.
2. Type `channel mode active`.
3. Type `exit`.
4. Type `vsan database`.
5. Type `vsan <VSAN A ID> name Fabric_A`.
6. Type `vsan <VSAN A ID> interface fc1/29-32`.
7. Type `vsan <VSAN A ID> interface san-port-channel 1`.
8. Type `exit`.
9. Type `interface fc1/31-32`.
10. Type `channel-group 1 force`.
11. Type `no shutdown`.
12. Type `exit`.
13. Type `interface fc1/29-30`.
14. Type `no shutdown`.
15. Type `exit`.
16. Type `show int san-port-channel 1` to confirm connectivity.
17. Type `interface fc1/29`.
18. Type `switchport description <Controller A:0c>`.
19. Type `exit`.
20. Type `interface fc1/30`.
21. Type `switchport description <Controller B:0c>`.
22. Type `exit`.
23. Type `interface fc1/31`.
24. Type `switchport description <UCSM A:fc1/31>`.
25. Type `exit`.
26. Type `interface fc1/32`.
27. Type `switchport description <UCSM A:fc1/32>`.
28. Type `exit`.

Cisco Nexus 5548 B

1. From the global configuration mode, type `interface san-port-channel 2`.
2. Type `channel mode active`.
3. Type `exit`.

4. Type `vsan database`.
5. Type `vsan <VSAN B ID> name Fabric_B`.
6. Type `vsan <VSAN B ID> interface fc1/29-32`.
7. Type `vsan <VSAN B ID> interface san-port-channel 2`.
8. Type `exit`.
9. Type `interface fc1/31-32`.
10. Type `channel-group 2 force`.
11. Type `no shutdown`.
12. Type `exit`.
13. Type `interface fc1/29-30`.
14. Type `no shutdown`.
15. Type `exit`.
16. Type `show int san-port-channel 2` to confirm connectivity.
17. Type `interface fc1/29`.
18. Type `switchport description <Controller A:0d>`.
19. Type `exit`.
20. Type `interface fc1/30`.
21. Type `switchport description <Controller B:0d>`.
22. Type `exit`.
23. Type `interface fc1/31`.
24. Type `switchport description <UCSM B:fc1/31>`.
25. Type `exit`.
26. Type `interface fc1/32`.
27. Type `switchport description <UCSM B:fc1/32>`.
28. Type `exit`.

Create Device Aliases and Create Zones

These steps provide details for configuring device aliases and zones for the primary boot path. Instructions are given for all target ports, however, the redundant path is enabled following operating system installation..

Cisco Nexus 5548 A

1. From the global configuration mode, type `device-alias database`.
2. Type `device-alias name VM-Host-Infra-01_A pwwn <Fabric-A WWPN>`.
3. Type `device-alias name VM-Host-Infra-02_A pwwn <Fabric-A WWPN>`.
4. Type `device-alias name controller_A_0c pwwn <Controller A 0c WWPN>`.
5. Type `device-alias name controller_B_0c pwwn <Controller B 0c WWPN>`.
   Get this information from the table in section Gather Necessary Information.
6. After all of the necessary device-alias are created, type `exit`.

7. Type `device-alias commit`.
8. Create the zone for each service profile.
   a. Type `zone name VMVM-Host-Infra-01_A vsan <Fabric A VSAN ID>`.
   b. Type `member device-alias ucs controller_A_0c1_A`.
   c. Type `member device-alias controller_A_0c`.
   d. Type `exit`.
9. After the zone for the primary path of the first Cisco UCS service profiles has been created, create a zoneset to organize and manage them.
10. Create the zoneset and add the necessary members.
    a. Type `zoneset name flexpod vsan <Fabric A VSAN ID>`.
    b. Type `member ucs controller_A_0c1_A`.
    c. Type `exit`.
11. Activate the zoneset.
    a. Type `zoneset activate name flexpod vsan < Fabric A VSAN ID>`.
    b. Type `exit`.
12. Type `copy run start`.

Cisco Nexus 5548 B

1. From the global configuration mode, type `device-alias database`.
2. Type `device-alias name VMVM-Host-Infra-01_B pwwn <Fabric-B WWPN>`.
3. Type `device-alias name ucs_controller_B_0d1_B pwwn <Fabric-B WWPN>`.
4. Type `device-alias name controller_A_0d pwwn <Controller A 0d WWPN>`.
5. Type `device-alias name controller_B_0d pwwn <Controller B 0d WWPN>`.
   Get this information from the tables in the section Gather Necessary Information.

6. After all of the necessary device-alias are created, type `exit`.
7. Type `device-alias commit`.
8. Create the zones for each service profile.
   a. Type `zone name VM-Host-Infra-02_B vsan <Fabric B VSAN ID>`.
   b. Type `member device-alias ucs controller_B_0d1_B`.
   c. Type `member device-alias controller_B_0d`.
   d. Type `exit`.
9. After all of the zones for the Cisco UCS service profiles have been created, create a zoneset to organize and manage them.
10. Create the zoneset and add the necessary members.
    a. Type `zoneset name flexpod vsan <Fabric B VSAN ID>`.
    b. Type member `VM-Host-Infra-02`_B.
    c. Type `exit`.
11. Activate the zoneset.
    a. Type `zoneset activate name flexpod vsan <Fabric A VSAN ID>`.

b. Type `exit`.

12. Type `copy run start`.

NetApp FAS3240A Deployment Procedure: Part 2

The following sections provide detailed procedures for configuring the interface groups (or `igroups`), creating LUNs for the service profiles on the storage controllers, and mapping those LUNs to the igroups to be accessible to the service profiles.

Create iGroups

These steps provide details for configuring the necessary iGroups on the storage controller which enable the mapping of a given host the its storage resources.

Controller A

These steps provide details for assigning igroup configuration for each vHBA.

`igroup create –f –t hyper_v VMVM-Host-Infra-01 <Fabric-A WWPN> <Fabric-B WWPN>.`

`igroup set VMVM-Host-Infra-01 alua yes.`

Controller B

For the first service profile to boot off of controller B do the following to create igroups for each vHBA:

`igroup create –f –t hyper_v VM-Host-Infra-02<Fabric-A WWPN> <Fabric-B WWPN>.`

`igroup setVM-Host-Infra-02alua yes.`

Create LUNs

These steps provide details for configuring the necessary LUNs on the storage controller for deployment of the SAN booted Windows 2008 R2 SP1 operating system. This LUN, when prepared, will be used as the base for cloning multiple installations.

Controller A

For the first service profile to boot off of controller A do the following to create the LUN for the OS installation:

`lun create –s 250g –t hyper_v –o noreserve /vol/win_boot_A/ hyper-v-host`

Map LUNs to iGroup

These steps provide details for mapping the necessary LUN on the storage controller to the created iGroups.

Controller A

For the first service profile to boot off of controller A map the LUN for the OS installation:

`lun map /vol/win_boot_A/hyper-v-host VM-Host-Infra-01 0.`

Prepare the Host for Windows Server 2008 R2 SP1 Installation

These steps provide the details necessary to prepare the host for the installation of Windows Server 2008 R2.

Note: In order for the Windows Installer to recognize the Fiber Channel SAN boot disk for each server, the Cisco UCS fnic driver must be loaded into the windows installer during installation. Please download the latest Unified Computing System (UCS) Drivers from www.cisco.com under Cisco UCS B-Series Blade Server Software and place the iso on the same machine with the Windows Server 2008 R2 SP1 DVD iso.

Cisco UCS Manager

1. In the KVM window, select the `Virtual Media` tab.
2. Click the `Add Image…` button in the window that displays.
3. Browse to the Windows Server 2008 R2 SP1iso image file.
4. Click `Open` to add the image to the list of virtual media.
5. Click the checkbox for `Mapped` next to the entry corresponding to the image you just added.
6. In the KVM window, select the `KVM` tab to monitor during boot..
7. In the KVM window, select the `Boot Server` button in the upper left corner.
8. Click `OK`.
9. Click `OK`.

Install Windows Server 2008 R2

These steps provide the details necessary for the installation of Windows Server 2008 R2.

Cisco UCS Manger

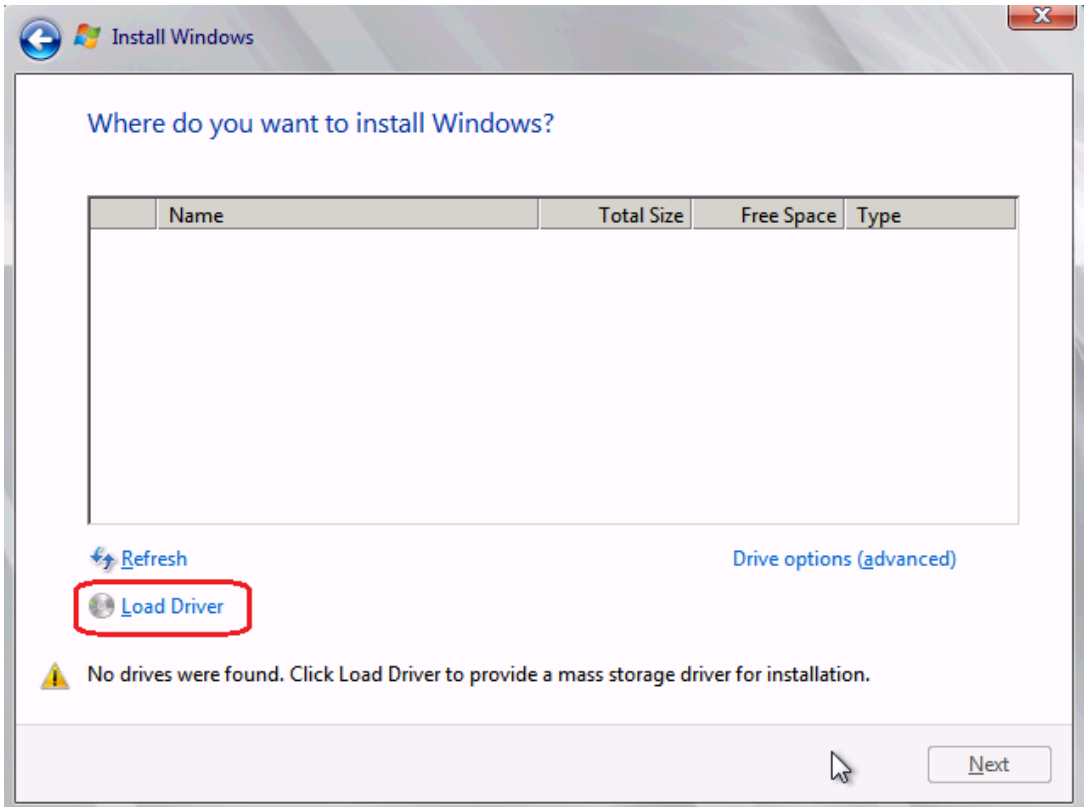
1. In the KVM window, select the `Boot Server` button in the upper left corner.
2. Click `OK`.
3. Click `OK`.
4. Reboot the blade using the `Boot Server` button at the top of the KVM window.

Note: It does not matter whether you use a soft or hard reboot, because the blades do not have an OS.

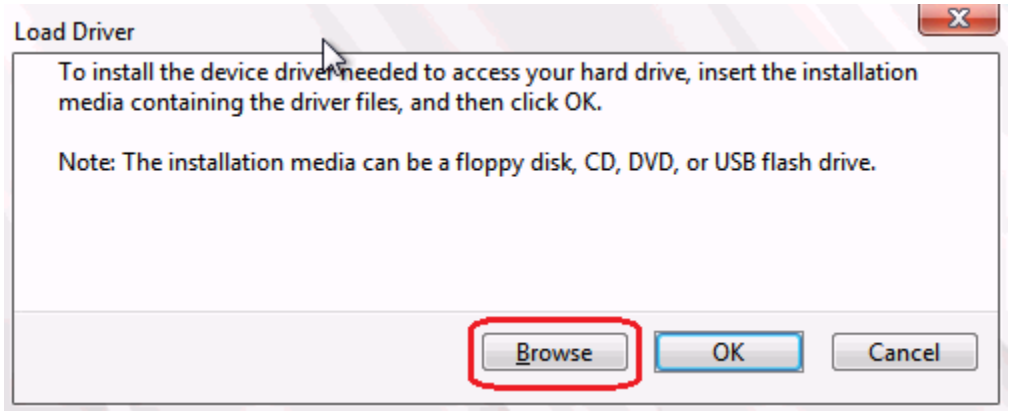
5. On reboot, the machine detects the presence of the Windows Server 2008 R2 SP1install media.
6. Select `Next` from the Install Windows window that displays and proceed to install Windows Server 2008 R2 SP1DataCenter Edition Full Installation.

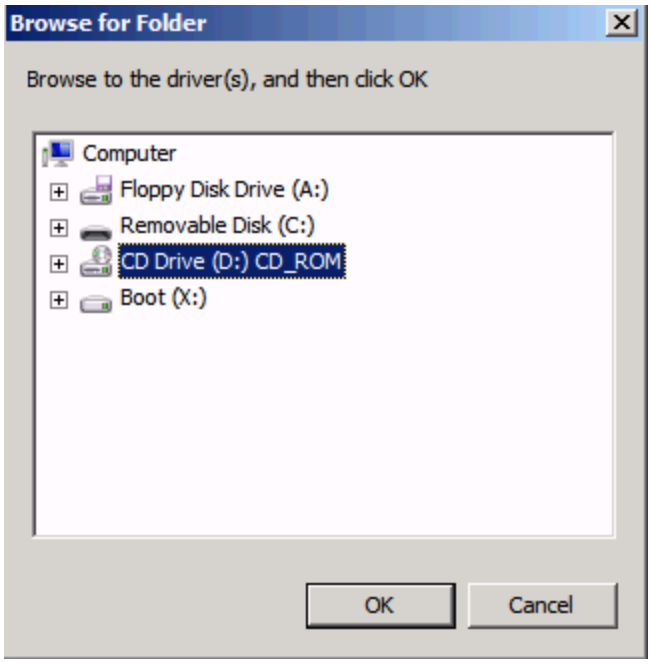
Note: During installation the Cisco VIC FCoE Storport Miniport driver will need to be loaded.

7. When the screen displays to select the installation disk, select `Load Driver`.

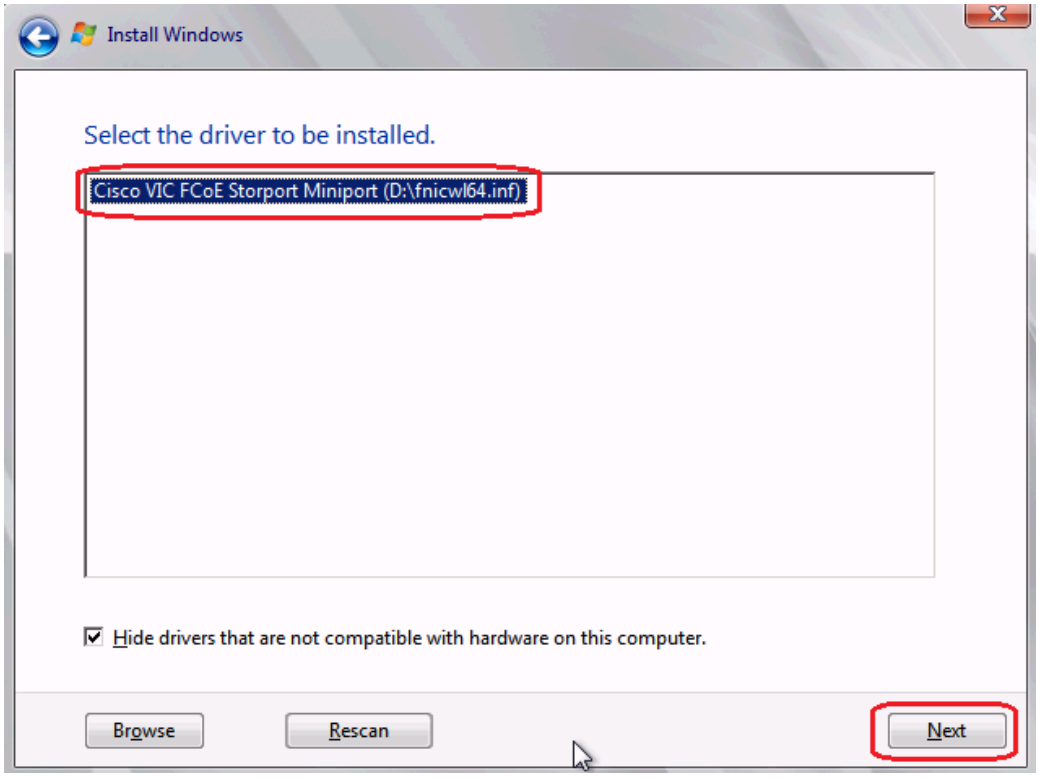


8. In order to load the appropriate driver, unmap the Windows Installer DVD in the Virtual Media tab.
9. Browse to and map the Cisco Drivers iso downloaded earlier.
10. Browse to the \Windows\Storage\Cisco\M81KR\W2K8R2\x64 folder on the mounted iso.



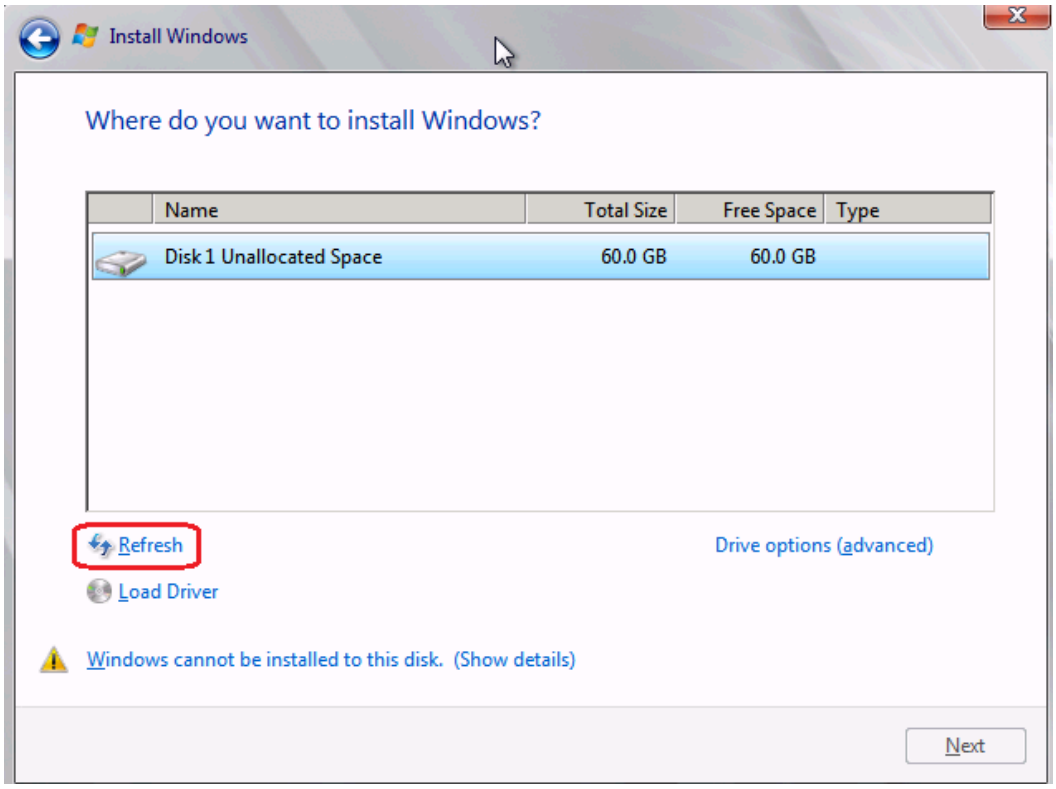


11. The Cisco VIC FCoE StorePort Drive will be selected. Click `Next` to load the driver.

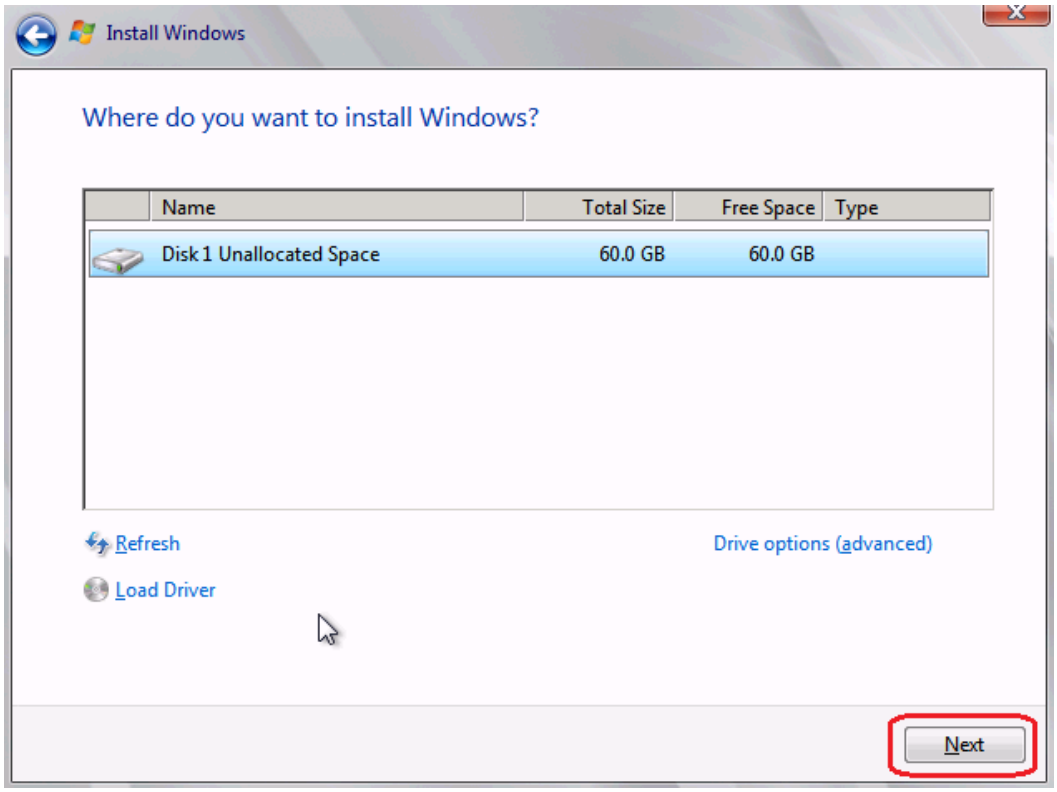


12. Switch to the `Virtual Media` tab.
13. Uncheck the check box for the currently mapped ISO image for Mapped next to the entry corresponding to the image you just added.

14. Remap the Windows Installer DVD by checking the `Mapped` box next to the ISO image.
15. Switch back to the `KVM` tab.
16. The boot LUN will now be visible as a selectable storage device for the Windows installation. Click the `Refresh` button to allow the installer to recognize the Windows Installer DVD.



17. Click `Next` to continue with installation. Do a standard installation of Windows Server 2008 R2 SP1DataCenter Edition.



Note: Detailed steps for the installation of Windows Server 2008 R2 SP1DataCenter Edition are not provided. Please reference Microsoft documentation in for this information.

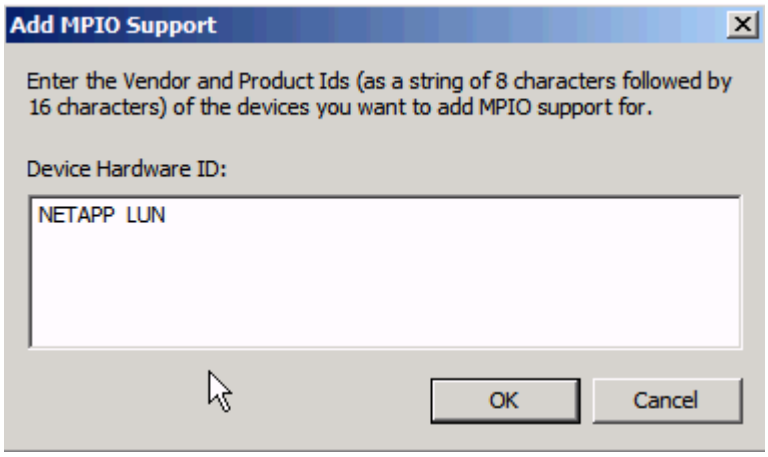
18. Following completion of the installation of Windows 2008 R2, which may require several server reboots, log into the server with an administrative account.
19. In the KVM window, select the `Virtual Media` tab.
20. Click the `Add Image…` button in the window that displays.
21. Browse to the Cisco Drivers iso image file.
22. Click `Open` to add the image to the list of virtual media.
23. Click the checkbox for `Mapped` next to the entry corresponding to the image you just added.
24. Within the KVM console of the host, browse to Device Manager. This can be accomplished by right-clicking `My Computer` and selecting `Properties` and selecting `Device Manager`.
25. Select the first Ethernet Controller in the Other Devices category.
26. Right-click and select `Update Driver Software`.
27. Click `Browse my computer` for driver software and browse to the \Windows\Network\Cisco\M81KR\W2K8R2\x64 folder on the virtual CD drive.
28. Click `Next` .
29. Click `Close` to complete the driver installation.
30. At the top of the Device Manager window, click `Action > Scan for Hardware Changes` button to install the Cisco driver to the remaining Ethernet interfaces.
31. Click the `X` at the top right corner to close the Device Manager window.

Note: At this point, if you have a DHCP server installed on your Management Network, the Management Network Interface should come up with an IP address. If you do not have DHCP, use the later procedure "Configure Network Interfaces and Rename Server" to determine which Network Interface is on the Management VLAN and configure it with a static IP with connection to the outside world.

32. Right-click `My Computer` and select `Manage`.
33. The Server Manager window displays.
34. Right-click `Features`.
35. Install the following features:
    - .NET Framework 3.5.1 Features. (WCF Activation is not required)
    - Multipath I/O
36. Return to Server Manager and right-click `Roles`.
37. Select `Add Role`.
38. Select the `Hyper-V` role and click `Next` to complete the installation wizard.
39. Chose the option not to reboot the server. The server will be rebooted after the next step.

Configure MPIO

1. Click `Start`, select `Administrative Tools`, and click `MPIO`
2. Click the `Add` button and enter `NETAPP LUN`. (There are two spaces between NETAPP and LUN)



3. A reboot is required. Click `OK` to reboot the server.
4. After the server reboots, login again with administrator rights and open the MPIO configuration utility again.
5. Verify the `NETAPP LUN` entry is in the list.
6. Open the Device Manger by clicking `Start > Run`, and typing `devmgmt.msc`.
7. Expand the Disk Drives node and verify that you entered the `NETAPP LUN Multi-Path Disk Device`. Additional SAN paths for redundancy.

Install Microsoft Hotfixes

Install the following Windows HotFixes:

- KB2517329,

- KB2552040,
- KB2522766
- KB2528357.

This will require multiple reboots.

Create Zones for Redundant Paths

These steps provide details for configuring zones for the redundant boot path for each service profile.

Note: If FCoE is being used between the Nexus 5548s and Storage, use the Alternate Create Zones for Redundant Paths section in the Appendix.

Cisco Nexus 5548 A

1. From the global configuration mode, create the zones for the redundant path for each service profile.
   a. Type zone name `VM-Host-Infra-01_A vsan <Fabric A VSAN ID>`.
      1. Type `member device-alias controller_B_0c`.
      2. Type `exit`.
      3. Type `zone name VM-Host-Infra02_A vsan <Fabric A VSAN ID>`.
      4. Type `member device-alias VM-Host-Infra02_A`.
      5. Type `member device-alias controller_B_0c`.
      6. Type `member device-alias controller_A_0c`.
      7. Type `exit`.
2. Modify the zoneset and add the necessary members.
   a. Type `zoneset name flexpod vsan <Fabric A VSAN ID>`.
      8. Type `member` VM-Host-Infra-02.
      9. Type exit.
3. Activate the zoneset.
   a. Type `zoneset activate name flexpod vsan <Fabric A VSAN ID>`.
      10. Type `exit`.
      11. Type `copy run start`.

Cisco Nexus 5548 B

1. From the global configuration mode, create the zones for the redundant path for each service profile.
   a. Type `zone name VM-Host-Infra-01_B vsan <Fabric B VSAN ID>`.
   b. Type `member device-alias` alias VM-Host-Infra-01_B.
   c. Type `member device-alias controller_A_0d`.
   d. Type `member device-alias controller_B_0d`.
   e. Type `exit`.
   f. Type `zone name` VM-Host-Infra-02_B `vsan <Fabric B VSAN ID>`.
   g. Type `member device-alias controller_A_0d`.
   h. Type `exit`.
2. Modify the zoneset and add the necessary members.

a. Type `zoneset name flexpod vsan <Fabric B VSAN ID>`.

b. Type `member` VM-Host-Infra-01_B.

c. Type `exit`.

3. Activate the zoneset.

a. Type `zoneset activate name flexpod vsan <Fabric B VSAN ID>`.

b. Type `exit`.

4. Type `copy run start`.

Verify MultiPath I/O Connections (Both Hyper-V Hosts)

Both Cisco UCS Hosts

1. Open the Device Manger by clicking `Start > Run`, and typing `devmgmt.msc`.
2. Expand the Disk Drives node and verify that you entered the `NETAPP LUN Multi-Path Disk Device`. Additional SAN paths for redundancy.

Clone the Windows Server 2008 R2 SP1 Installation

During these steps, you will be guided through the creation of a golden Windows image which once created is used for rapid cloning of the Windows 2008 R2 SP1 installation. At this point, the boot LUN for the first server can be cloned and prepared using Microsoft Sysprep to be used for host VM-Host-Infra-02 and future Servers.

Cloning is a NetApp feature that enables the rapid provisioning of resources while requiring very little storage at the time of creation. If this process is used, it is important to have only one fabric path enabled, through zoning, for the given server. Following server provisioning, multipath I/O and the NetApp DSM is installed.

If an alternative method for installing Windows is being used, such as Windows Deployment Services, then cloning the boot LUN is not necessary.

Cisco UCS Manager

1. Within the KVM console of the host, confirm that all Windows updates have been installed. Windows Update will display a status of Windows is up to date.
2. Select Start > Logoff > Shut down to power down the host.

NetApp Controller A

1. Clone the first boot LUN, by typing `clone start /vol/win_boot_A/hyper-v-host /vol/win_boot_A/hyper-v-template`. Wait for the clone operation to complete.
2. Unmap the first boot LUN by typing `lun unmap /vol/win_boot_A/hyper-v-host VM-Host-Infra-01`.
3. Map the cloned LUN by typing lun map `/vol/win_boot_A/hyper-v-template VM-Host-Infra-01 0`

Cisco UCS Manager

1. Within the KVM console of the host, boot the server and log in with an administrator account.
2. Click `Restart Later` if prompted to restart the server.

3. Launch `C:\Windows\system32\sysprep\sysprep.exe`. Select the `Generalize` button and the `Shutdown` option. The server should prep then shutdown.

NetApp Controller A

1. Clone the Hyper-V Golden Template LUN by typing `clone start /vol/win_boot_A/hyper-v-template /vol/win_boot_A/ VM-Host-Infra-01`. Wait for the clone operation to complete.
2. Unmap the Hyper-V Golden Template LUN by typing `lun unmap /vol/win_boot_A/hyper-v-template VM-Host-Infra-01`.
3. Map the cloned LUN by typing `lun map /vol/win_boot_A/ VM-Host-Infra-01 VM-Host-Infra-01 0`.
4. Make sure that ndmpd is enabled on both NetApp controllers by typing `ndmpd on` on both controllers.
5. Copy the Hyper-V Golden Template LUN from NetApp Controller A to NetApp Controller B by typing `ndmpcopy –da <ControllerB username>:<password> /vol/win_boot_A/hyper-v-template <ControllerB IP>:/vol/win_boot_B/`. You now have a copy of the golden Hyper-V LUN on each storage controller, and a LUN of the host image that can be updated and Sysprepped in the future on Controller A.

NetApp Controller B

1. Online the just-copied LUN by typing `lun online /vol/win_boot_B/hyper-v-template`.
2. Clone the Hyper-V Golden Template LUN, by typing `clone start /vol/win_boot_B/hyper-v-template /vol/win_boot_B/VM-Host-Infra-02`. Wait for the clone operation to complete.
3. Map the cloned LUN by typing `lun map /vol/win_boot_B/ VM-Host-Infra-02 VM-Host-Infra-02 0`.

VM-Host-Infra-01 and VM-Host-Infra-02

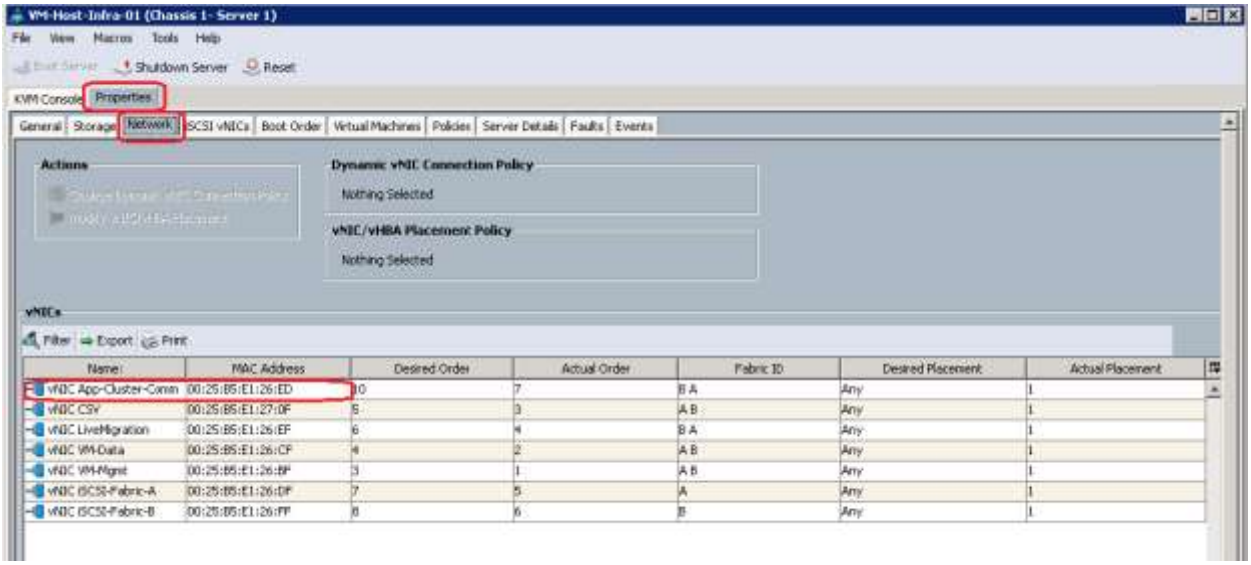
1. Using the UCS KVM Console, boot up both hosts.
2. Complete Windows Setup.

Configure Network Interfaces, Rename Servers, and Install Microsoft Windows Updates on Both Hyper-V Hosts

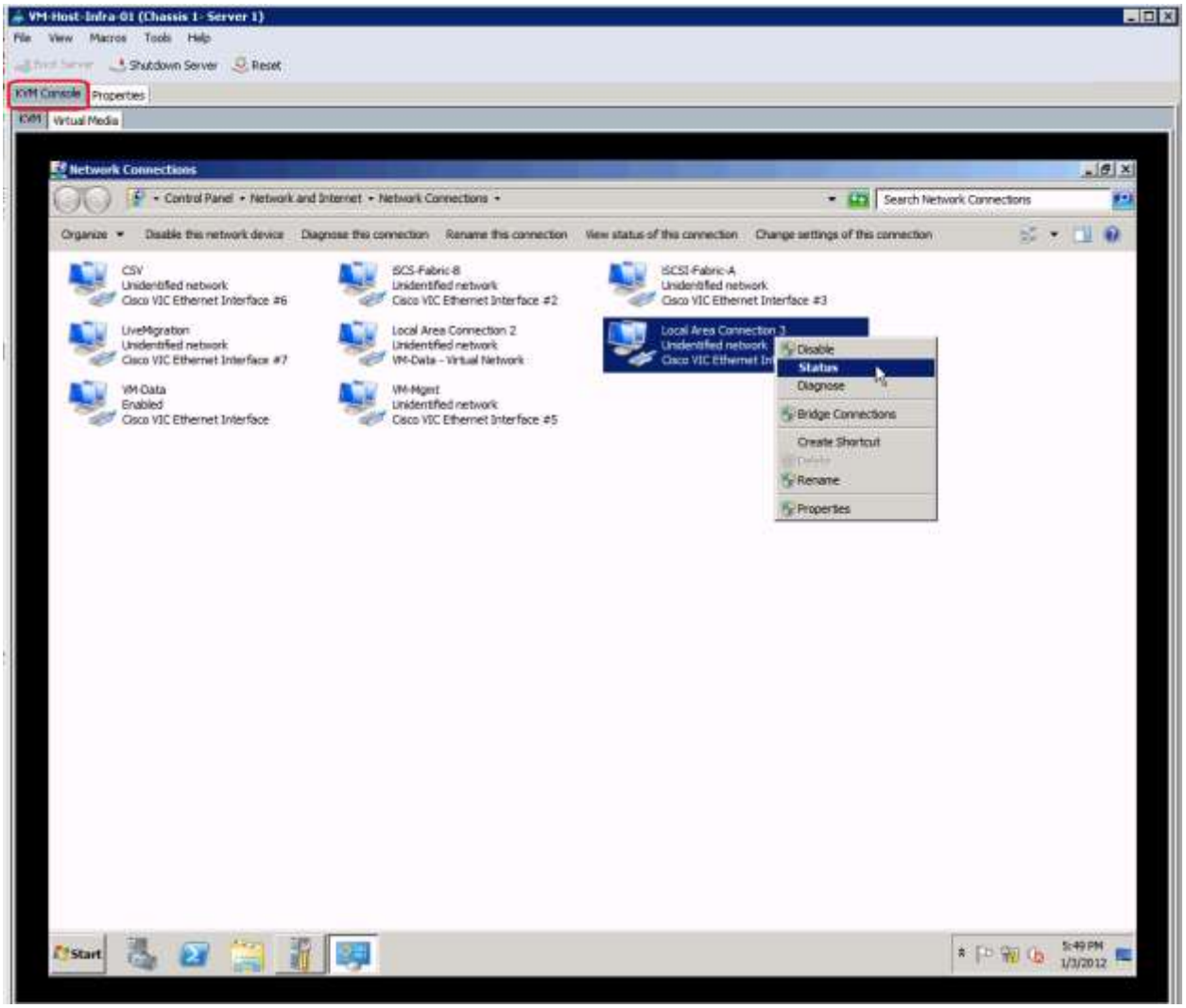
These steps provide details for naming the Windows network interfaces according to the VLANs in which they reside for VM-Host-Infra-01. This is achieved by matching the MAC addresses assigned in the service profile with the network interfaces presented in the operating system. Also, during this section, the server is renamed as well as Windows Updates performed. Repeat these steps for the second Hyper-V host.

Cisco UCS Manager

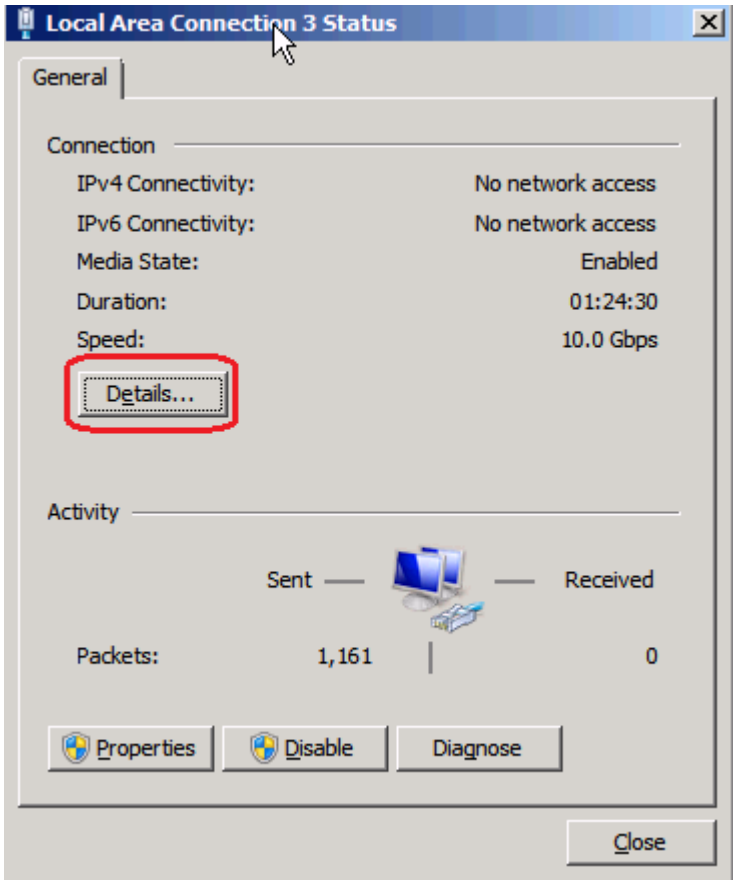
1. In the KVM window, select the `Properties` tab.
2. Select the `Network` tab. The corresponding vNICs are displayed along with their MAC addresses.



3. Within the KVM console of the host, browse to the `Network Connections` window, This can be accomplished by selecting `Start` and right-clicking `Network`. Then in the Network and Sharing Center that displays, select `Change Adapter Settings`.
4. Right-click the first network adapter.
5. Select `Status`.

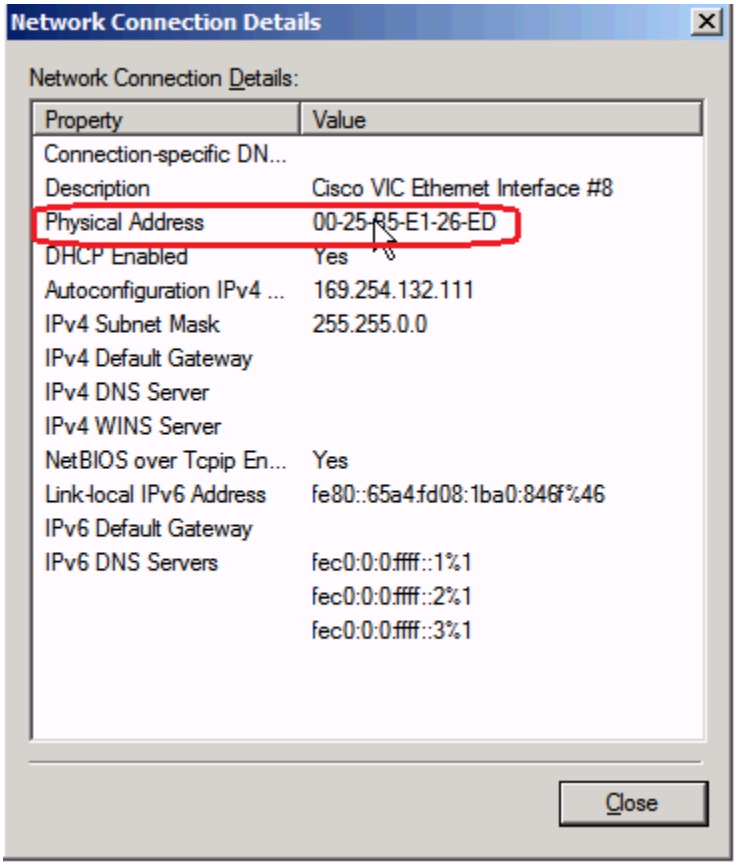


6. In the Status window that appears, select the `Details` button.

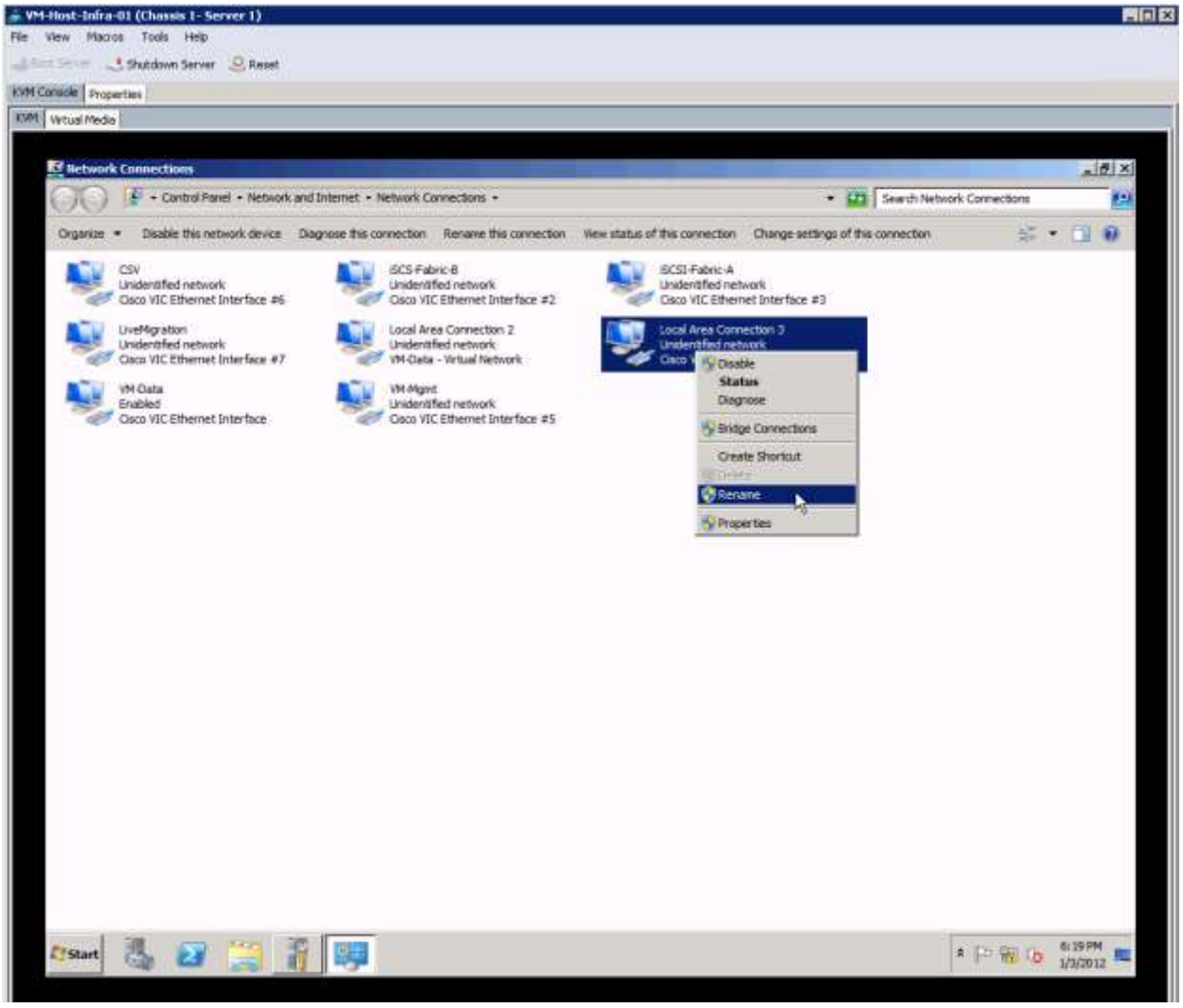


7. In the Network Connection Details window, note the Physical Address, which is the MAC address for the vNIC.

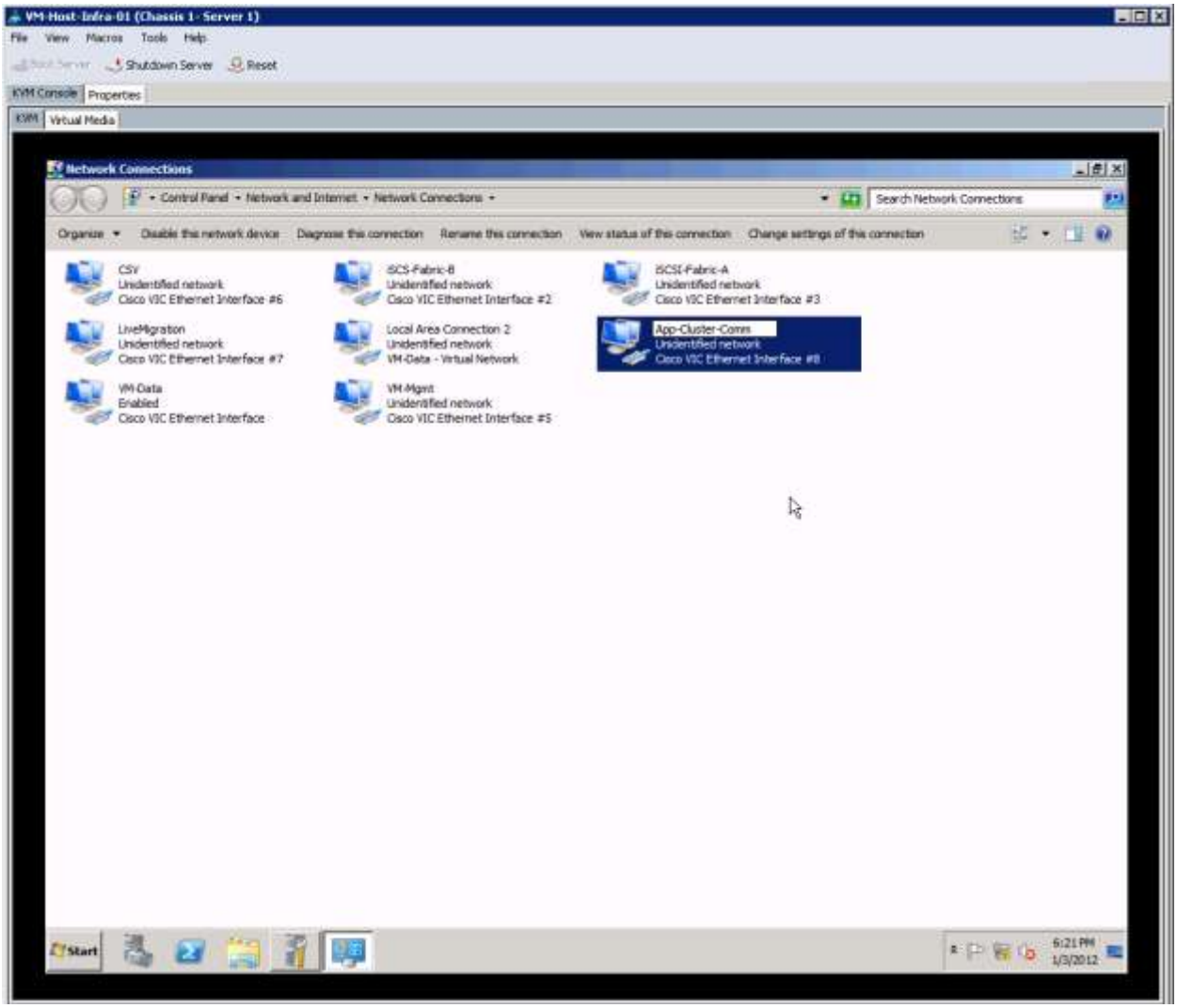
Note: Cross-reference this address with the MAC addresses for the provisioned vNICs as detailed in step 2 of this section.



8. Click `Close`.
9. In the Network Connection window, right-click the interface whose MAC address was just determined.
10. Select `Rename`.

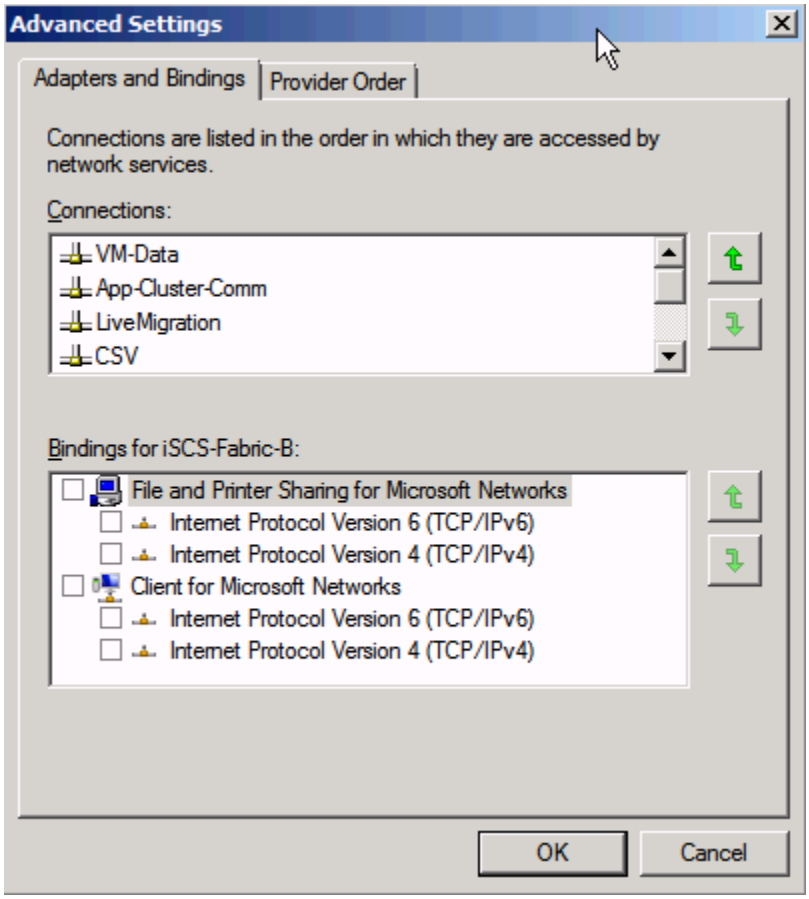


11. Name the interface the same as the corresponding vNIC within the service profile provisioned within Cisco UCS Manager.



12. Repeat this process for all network interfaces.
13. Following renaming of all the network interfaces, configure the binding order.
14. In the Network Connection window, press the `ALT` key and hold for a few seconds until the Menu Bar displays.
15. Click `Advanced > Advanced Settings...`
16. Under the Connections section of the Advanced Settings window, use the arrows to modify the binding order. The recommended binding order is:
    a. VM-Data
    b. App-Cluster-Comm
    c. Live Migration
    d. CSV
    e. VM-Mgmt
    f. iSCSI –Fabric-A

g. iSCSI-Fabric-B



17. Click `OK` to set the binding order.
18. In the Network Connection window, right-click individual interfaces (excluding VM-Data and App-Comm-Cluster) and select `Properties` to navigate to the interface properties, enabling IP address assignment.
19. Assign IP addresses to all interfaces except the VM-Data and App-Comm-Cluster interfaces.
20. Click the `X` at the top right corner to close the Network Connections window.
21. Within the KVM console of the host, browse to the System window. This can be accomplished by right-clicking `My Computer` and selecting `Properties`.
22. In the System window that displays, select `Change Settings`.
23. In the System Properties window that displays, select `Change`.
24. Assign the Server Hostname and Workgroup.
25. Click `OK`.
26. A restart is required. Click `OK`.
27. Following reboot, log-in to the server with an administrator account.
28. Within the KVM console of the host, browse to the System window. This can be accomplished by right-clicking `My Computer` and selecting `Properties`.
29. Install all Windows Updates on the server by selecting the Windows Update link in the lower left-hand corner.

Install the Failover Cluster Feature

Cisco UCS Hosts VM-Host-Infra-01 and HostVM-Host-Infra-02

1. In Server Manager, right-click `Features` and select `Add Features`.
2. Check `Failover Cluster` and click `Next`.
3. Click `Install`.

Install NetApp MultiPath IO Tools on Both Hyper-V Hosts

Cisco UCS Hosts VM-Host-Infra-01 and HostVM-Host-Infra-02

1. Using the UCS KVM Console,download NetApp SnapDrive for Windows version 6.4 64-bit from the NetApp on the Web (NOW) website.
2. Install Microsoft Hotfixes KB2494016, KB2520235, and KB2531907.
3. Using the SnapDrive version 6.4 Installation and Administration Guide as a reference, install SnapDrive for Windows version 6.4. Note that the SnapDrive6.4 Installer program should be run as Administrator. Also, note during installation that https credentials need to be entered for Storage Systems and do not use Protection Manager Integration.
4. Download the Data ONTAP DSM 3.5 for Windows MPIO software under MultiPath I/O for Windows on the NOW website.
5. Using the Data ONTAP DSM 3.5 for Windows MPIO Installation and Administration Guide as a reference, install Data ONTAP DSM 3.5 for Windows MPIO. Choose Yes to install the Hyper-V Guest Utilities. At the end of the DSM Installation, click Yes to Reboot Now.

Verify MultiPath I/O Connections (Both Hyper-V Hosts)

Both Cisco UCS Hosts

1. Using the UCS KVM Console, boot and log into the server.
2. In Windows Server Manager, under Storage, navigate to Data ONTAP® DSM Manager, Virtual Disks, Disk 1, and verify four available paths to the disk.

Verify MultiPath I/O Connections

Cisco UCS Hosts VM-Host-Infra-01 and VM-Host-Infra-02

1. Using the Cisco UCS KVM Console, boot and log into the server. Note that a reboot will be required for the multipath software drivers to install.
2. In Windows Server Manager, under Storage, navigate to `Data ONTAP® DSM Manager, Virtual Disks, Disk 1`, and verify four available paths to the disk.

Creating Microsoft Hyper-V Virtual Network Switches

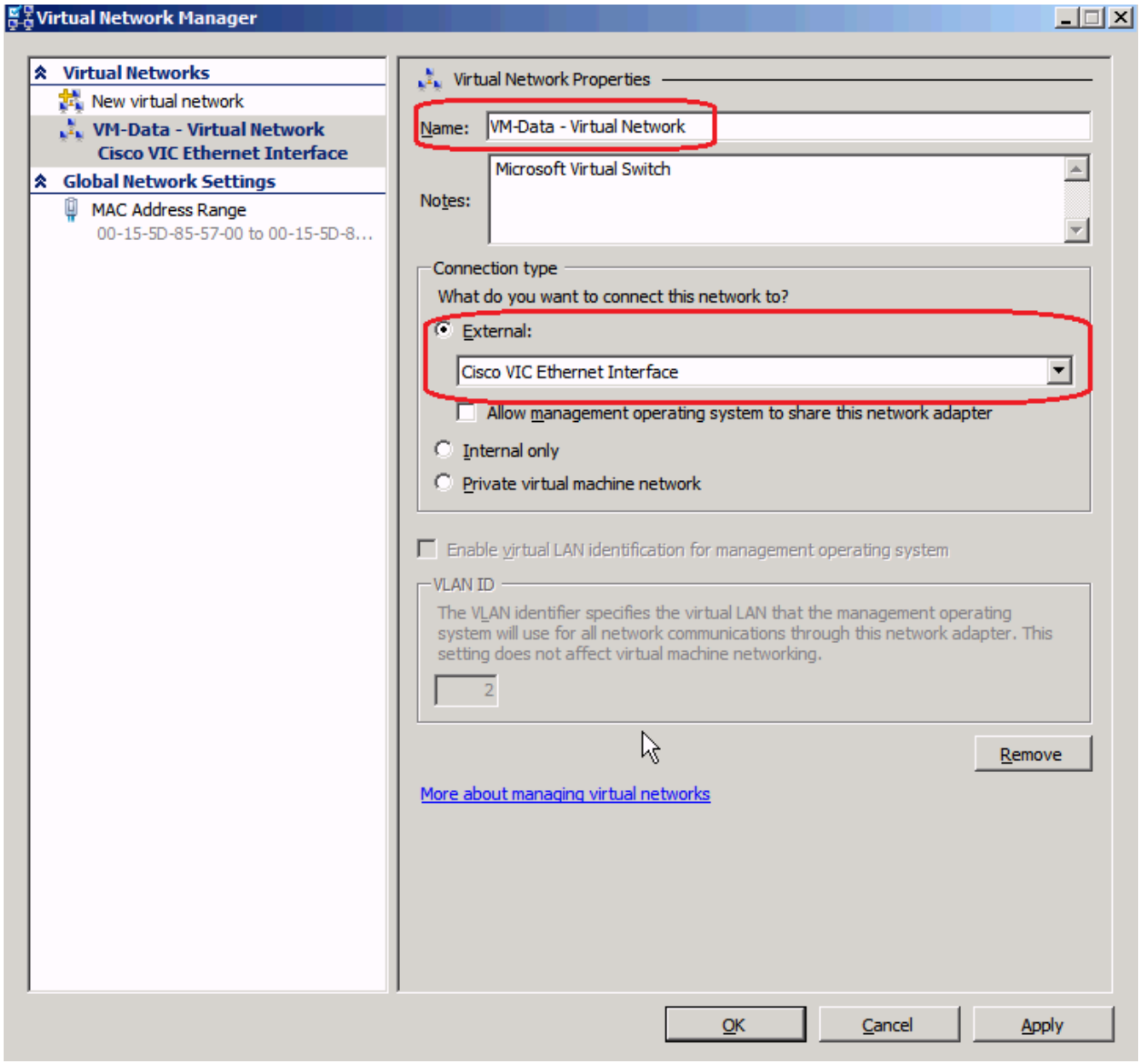
Create the following Virtual Network Switches on both infrastructure hosts.

Virtual Network Name	Connection Type	Interface
VM-Data	External	Cisco VIC Interface
App-Cluster-Comm	External	Cisco VIC Interface #8
iSCSI-Fabric-A	External	Cisco VIC Interface #3
iSCSI-Fabric-B	External	Cisco VIC Interface #2

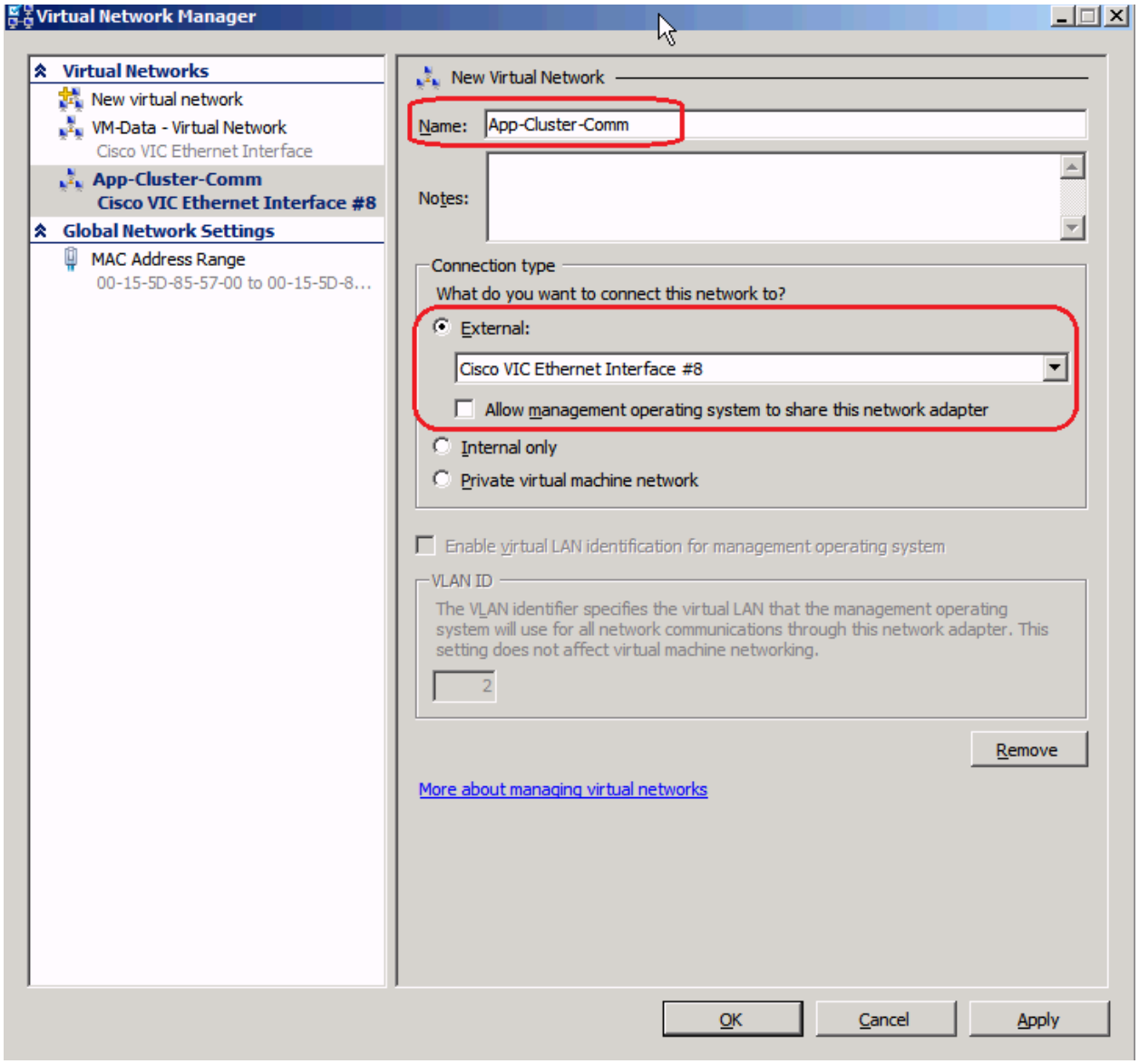
Note: Interface numbers may vary.

1. Open Hyper-V Manager.
2. Select the `Hyper-V server` and click `Virtual Network Manager` in the action pane on the right.
3. Select `External` and click `Add`.
4. Provide a name that matches the network name used in the Network Interface Configuration section.
5. Select `External connection type` and the matching interface for each network adapter.
6. Click `Apply`.
7. Click `New Virtual Network`.
8. Select `External`.
9. Click `Add`.
10. Repeat steps 4 through 9 for all Virtual Machine Networks.

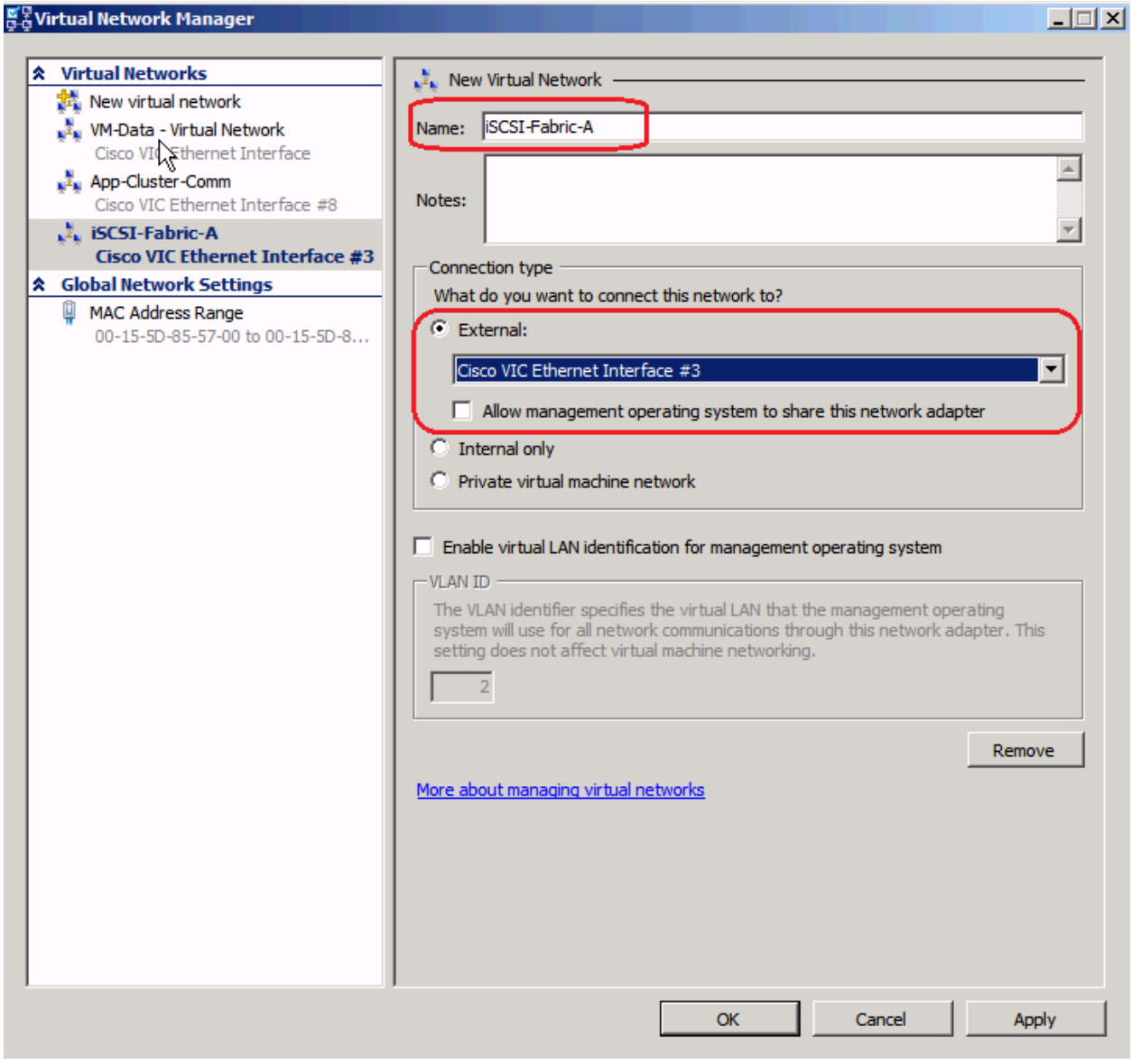
VM-Date Hyper-V Network Switch



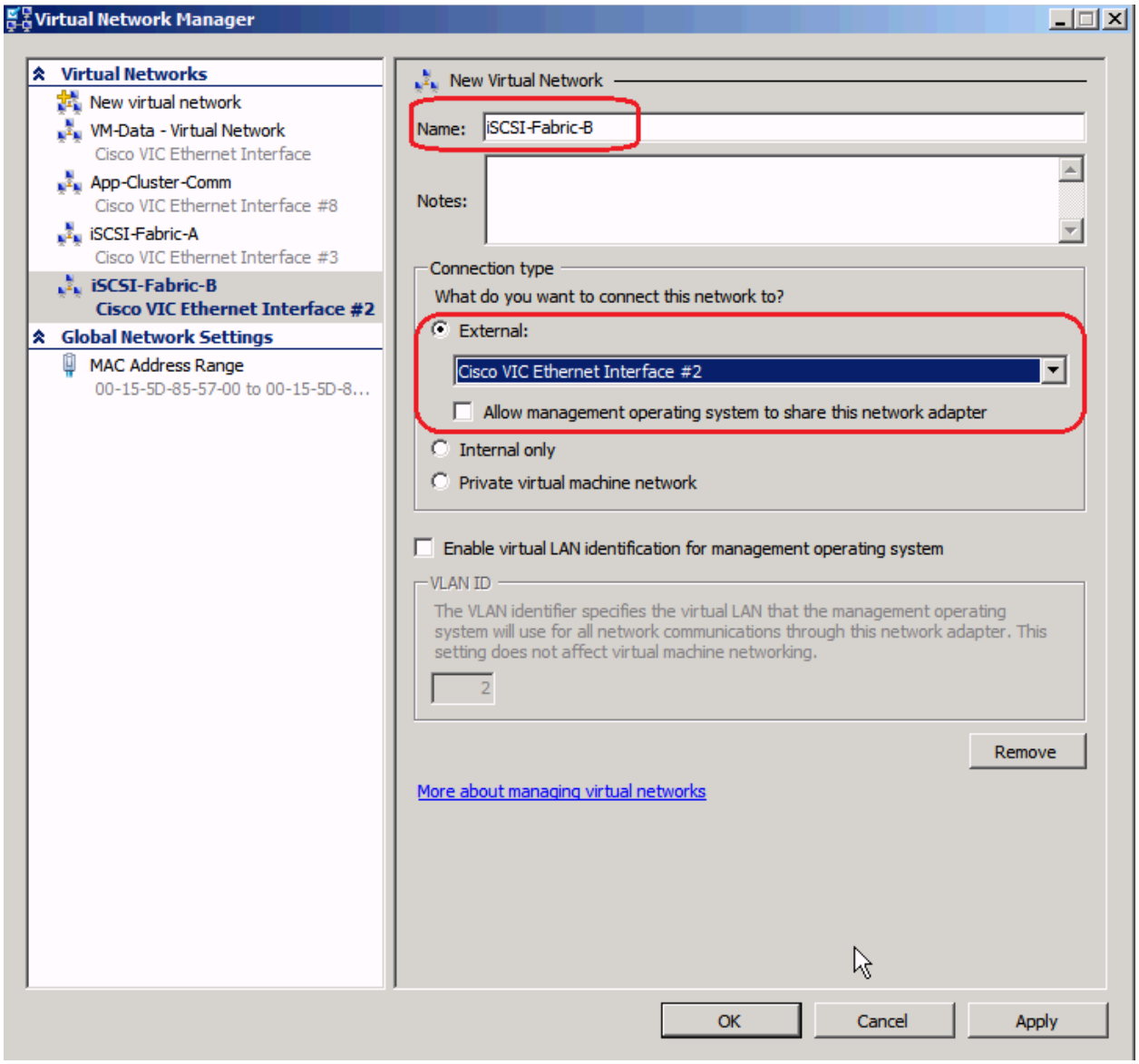
App-Cluster-Comm



iSCSI-Fabric-A



iSCSI-Fabric-B



Domain Controller Virtual Machine (optional)

Most environments will already have and active directory infrastructure and will not require additional domain controllers do be deployed for the Hyper-V FlexPod. The optional domain controllers can be omitted from the configuration in this case or used as a resource domain. The domain controller virtual machines will not be clustered because redundancy is provided by deploying multiple domain controllers running in virtual machines on different servers. Since these virtual machines reside on Hyper-V hosts that run Windows Failover cluster, but are not clustered themselves, Hyper-V Manager should be used to manage them instead of Virtual Machine Manager.

Note: The domain controller network interfaces must be accessible by the all virtual machines and the virtual machines hosts. For the configuration presented in this document, the IP subnet on VLAN VM-Mgmt must have a layer 3 route to the IP subnet on VLAN VM-Data.

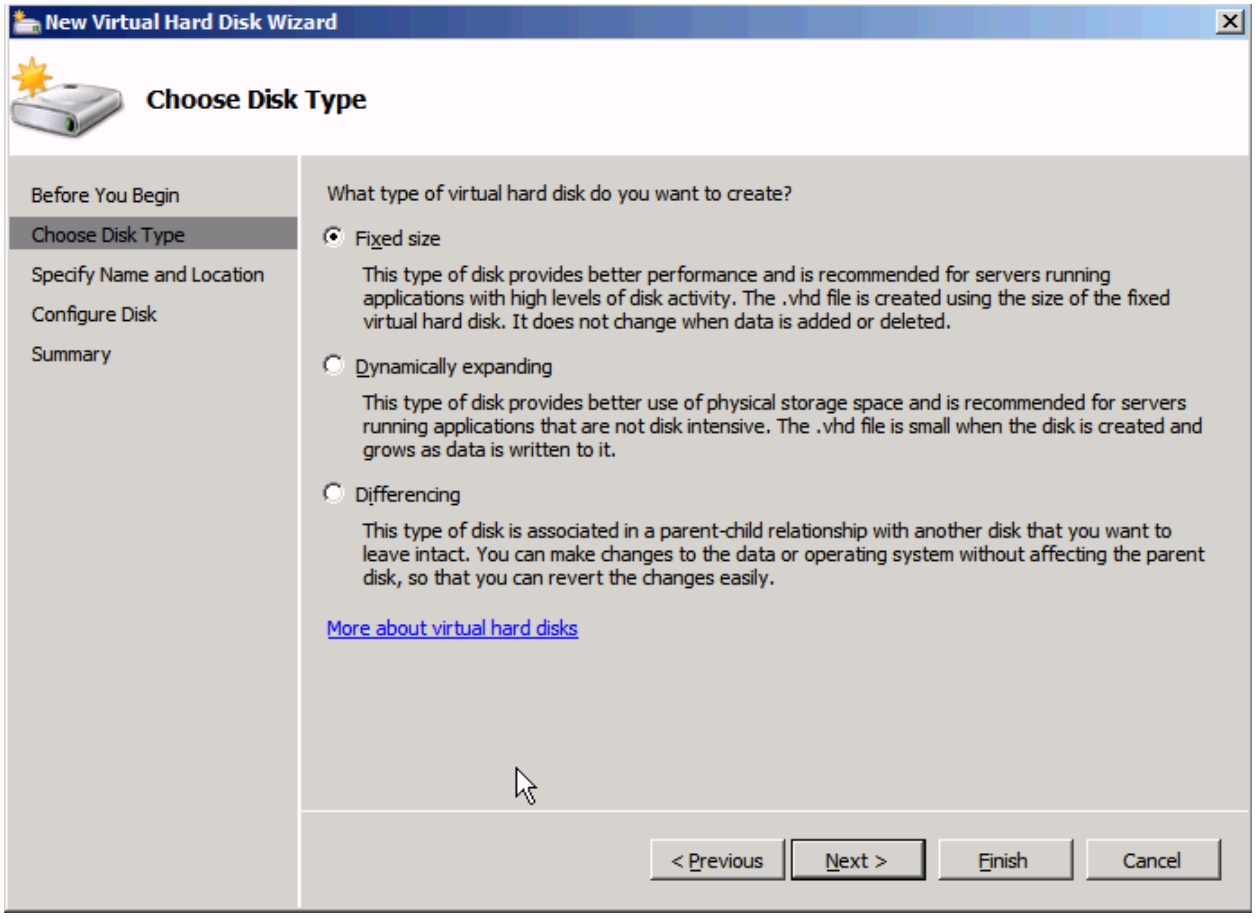
Create VHD for Domain Controller Virtual Machine (Optional)

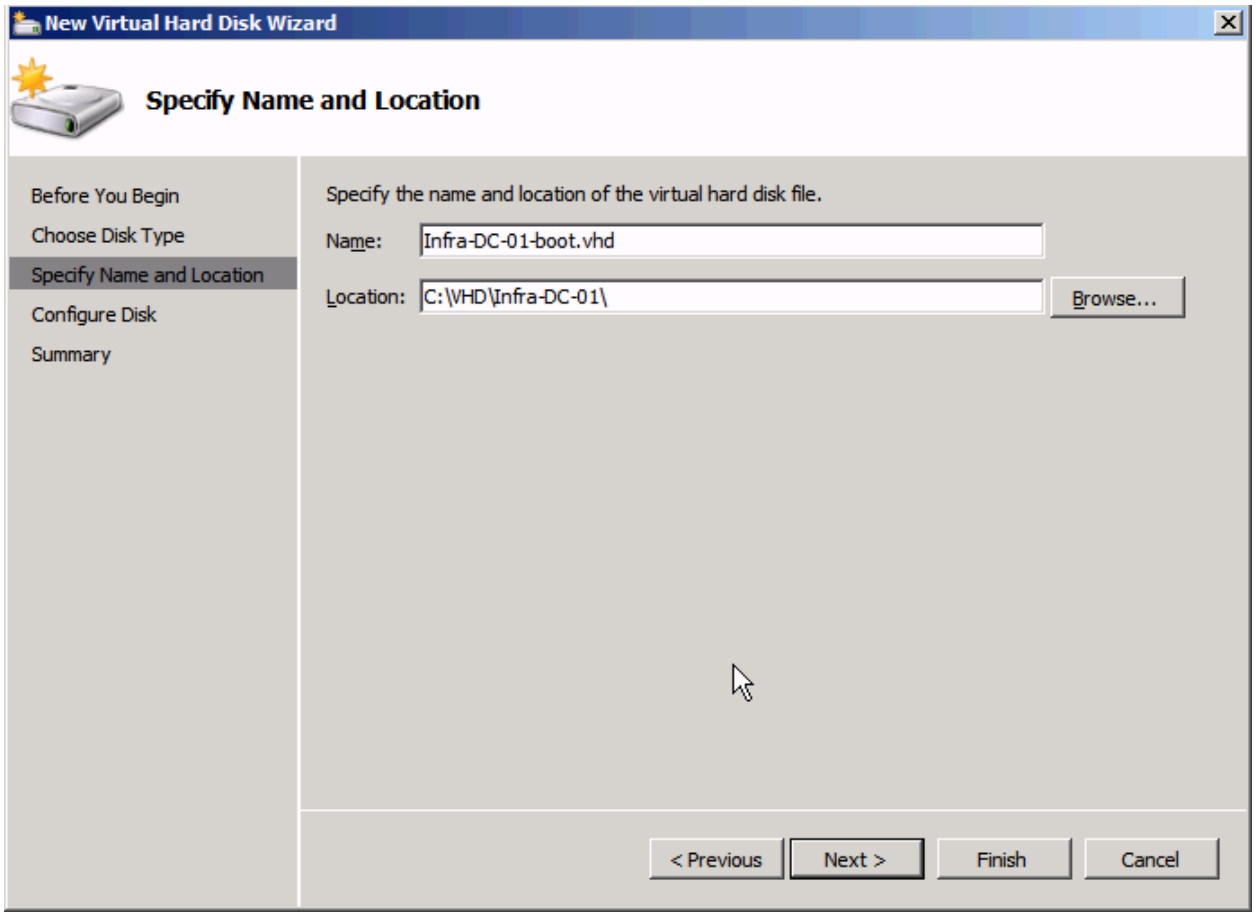
Create the following VHD storage resources that will be used by the virtual machines running system center roles:

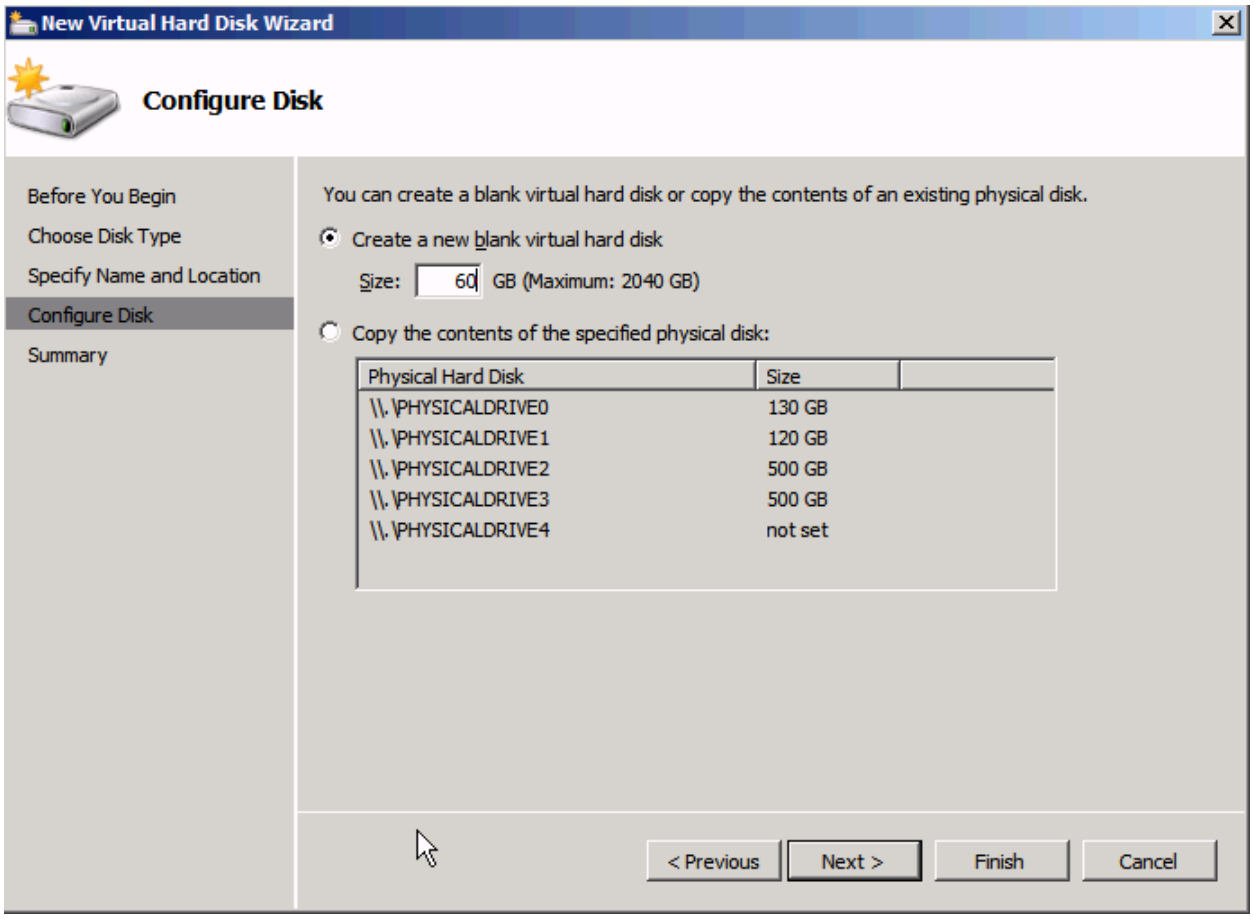
Table 13 VHD Storage Resources

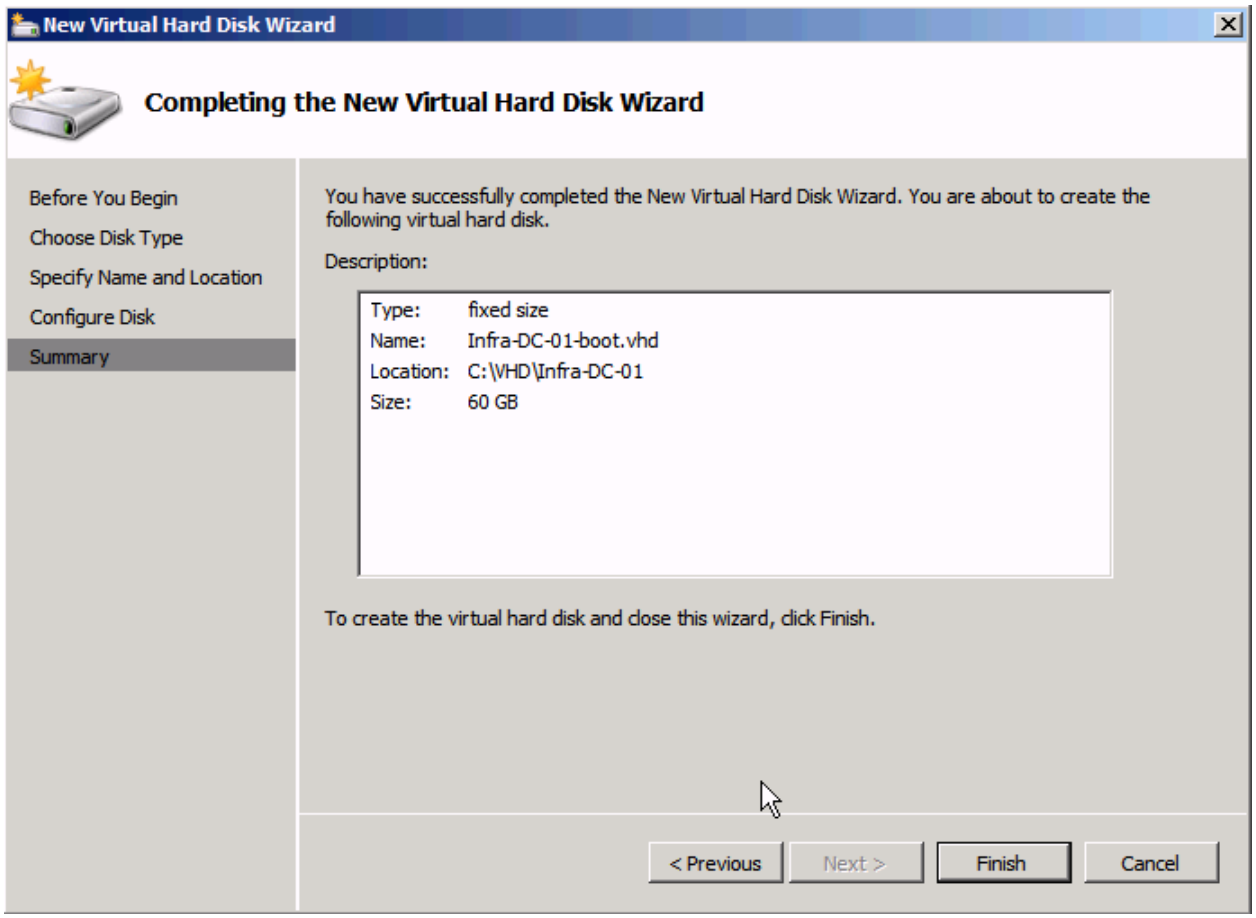
VM Host	VM Name	Name	Location	Size	Type
Infra-VM-Host-01	Infra-DC-01	Infra-DC-01.vhd	C:\ClusterStorage\CSV-01	60 GB	Fixed
Infra-VM-Host-02	Infra-DC-02	Infra-DC-02.vhd	C:\ClusterStorage\CSV-02	60 GB	Fixed

1. Open the Hyper-V Manager and select the `Hyper-V server` in the left pane.
2. Click `New` in the right action pane and select `Hard Disk`.









Create Domain Controller Virtual Machine

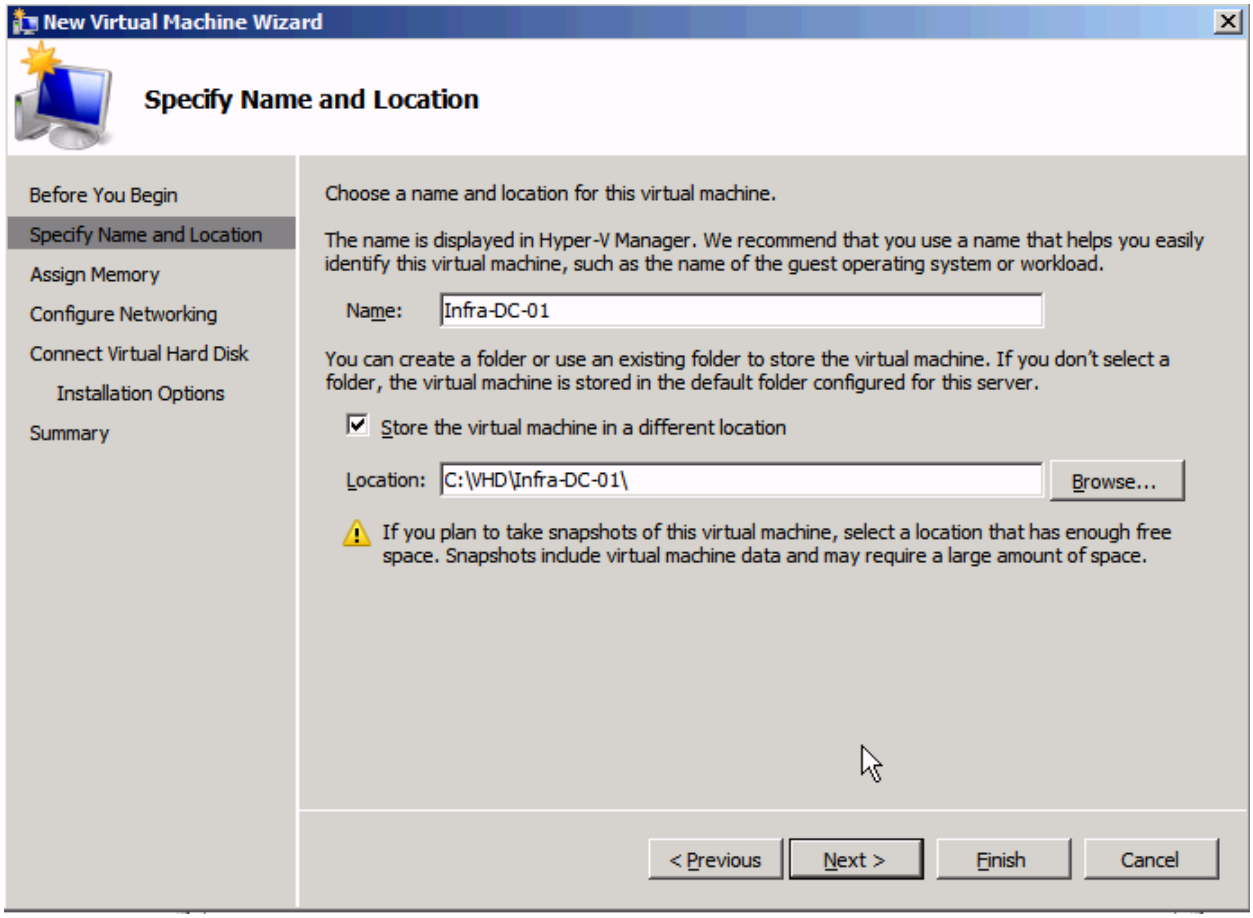
Create the following virtual machines that will be used by the domain controller roles.

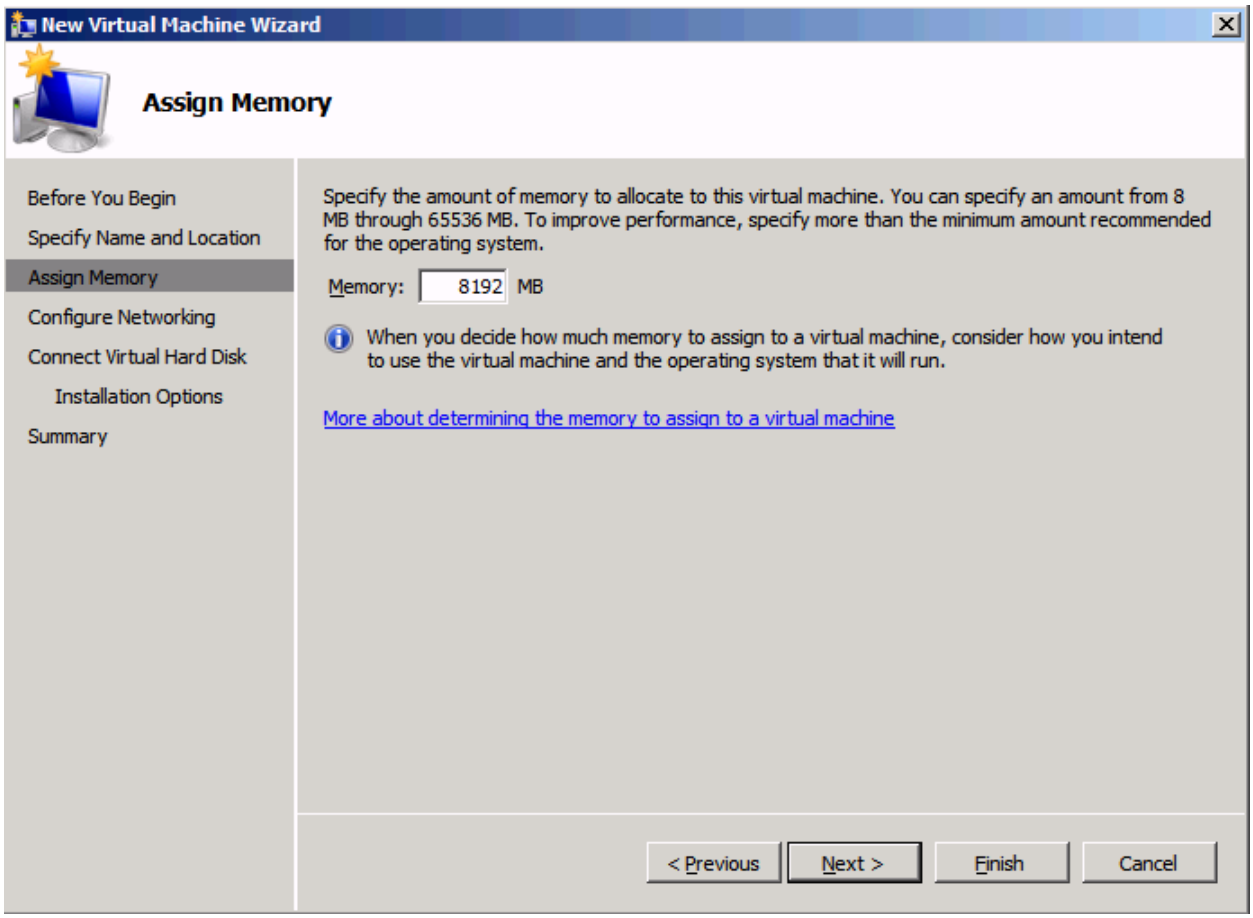
Table 14 Virtual Machine Domains

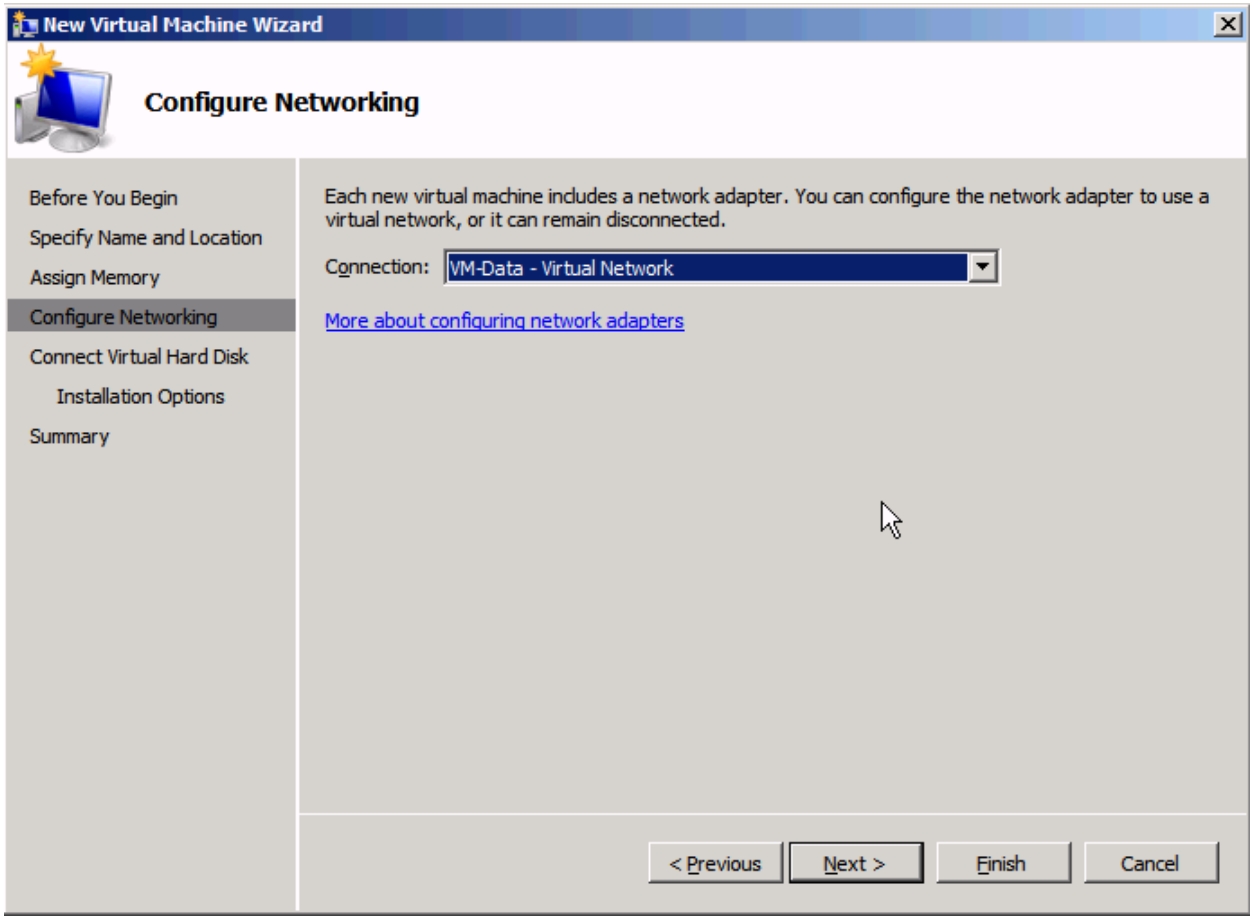
VM Host	VM Name	Hard Disk	Network	Memory	VLAN ID
Infra-VM-Host-01	Infra-DC-01	C:\ClusterStorage\CSV-01\Infra-DC-01.vhd	VM-Data – Virtual Network	8 GB	804
Infra-VM-Host-02	Infra-DC-02	C:\ClusterStorage\CSV-02\Infra-DC-02.vhd	VM-Data – Virtual Network	8 GB	804

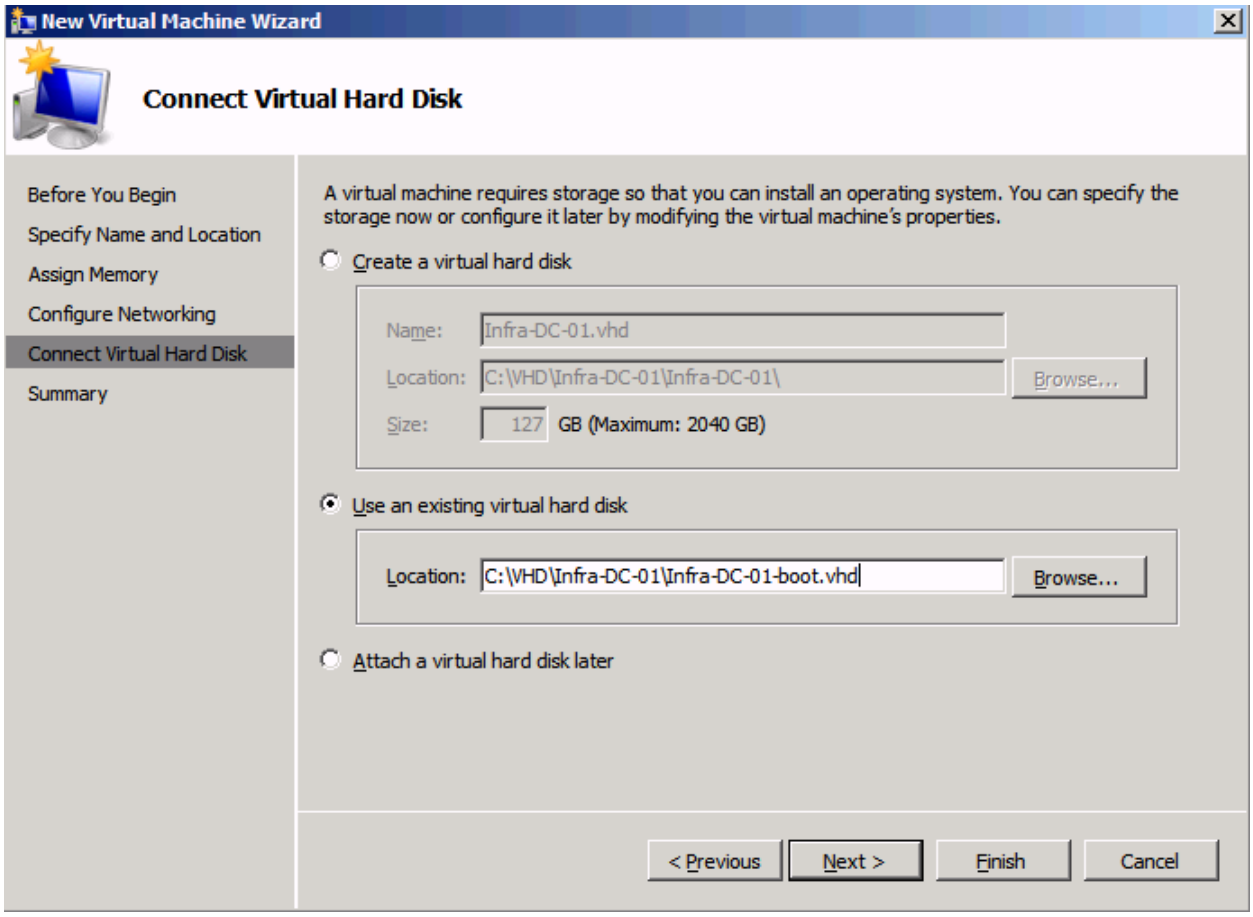
1. Open Hyper-V Manager and select the `Hyper-V server` in the left pane.
2. Click `New` in the right action pane and select `Virtual Machine`.
3. Provide the name. Check the box for storing the virtual machine in a different location and provide the path. Click `Next`.
4. Enter the memory size and click `Next`.
5. Select the Network connection `VM-Data-Virtual Network`. Click `Next`.
6. Select the option to use an existing virtual hard disk and specify the path to the VHD created in the previous section. Click `Next`.

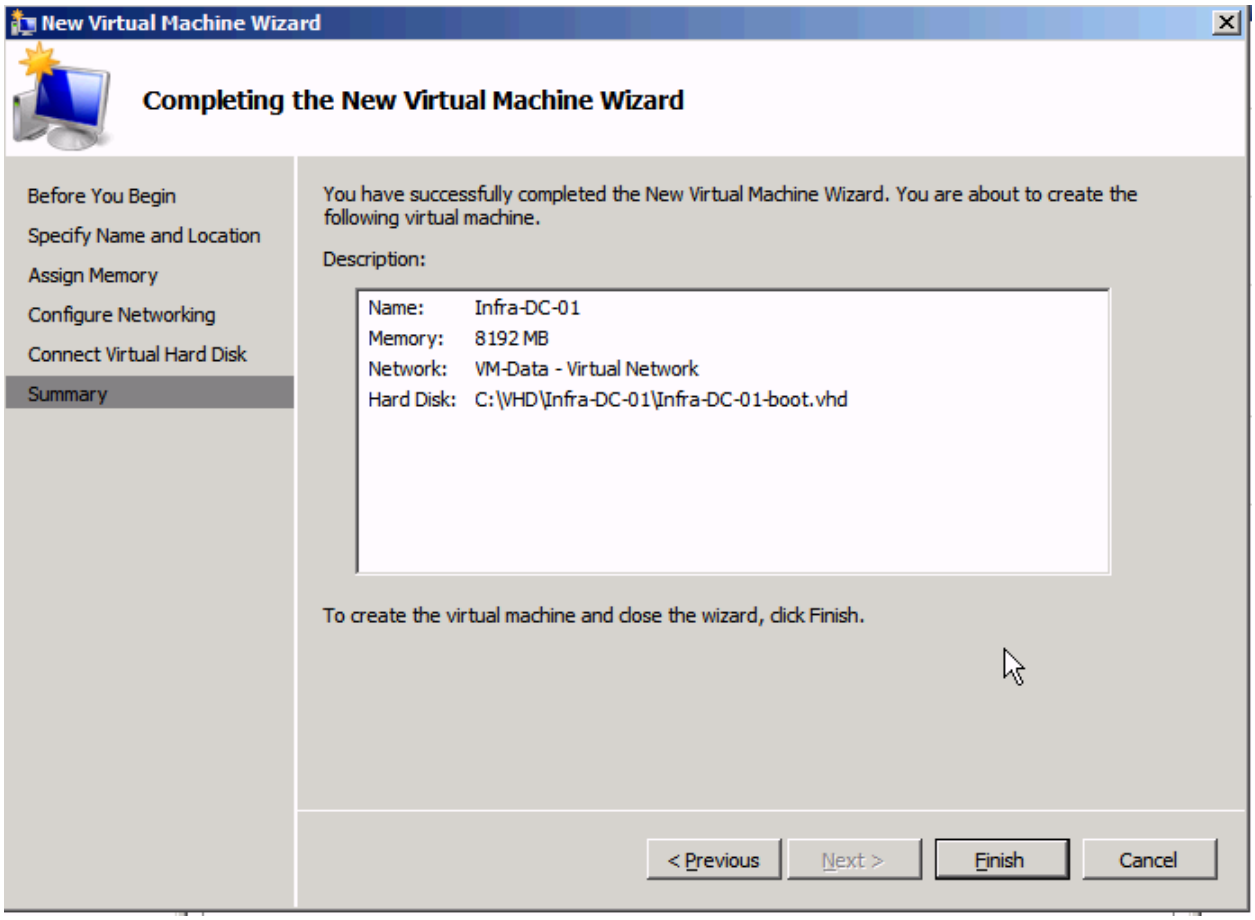
7. Select the option to install the operating system later and click `Finish`.
8. Repeat steps 1 through 7 for each virtual machine.

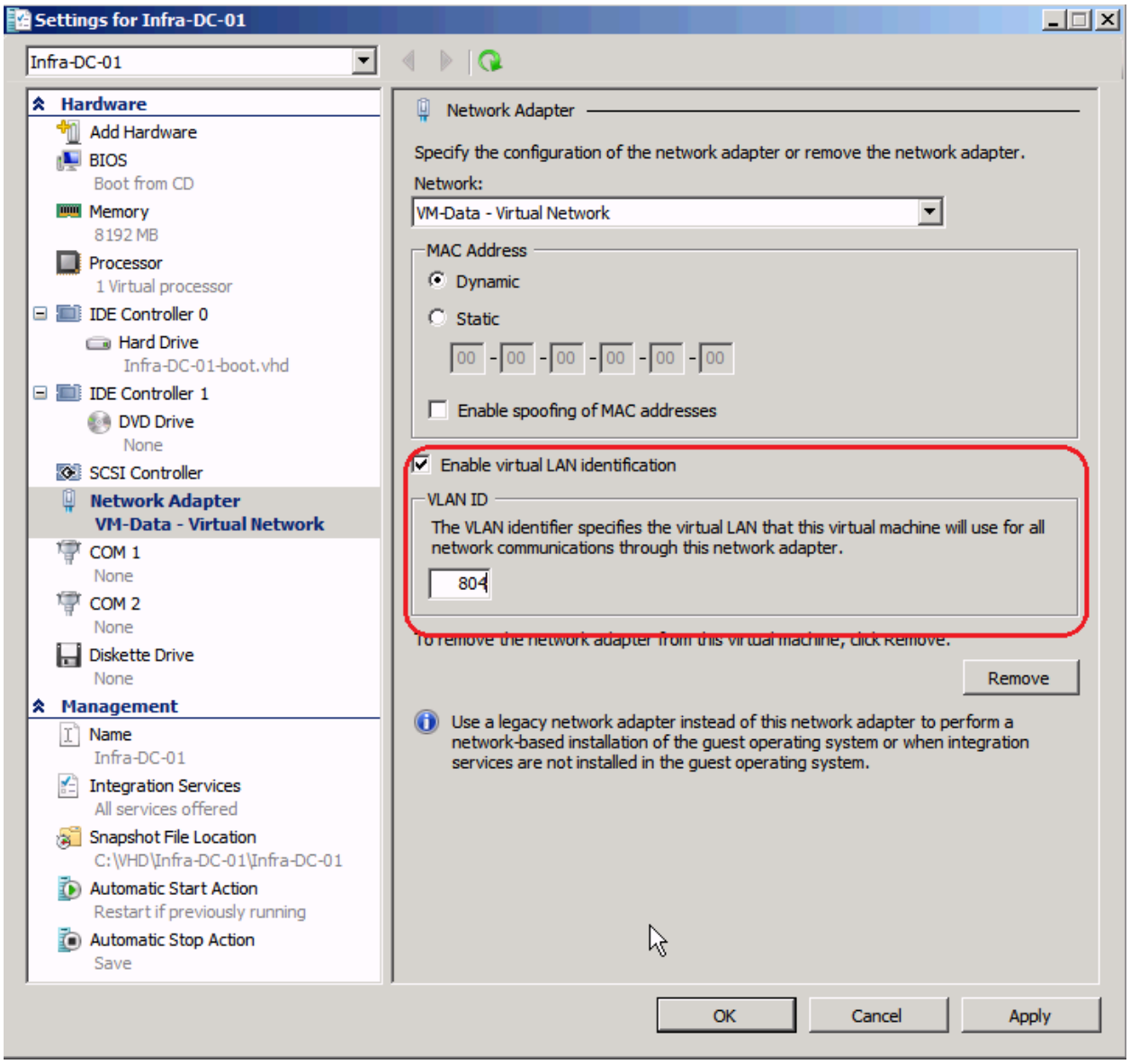




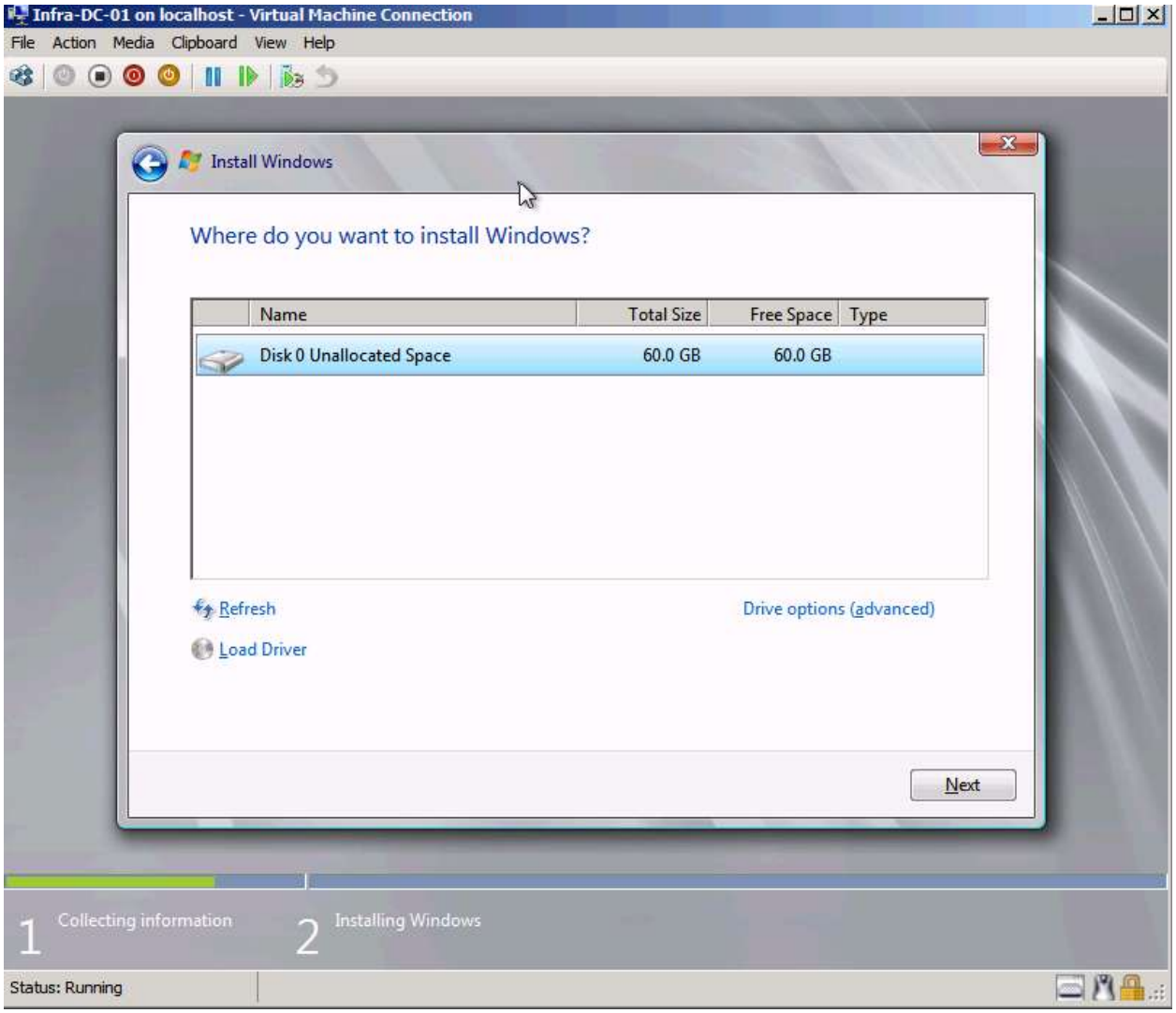


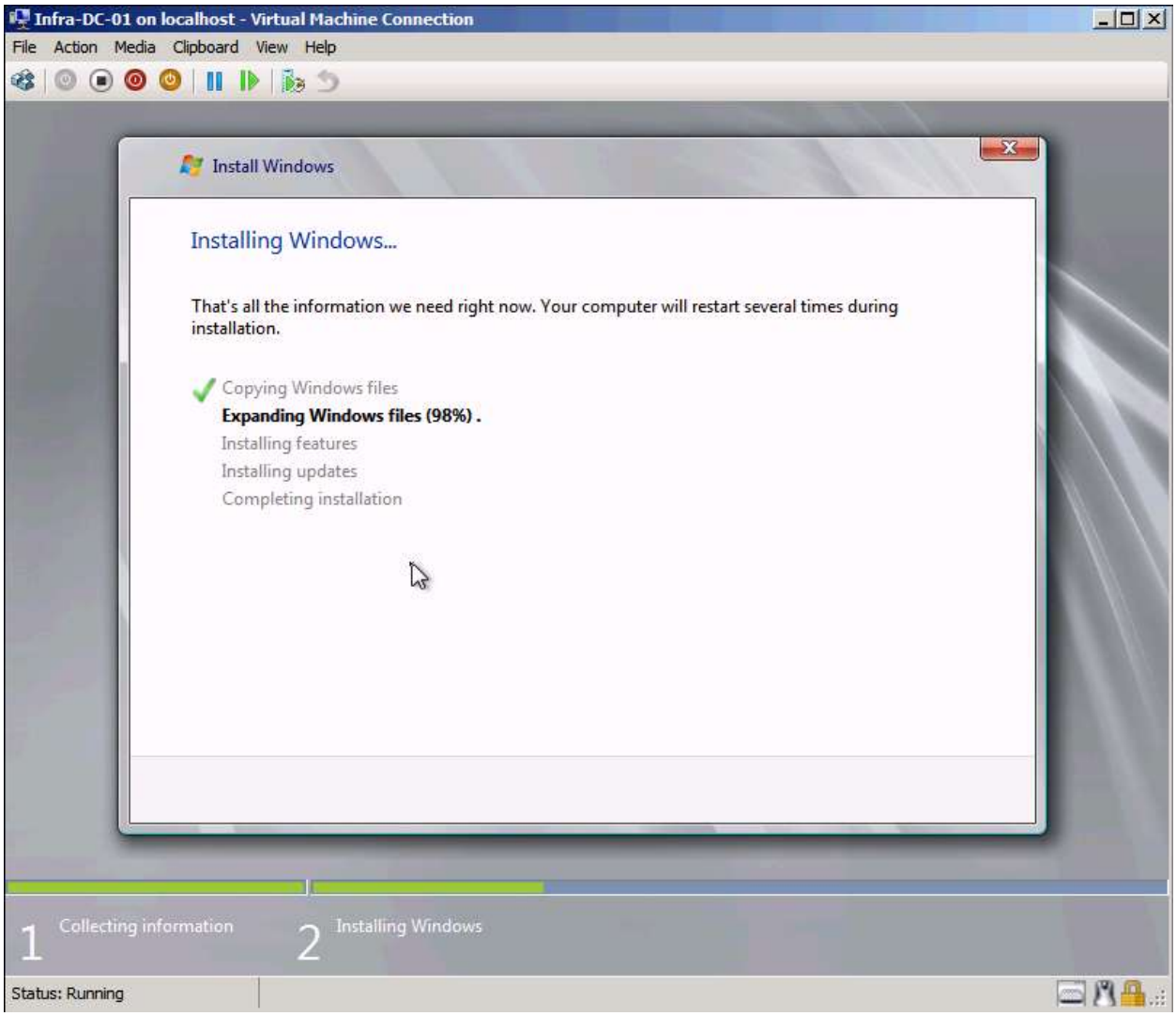




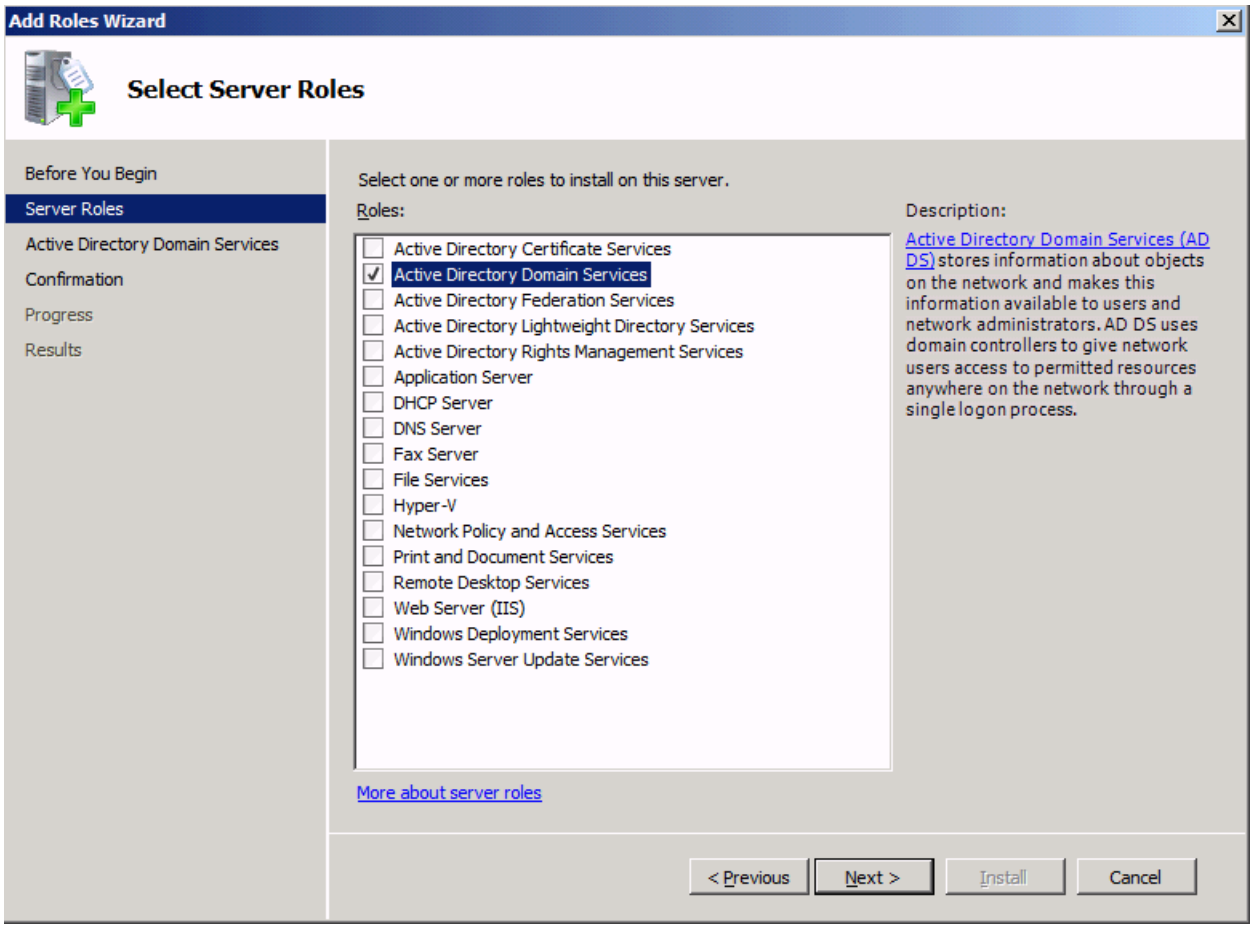


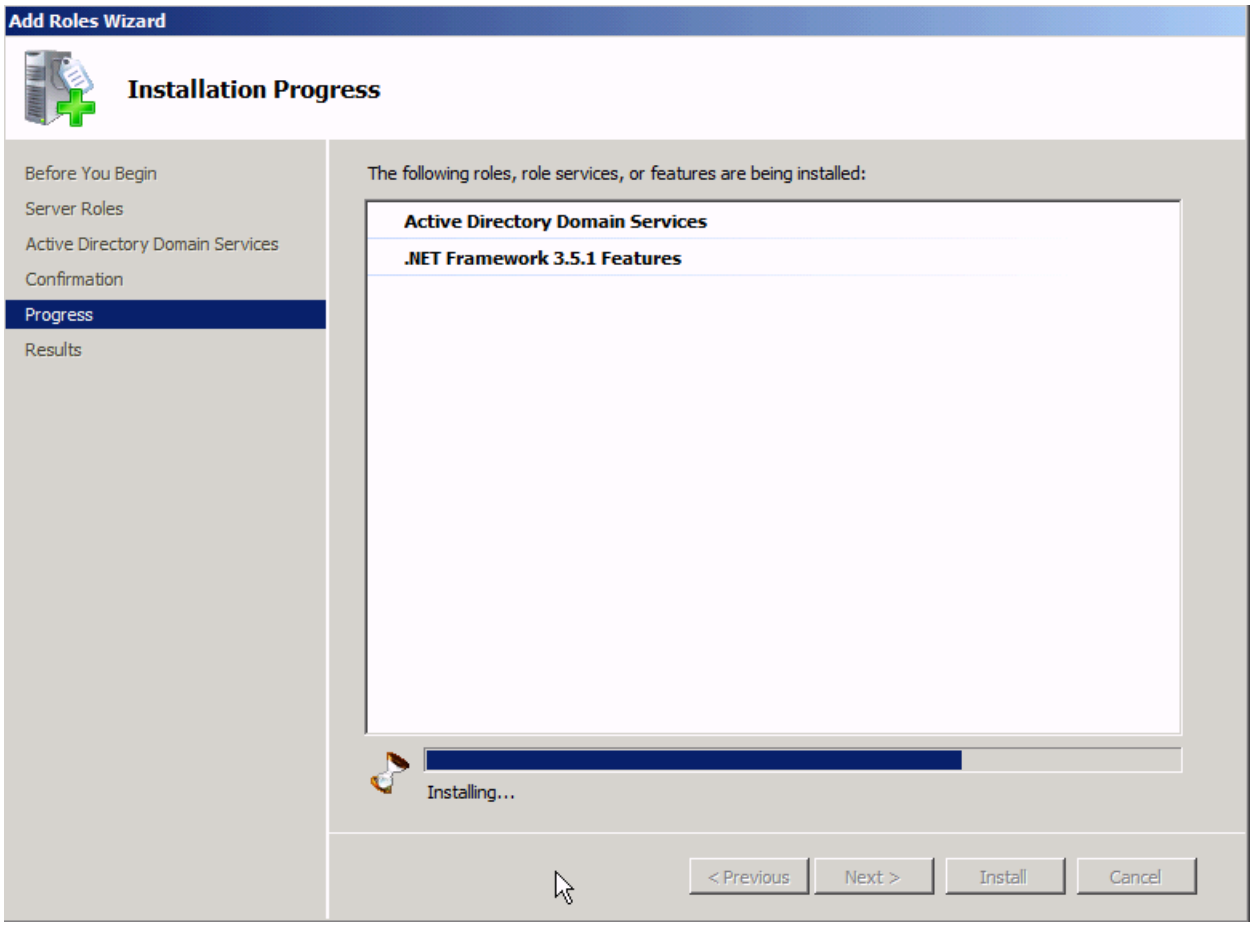
Install Windows in a Domain Controller Virtual Machine



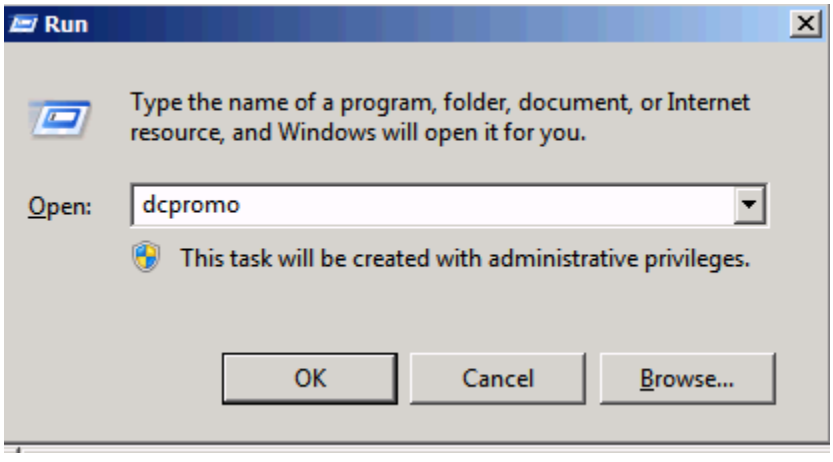


Install Active Directory Services





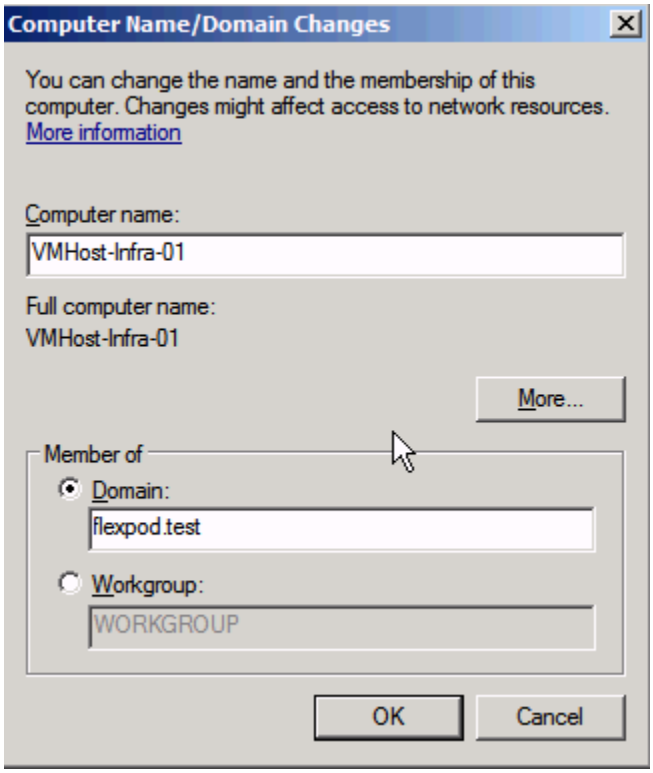
Run `dcpromo` to configure the Domain Controllers.



Complete the domain controller installation and repeat the process on VM-Host-Infra-02 to install the redundant domain controller.

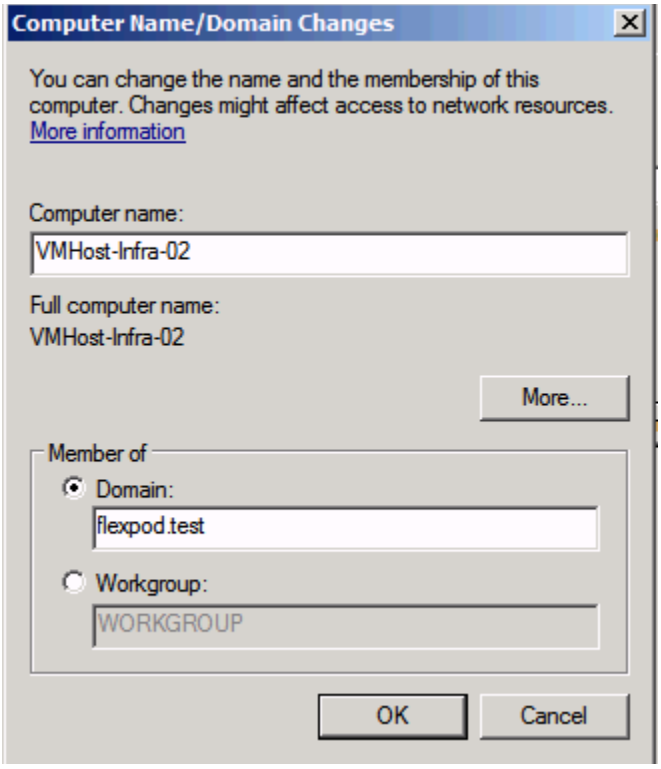
Join Virtual Machine Host VM-Host-Infra-01 to a Windows Domain

Note: The domain name service for each virtual machine host must be configured to use the domain name server that is running on a different physical server for the purpose of high availability.



Note: Reboot

Join Virtual Machine Host VM-Host-Infra-02 to a Windows Domain



Note: Reboot is required.

Set Firewall Exceptions (Both Hyper-V Hosts)

Open Windows Firewall with Advanced Security, by clicking Start > Administrative Tools > Windows Firewall with Advanced Security.

Add SnapDrive

1. Highlight `Inbound Rules` and click `New Rule`.
2. Select `Program` and click `Next`.
3. Enter the program path for the SnapDrive Service for example, `%ProgramFiles%\NetApp\SnapDrive\SWSvc.exe`.
4. Click `Next`, then select the “Allow the Connection” options and click `Next`, then `Next` again.
5. Enter the rule Name `<SnapDrive>` and Description, and click Finish.

Configure Infrastructure Server Cluster

1. Log in to VM-Host-Infra-01 using a domain administrative account with local privileges.
2. Open Server Manager and browse to `Features > Failover Cluster Manager`.
3. Validate cluster feasibility:
   a. Select `Validate a Configuration`, then click `Next`.
   b. Add both nodes one at a time into the `Enter server name` text field, and click `Next`.

c. Select `Run only tests I select` and click `Next`.

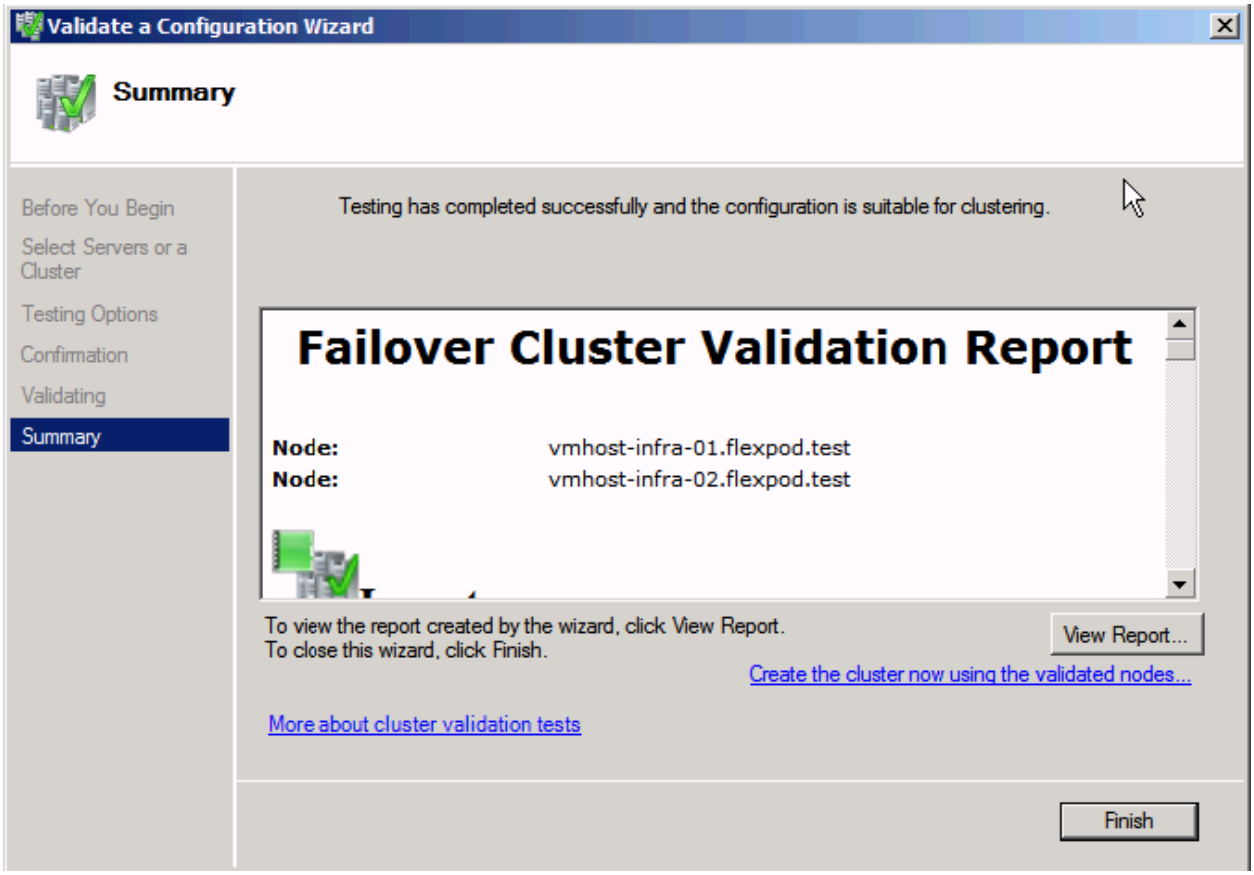
d. Scroll down to the storage section and clear all the storage related checkboxes.

Note: These will run after you attach storage.

e. Click `Next > Next`.

f. Review the report and resolve any issues found by the validation wizard before continuing.

g. Click `Finish`.

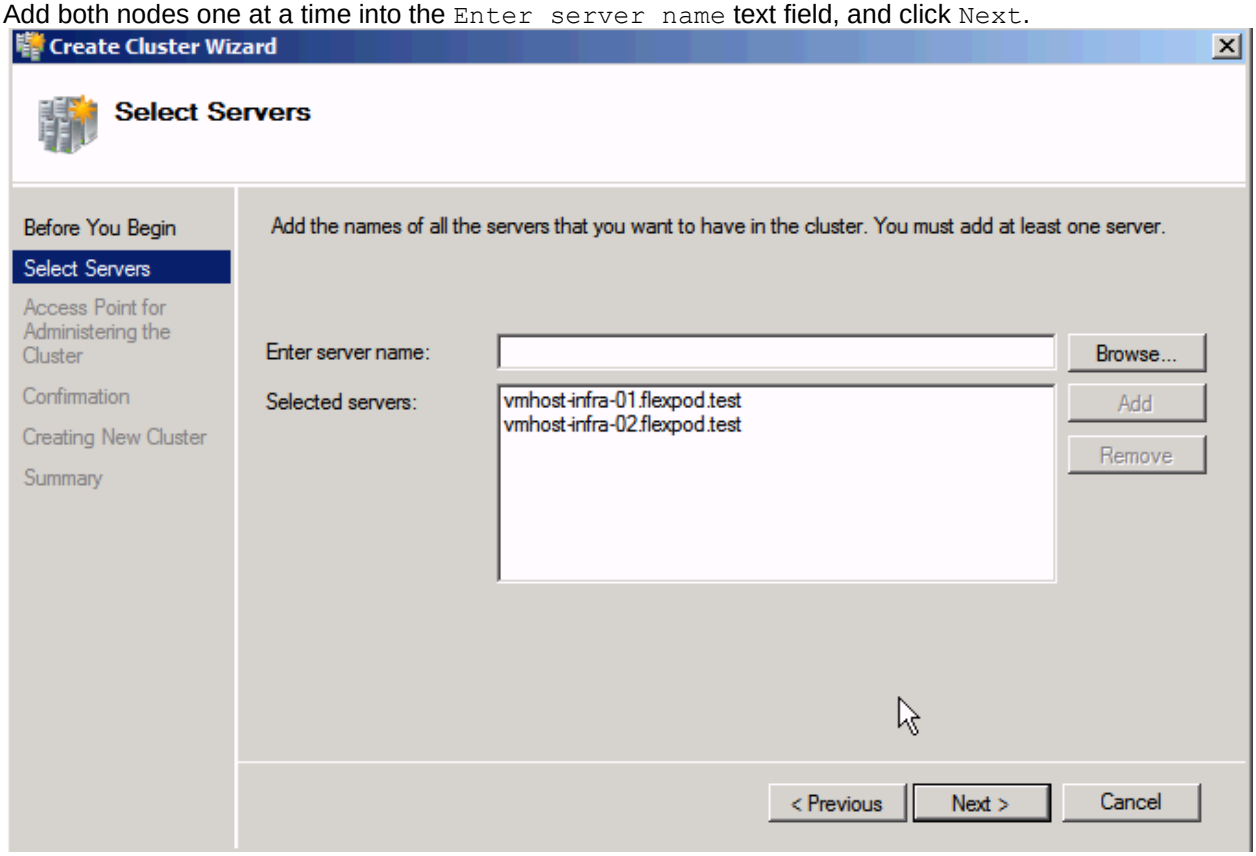


4. Create majority node cluster:

h. In the Failover Cluster Manager, select `Create a Cluster`.

i. In the Welcome screen, click `Next`.

j. Add both nodes one at a time into the `Enter server name` text field, and click `Next`.

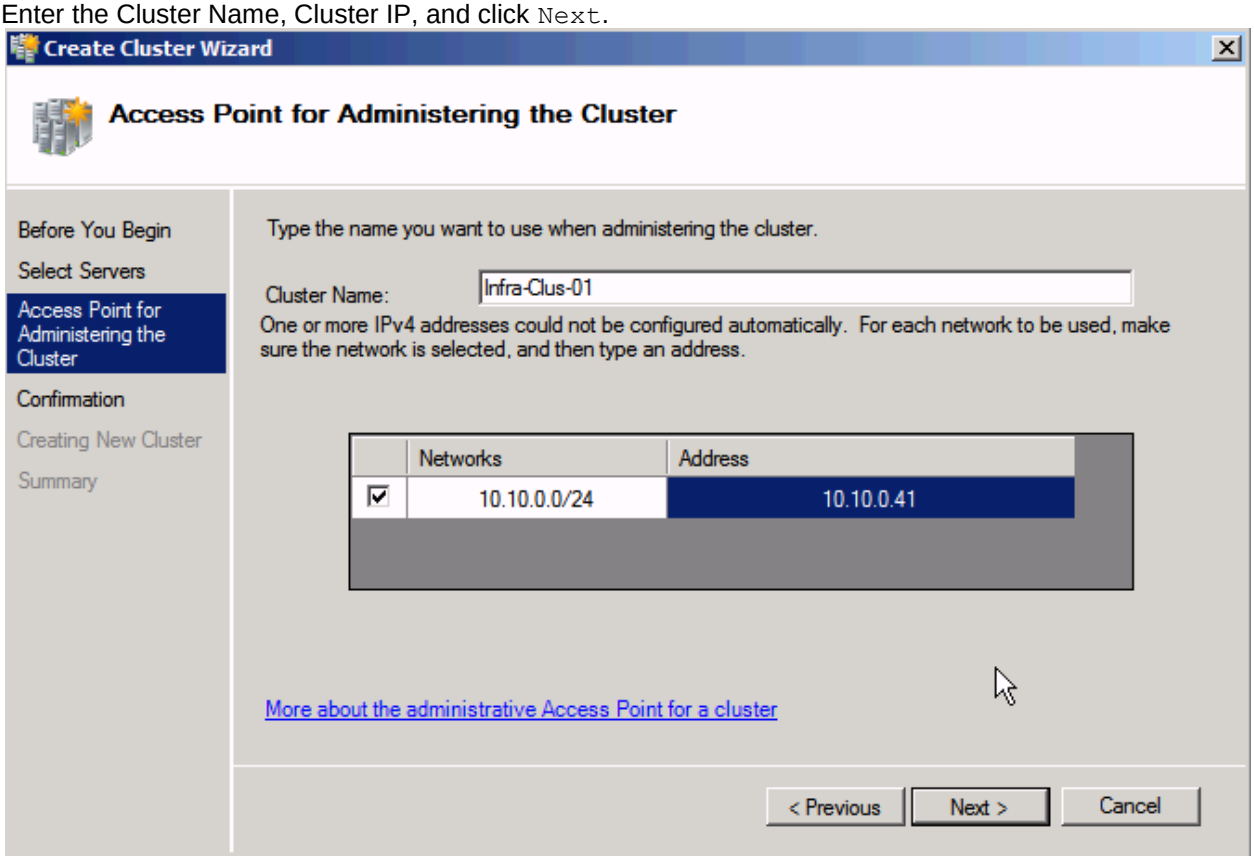


k. Select `Yes` to run all validation tests, and click `Next`, then `Next` again.

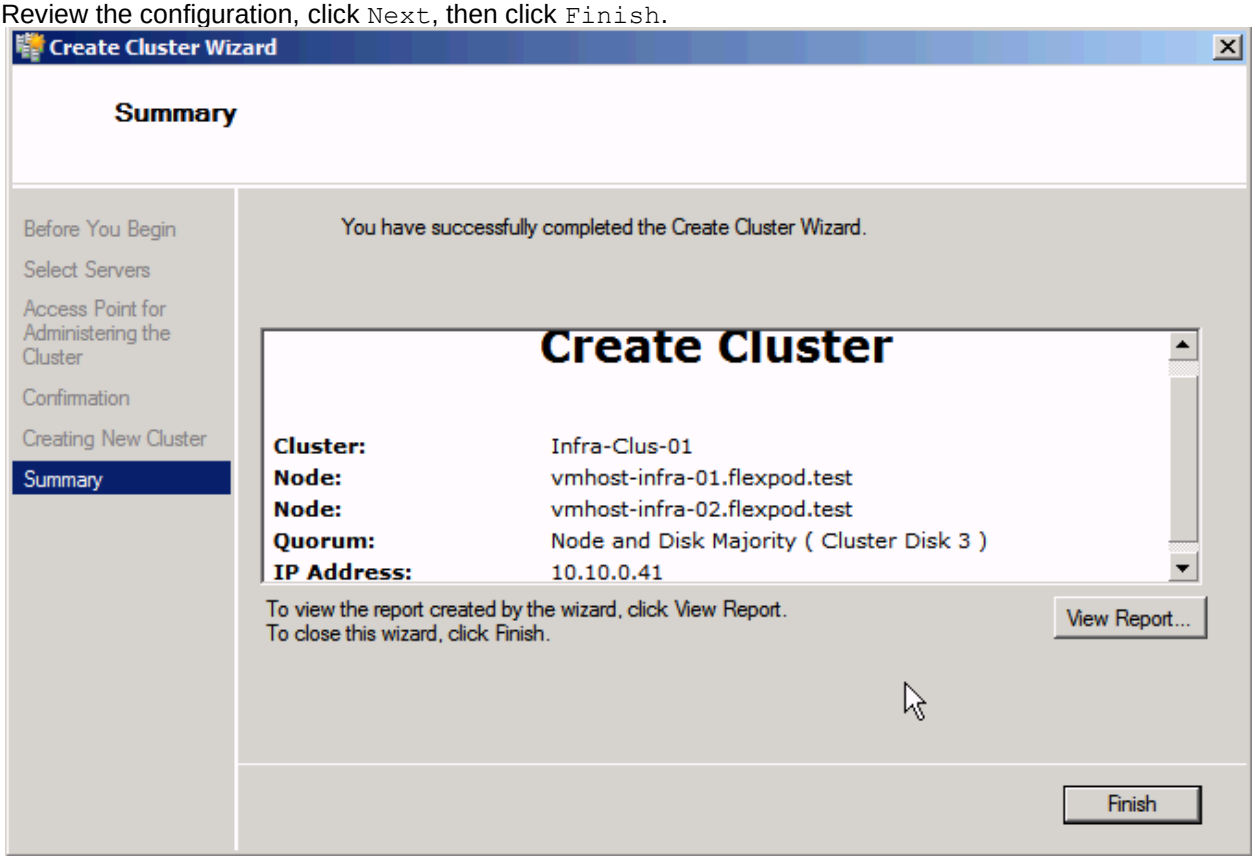
l. Select `Run all test` and click `Next`, then `Next` again.

m. Click `Finish`. At this time you may safely ignore any warnings or errors related to clustered disks.

n. Enter the Cluster Name, Cluster IP, and click `Next`.



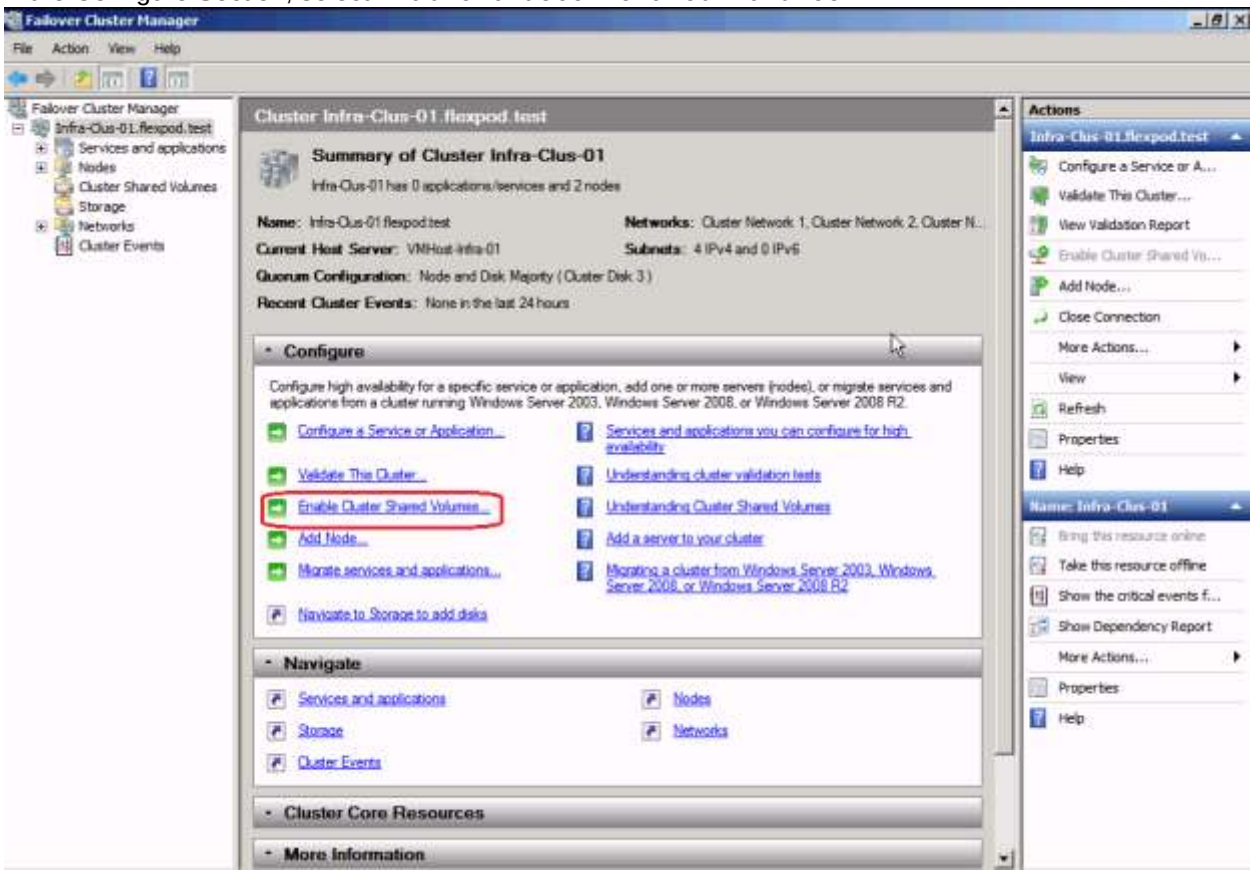
o. Review the configuration, click `Next`, then click `Finish`.



5. Provision cluster storage:
   a. Create a Quorum Disk:
      i. Log in to the cluster host server and open `SnapDrive`.
      ii. Select `Disks` and click `Create Disk`.
      iii. In the Welcome screen, click `Next`.
      iv. Enter the IP/FQDN for the Controller A and click `Add`.
      v. When enumeration has completed, select the target volume where you intend to add the LUN.
      vi. Add a LUN Name, LUN Description and click `Next`.
      vii. Select Shared (Microsoft Cluster Services only) and click `Next`.
      viii. Verify both nodes are shown for your cluster and click `Next`.
      ix. Select `Assign a Drive Letter` and pick a drive letter.
      x. Set the LUN Size to the size designated earlier, click `Next`, then `Next` again.
      xi. Highlight each node in the Cluster and select `All Fiber Channel Initiators` to map the new LUN.
      xii. Click `Next`, then `Select Automatic` and click `Next`.
      xiii. Make sure that `Select a cluster group by this node` is selected.
      xiv. Select the Cluster Group name `Available Storage`, click `Next`, then click `Finish`.

xv. Repeat for CSV-01, and CSV-02 LUNs. Do not assign a Drive Letter or Volume Mount Point to these LUNs, and also place these LUNs in Available Storage.

6. Change cluster quorum settings:
   a. From the node that currently owns the cluster open `Failover Cluster Manager`.
   b. Right-click the virtual cluster name for the cluster you built earlier, and select `More Actions > Configure Cluster Quorum Settings`. Open the `Configure Cluster Quorum Wizard`.
   c. In the Before You Begin screen, click `Next`.
   d. Select `Node` and `Disk Majority` and click `Next`.
   e. Select the `Quorum disk` with the mapped drive letter and click `Next`.
   f. Review the confirmation for accuracy and click `Next`, then click `Finish`.
7. Enable Cluster Shared Volumes:
   a. From the node that currently owns the cluster open `Failover Cluster Manager`.
   b. In the Configure Section, select `Enable Cluster Shared Volumes`.



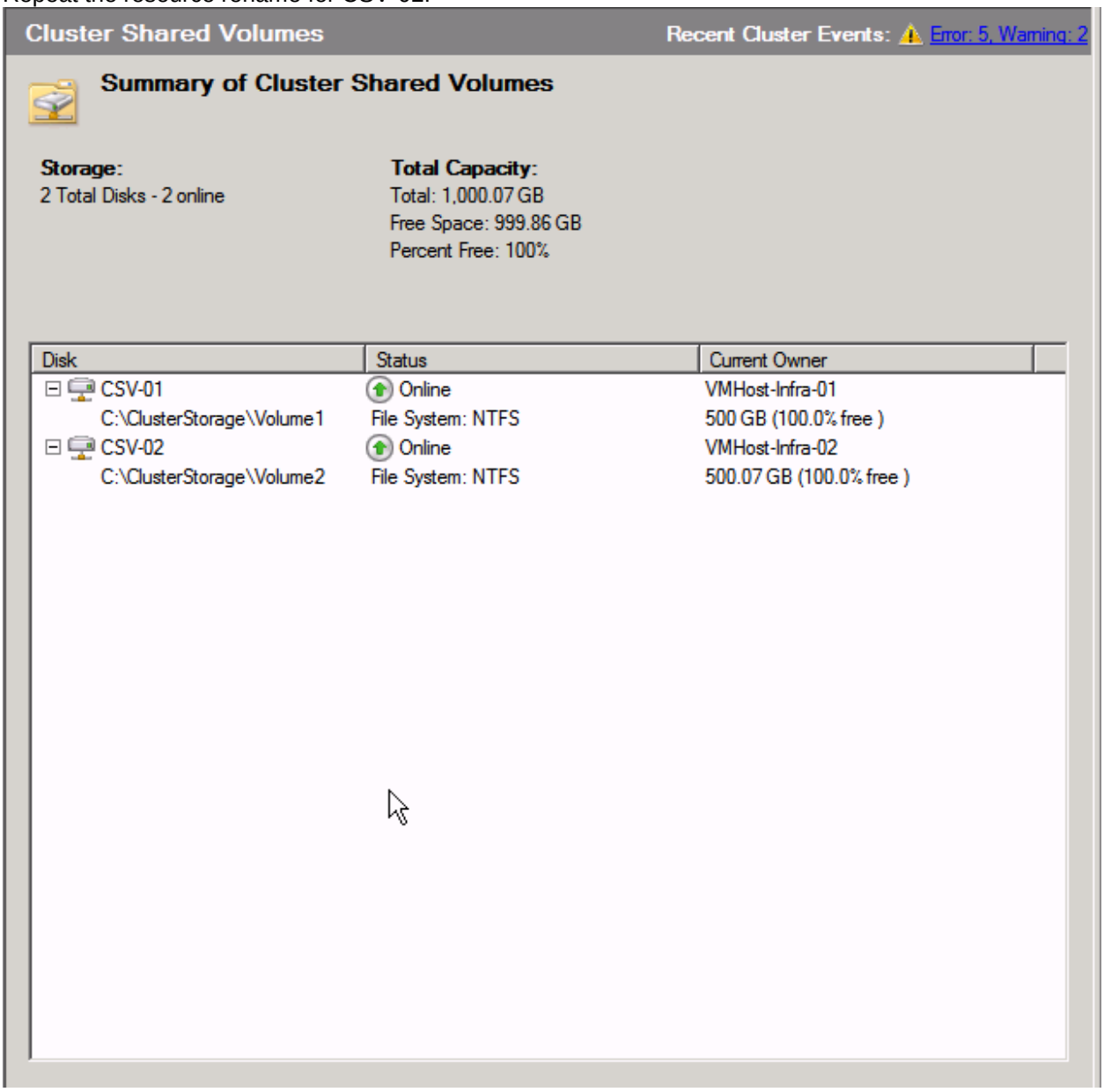
   c. Check `I have read the above notice` and click `OK`.
   d. Right-click `Cluster Shared Volumes` and select `Add Storage`.
   e. Select the volume corresponding to CSV-01 and click `OK`. You can look in SnapDrive to determine which volume is CSV-01.
   f. Right-click `Cluster Shared Volumes` and select `Add Storage`.

g. Select the remaining volume corresponding to CSV-02 and click `OK`.

h. Select Cluster Shared Volumes on the left.

i. Right-click the `CSV-01` volume in the center pane and select `Properties`. Rename the resource `CSV-01`.

j. Repeat the resource rename for CSV-02.



8. Rename Cluster Volume Mappings:

   a. On Host 1, open Windows Explorer and browse to `C:\ClusterStorage`.

   b. Right-click `Volume1` and rename it `CSV-01`.

   c. Right-click `Volume2` and rename it `CSV-02`.

9. Validate cluster (from the node that currently owns the cluster):

a. Open `Failover Cluster Manager` and right-click the `virtual cluster name` for the cluster you built earlier, and select `Validate This Cluster`.

b. Click `Next`, then Select `Run All Tests` and click `Next`.

c. Review the report and resolve any issues found by the validation wizard before continuing.

d. Click `Finish`.

10. Rename Cluster Networks:

a. From the `Failover cluster Manager`, Under Networks, select `Cluster Network 1`.

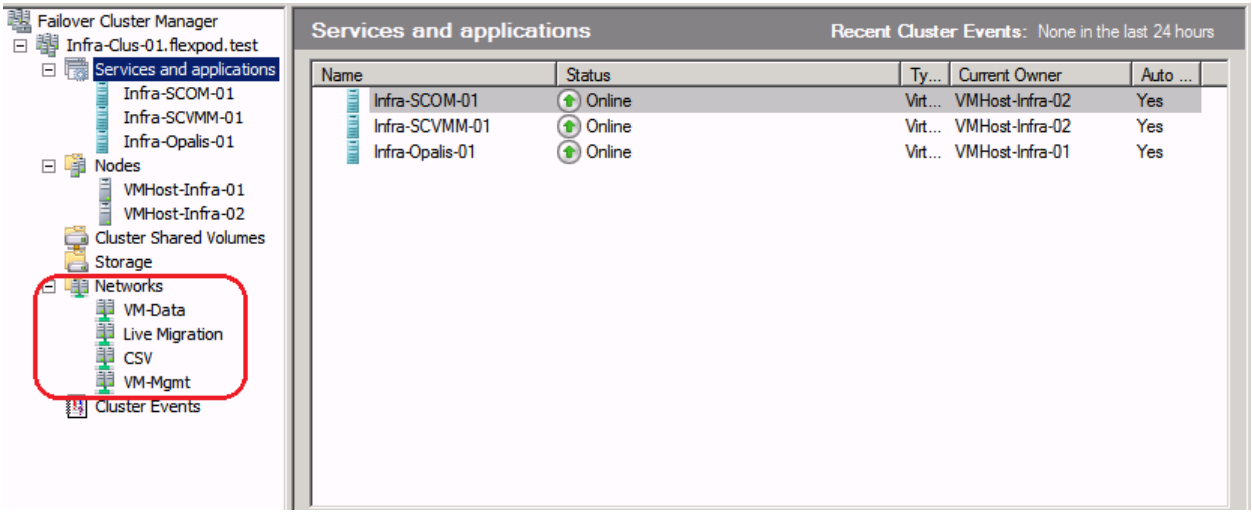
b. Expand the `Network Connections`.

c. Right-click the `Cluster Network 1`.

d. Select `Rename`.

e. Rename the Network to the adapter name.

f. Repeat these steps for the remaining cluster networks. Rename each one to the adapter name for that Cluster Network.



Configure Cluster Network For CSV Network Traffic

1. Open a PowerShell command window.
2. Enter the PowerShell command `Import-Module failoverclusters`.
3. Enter the PowerShell command `get-clusternetworkinterface | fl network,name`.

```
PS C:\Users\administrator.FLEXPOD> Import-Module failoverclusters

PS C:\Users\administrator.FLEXPOD> Get-ClusterNetworkInterface | fl
network, name


Network : Cluster Network 1
Name    : VMHost-Infra-01 - VM-Date-Software Switch

Network : Cluster Network 1
Name    : VMHost-Infra-02 - VM-Data Software

Network : Cluster Network 2
```

```
Name    : VMHost-Infra-01 - LiveMigration

Network : Cluster Network 2
Name    : VMHost-Infra-02 - LiveMigration

Network : Cluster Network 3
Name    : VMHost-Infra-01 - CSV

Network : Cluster Network 3
Name    : VMHost-Infra-02 - CSV

Network : Cluster Network 4
Name    : VMHost-Infra-01 - VM-Mgmt

Network : Cluster Network 4
Name    : VMHost-Infra-02 - VM-Mgmt
```

4. Enter the PowerShell command `get-clusternetwork | fl name,metric`.

```
PS C:\Users\administrator.FLEXPOD> Get-ClusterNetwork | fl  name,
metric


Name   : Cluster Network 1
Metric : 10100

Name   : Cluster Network 2
Metric : 1100

Name   : Cluster Network 3
Metric : 1200

Name   : Cluster Network 4
Metric : 10000
```

5. Change the CSV network metric by entering the PowerShell command `(get-clusternetwork "Cluster Network 3").Metric=900`

```
PS C:\Users\administrator.FLEXPOD> ( Get-ClusterNetwork "Cluster
Network 3").Metric = 900
```

6. Enter the PowerShell command `get-clusternetwork | fl name,metric`.

```
PS C:\Users\administrator.FLEXPOD> Get-ClusterNetwork | fl name, metric

Name   : Cluster Network 1
Metric : 10100

Name   : Cluster Network 2
Metric : 1100
```

```
Name   : Cluster Network 3
Metric : 900

Name   : Cluster Network 4
Metric : 10000
```

Create Virtual Machines and Resource for Deploying Infrastructure Roles

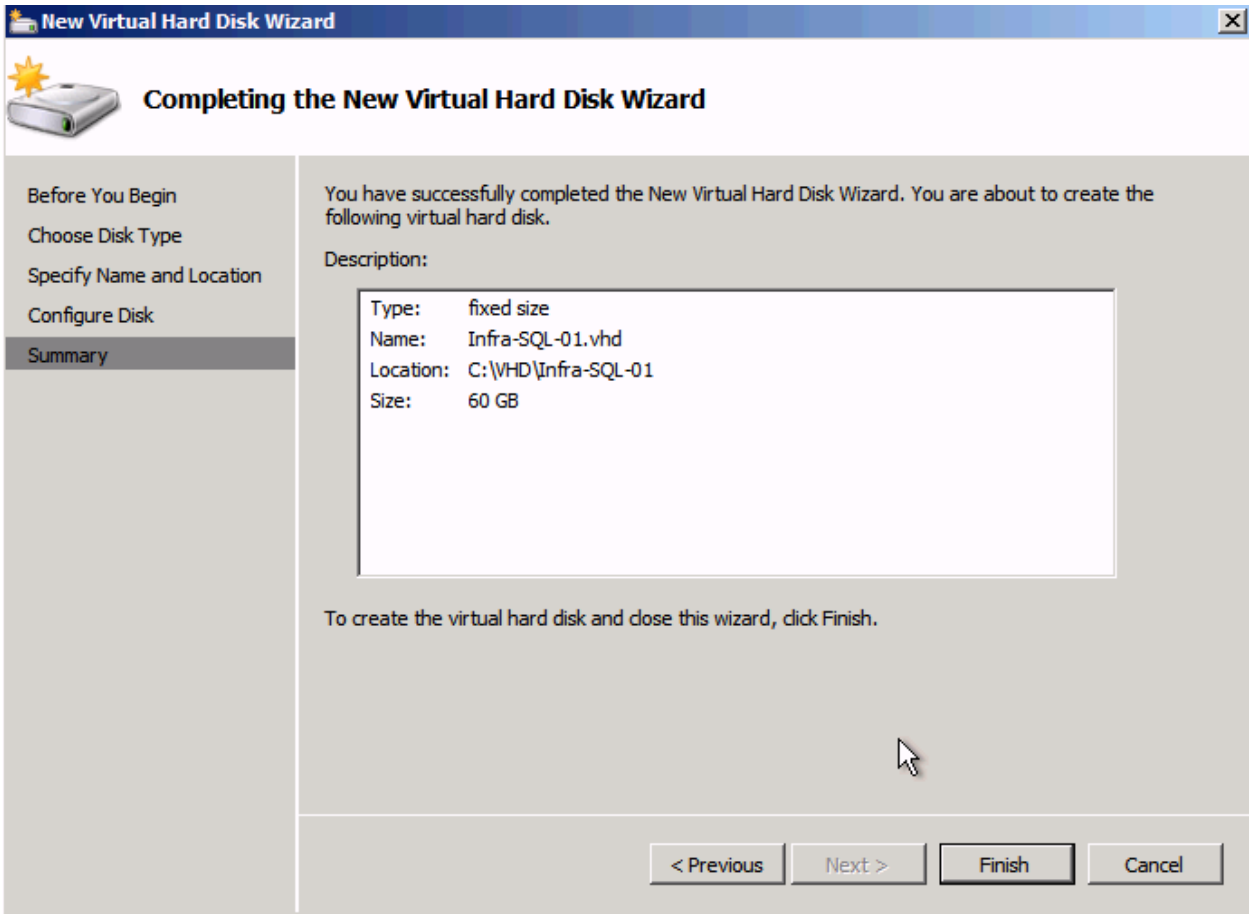
Create VHD for Infrastructure Roles

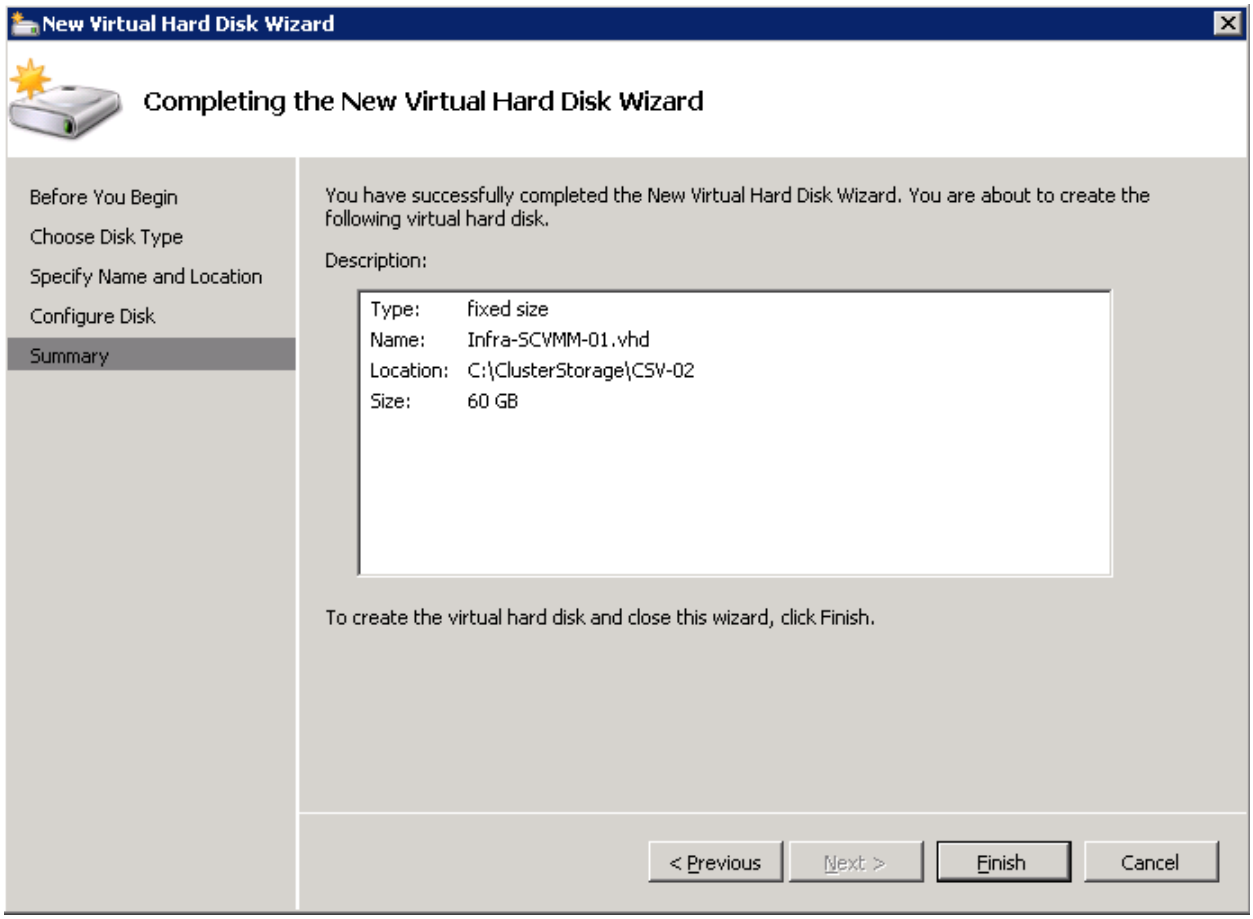
Create the following VHD storage resources that will be used by the virtual machines running system center roles:

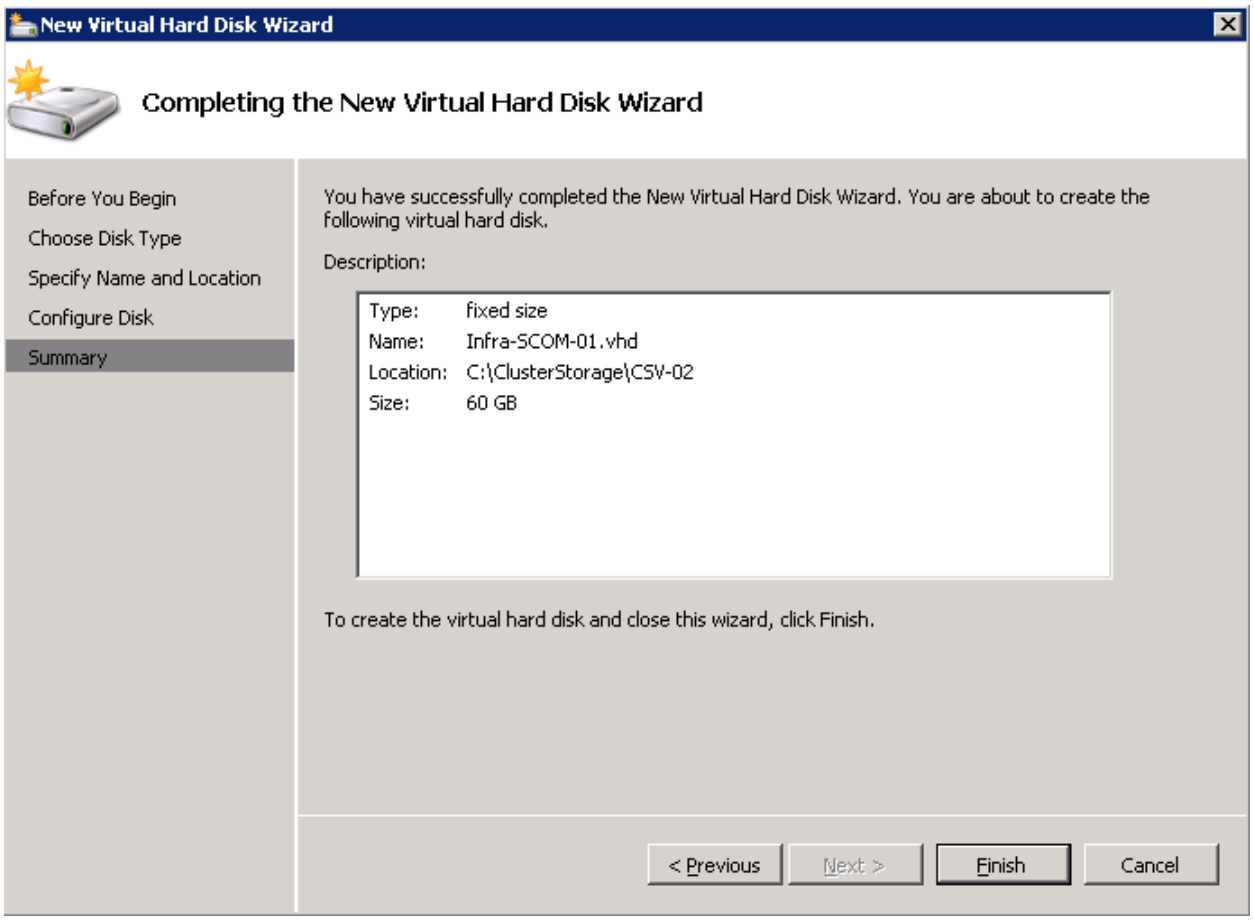
Table 15 VHD Storage Resources

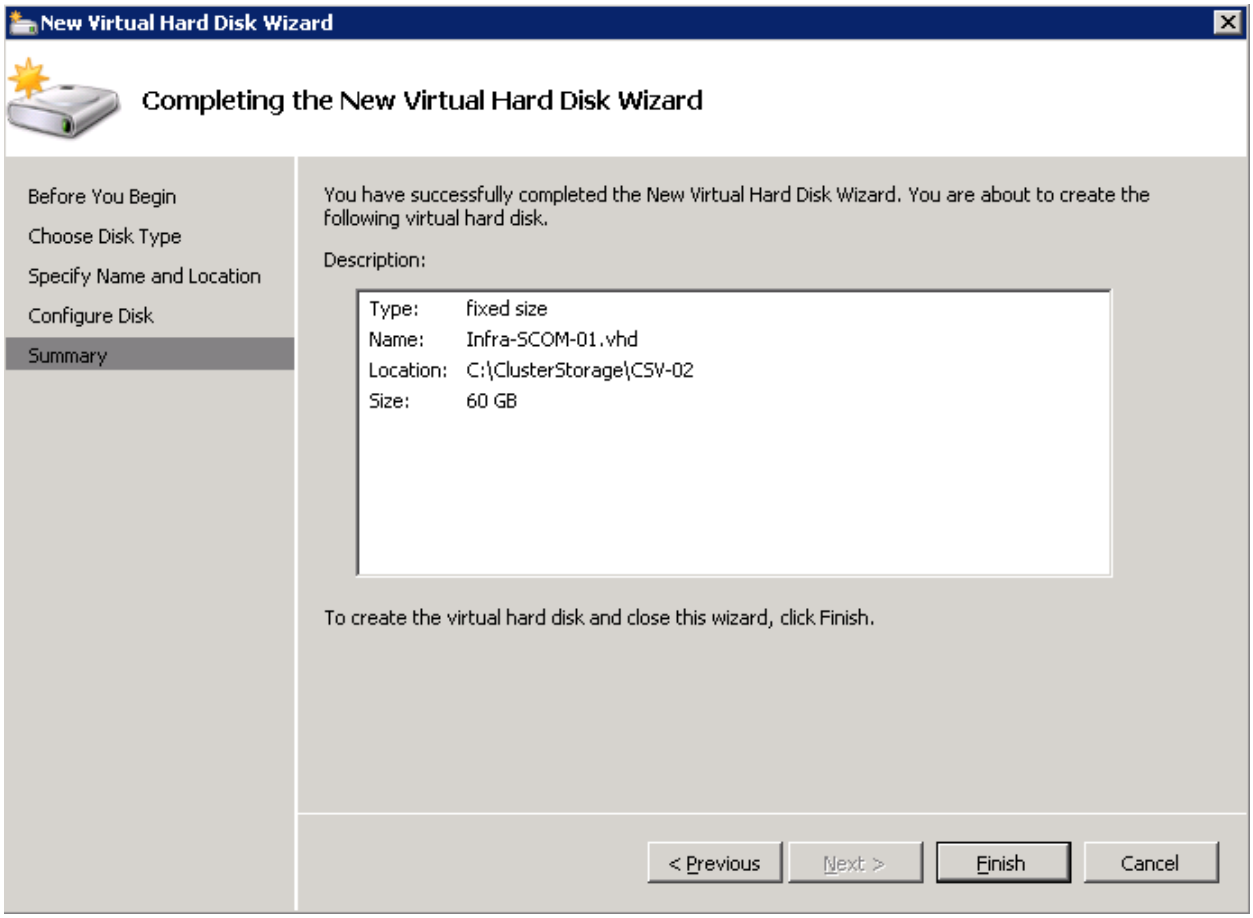
VM Host	VM Name	Name	Location	Size	Type
Infra-VM-Host-01	Infra-SQL-01	Infra-SQL-01.vhd	C:\VHD\Infra-SQL-01	60 GB	Fixed
Infra-VM-Host-02	Infra-SQL-02	Infra-SQL-02.vhd	C:\VHD\Infra-SQL-01	60 GB	Fixed
Infra-VM-Host-01	Infra-SCOM-01	Infra-SCVMM-01.vhd	C:\ClusterStorage\CSV-01	60 GB	Fixed
Infra-VM-Host-02	Infra-SCVMM-01	Infra-SCVMM-01.vhd	C:\ClusterStorage\CSV-02	60 GB	Fixed
Infra-VM-Host-01	Infra-Opalis-01	Infra-Oplis-01.vhd	C:\ClusterStorage\CSV-01	60 GB	Fixed

1. Open the Hyper-V Manager and select the `Hyper-V server` in the left pane.
2. Click `New` and select `Hard Disk`.
3. Choose the `Fixed size disk` type and click `Next`.
4. Provide the VHD name and location, and click l `Next`.
5. Select `Create a new blank virtual hard disk` and provide the disk size. Click `Next`.
6. Click `Finish`.
7. Repeat steps 1 through 6 for each VHD.









Create Infrastructure Virtual Machines

Domain Controller Virtual Machine (optional)

Most environments will already have and active directory infrastructure and will not require additional domain controllers do be deployed for the Hyper-V FlexPod. The optional domain controllers can be omitted from the configuration in this case or used as a resource domain. The domain controller virtual machines will not be clustered because redundancy is provided by deploying multiple domain controllers running in virtual machines on different servers. Since these virtual machines reside on Hyper-V hosts that run Windows Failover cluster, but are not clustered themselves, Hyper-V Manager should be used to manage them instead of Virtual Machine Manager.

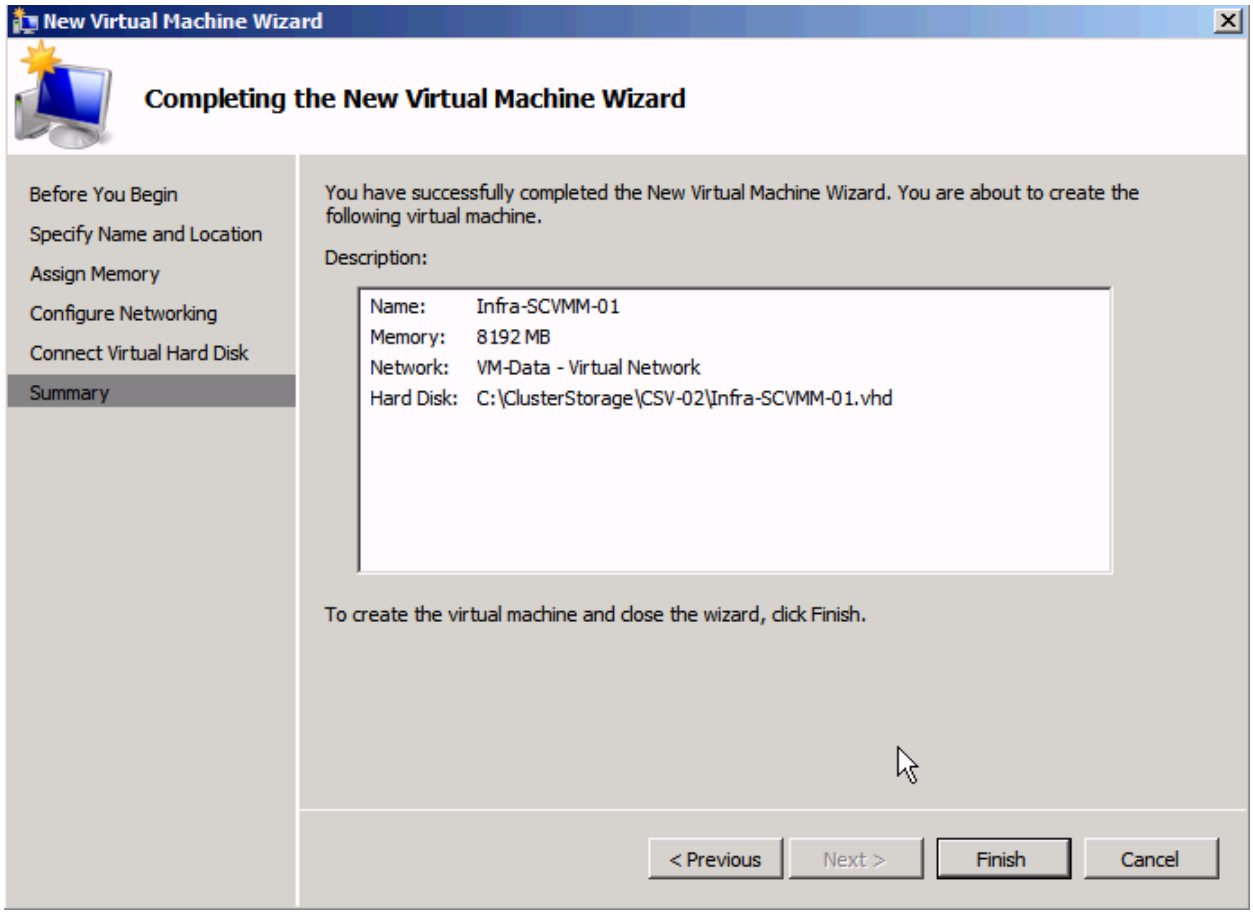
Create the following virtual machines that will be used by the virtual machines running system center roles.

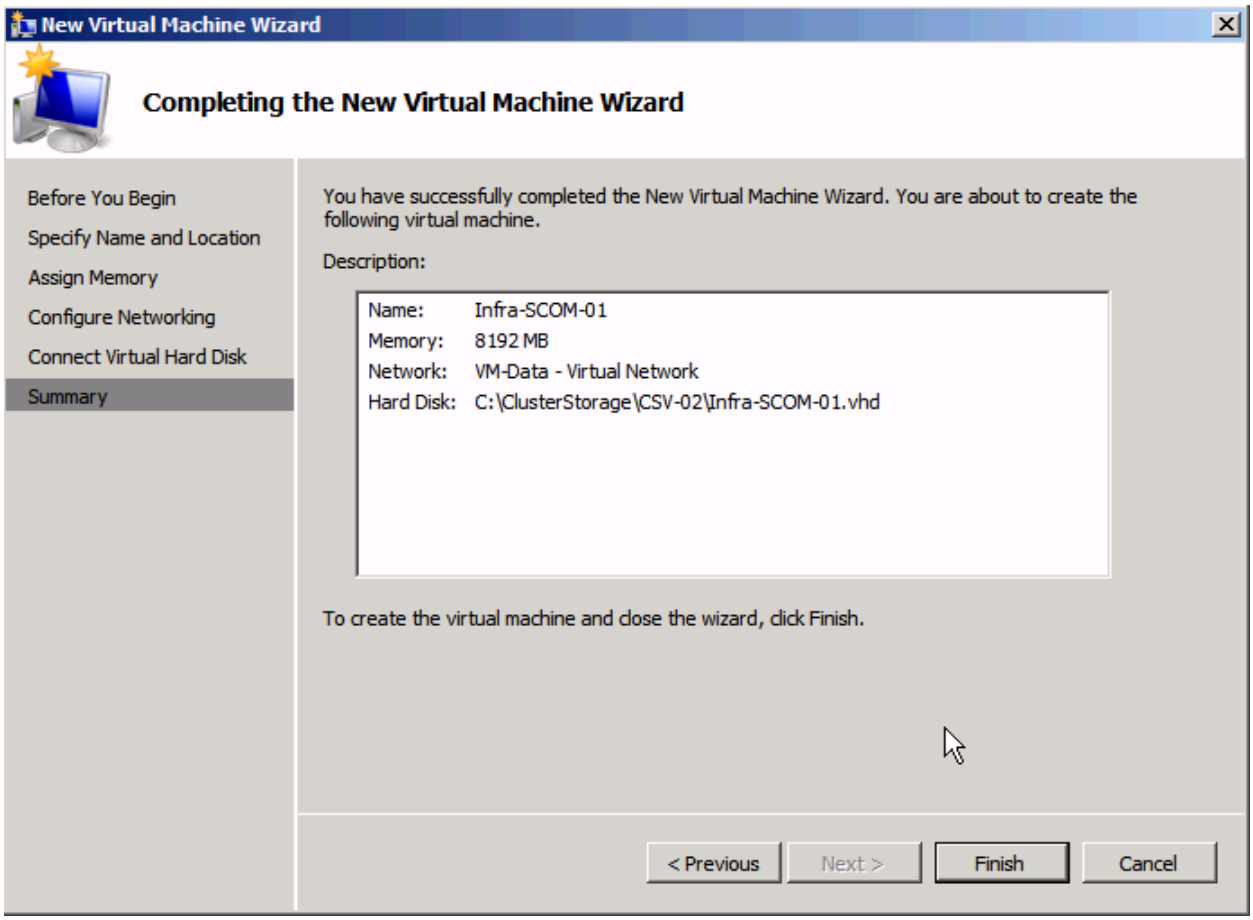
Table 16 Infrastructure Virtual Machines

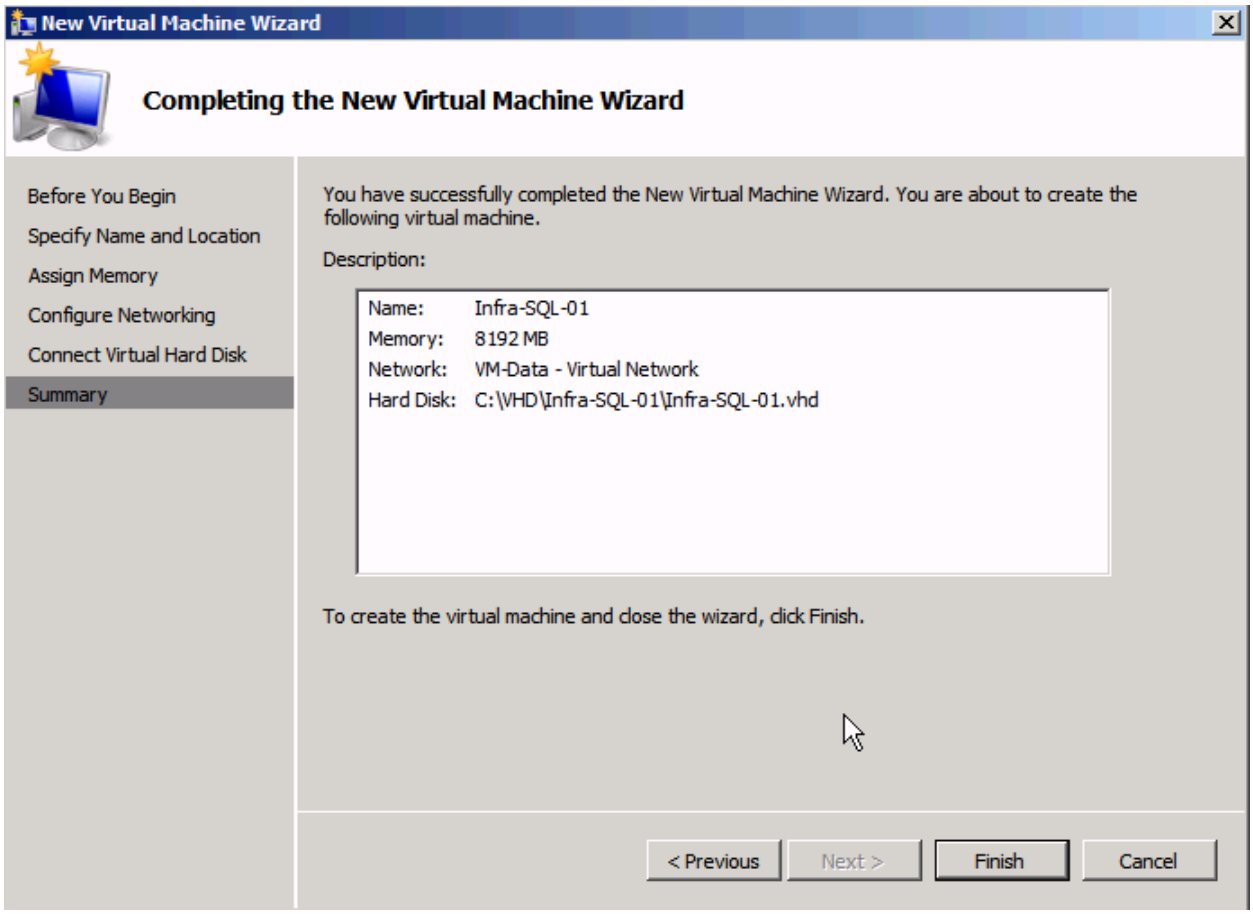
VM Host	VM Name	Hard Disk	Network	Memory
Infra-VM-Host-01	Infra-SQL-01	C:\VHD\Infra-SQL-01Infra-SQL-01.vhd	VM-Data – Virtual Network	8 GB
Infra-VM-Host-02	Infra-SQL-02	C:\VHD\Infra-SQL-01\Infra-SQL-02.vhd	VM-Data – Virtual Network	8 GB

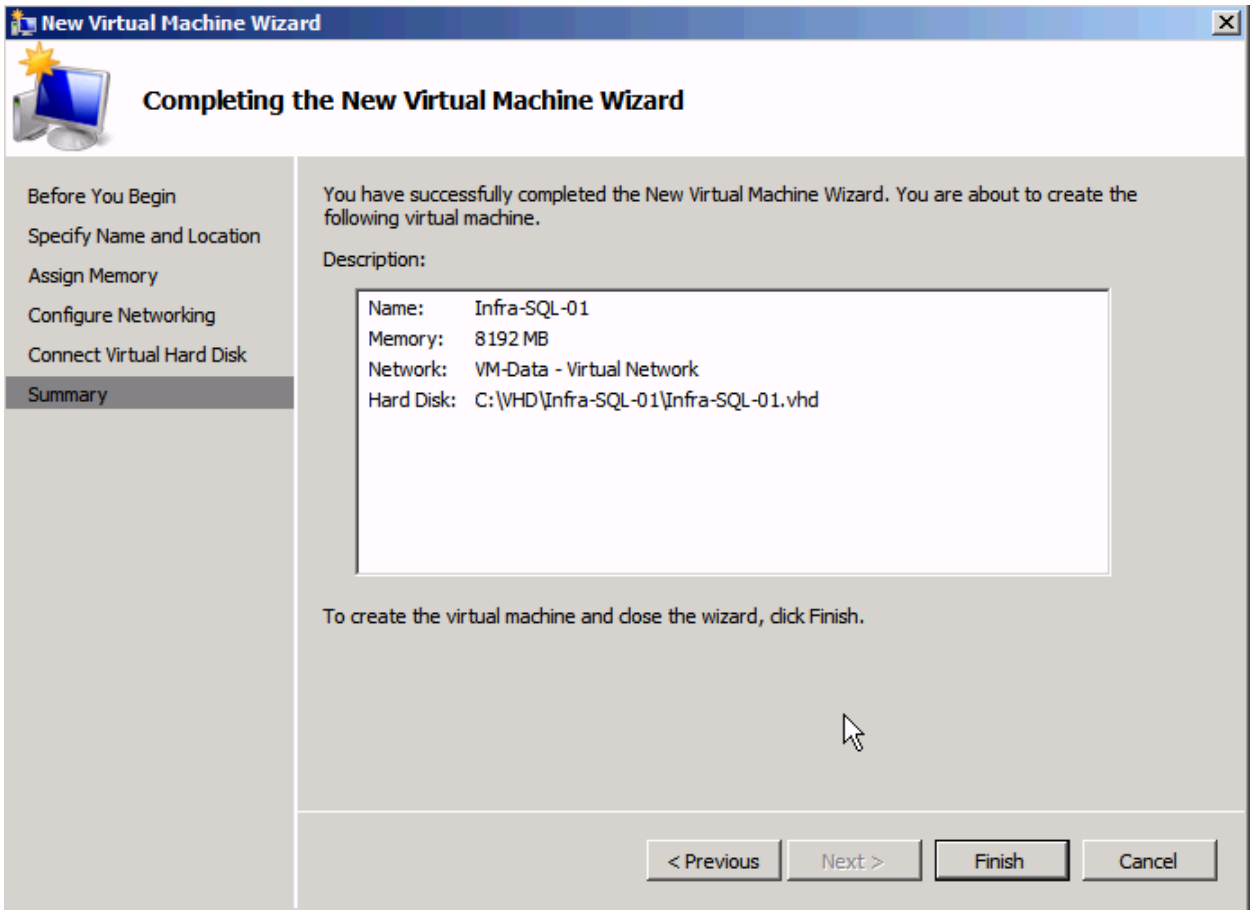
Infra-VM-Host-01	Infra-SCOM-01	C:\ClusterStorage\CSV-01\Infra-SCVMM-01.vhd	VM-Data – Virtual Network	8 GB
Infra-VM-Host-02	Infra-SCVMM-01	C:\ClusterStorage\CSV-02\Infra-SCVMM-01.vhd	VM-Data – Virtual Network	8 GB
Infra-VM-Host-01	Infra-Opalis-01	C:\ClusterStorage\CSV-01\Infra-Oplis-01.vhd	VM-Data – Virtual Network	8 GB

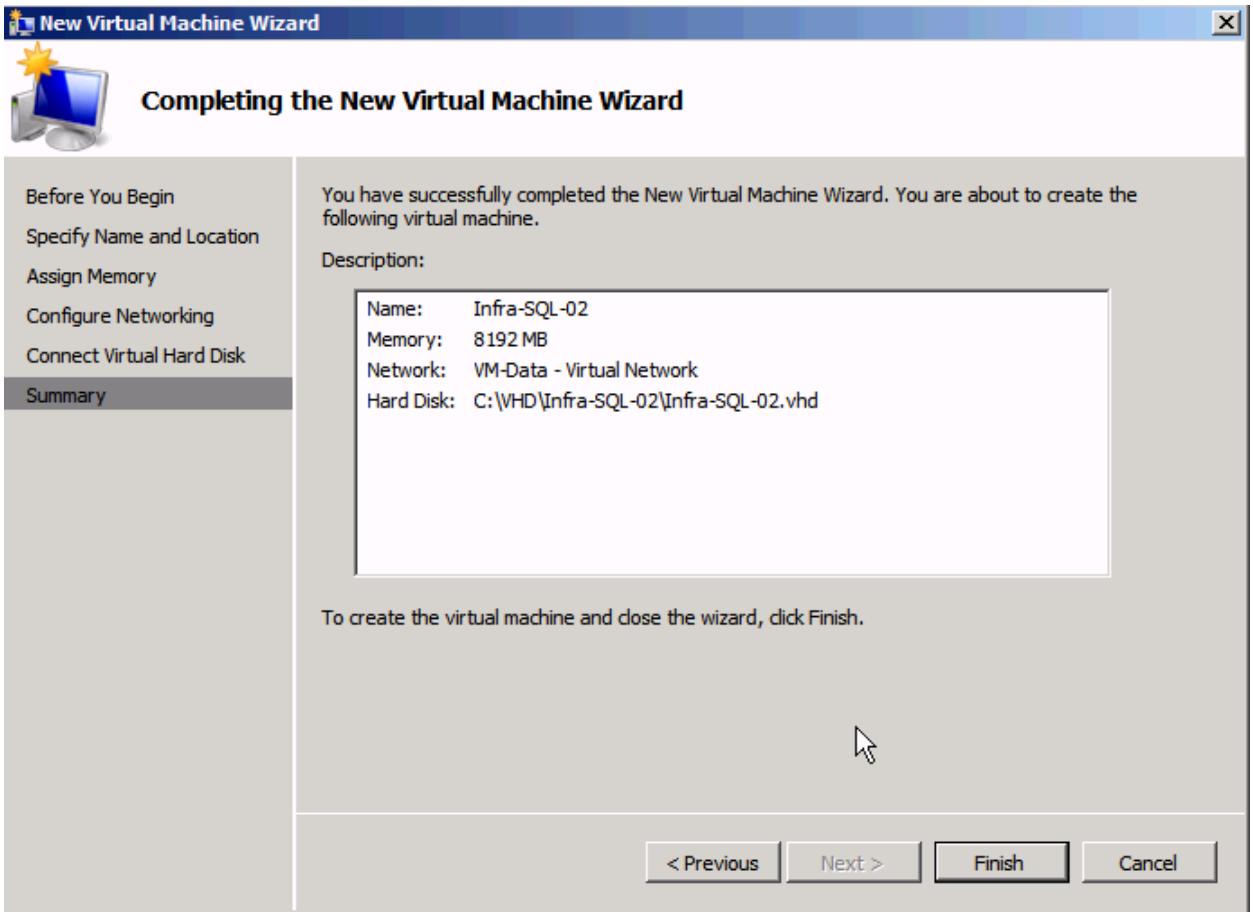
1. Open the `Hyper-V Manager` and select the `Hyper-V server` in the left pane.
2. Click `New` in the right action pane and select `Virtual Machine`.
3. Provide the name. Check the box for storing the virtual machine in a different location and provide the path. Click `Next`.
4. Enter the memory size and Click `Next`.
5. Select the Network connection `VM-Data-Virtual Network`. Click `Next`.
6. Select the option to use an existing virtual hard disk and specify the path to the VHD created in the previous section. Click `Next`.
7. Select the option to install the operating system later and click `Finish`.
8. Repeat steps 1 through 7 for each virtual machine.











Modify the Virtual Machine Settings

Update the logical processor setting and virtual network adapters with the following information.

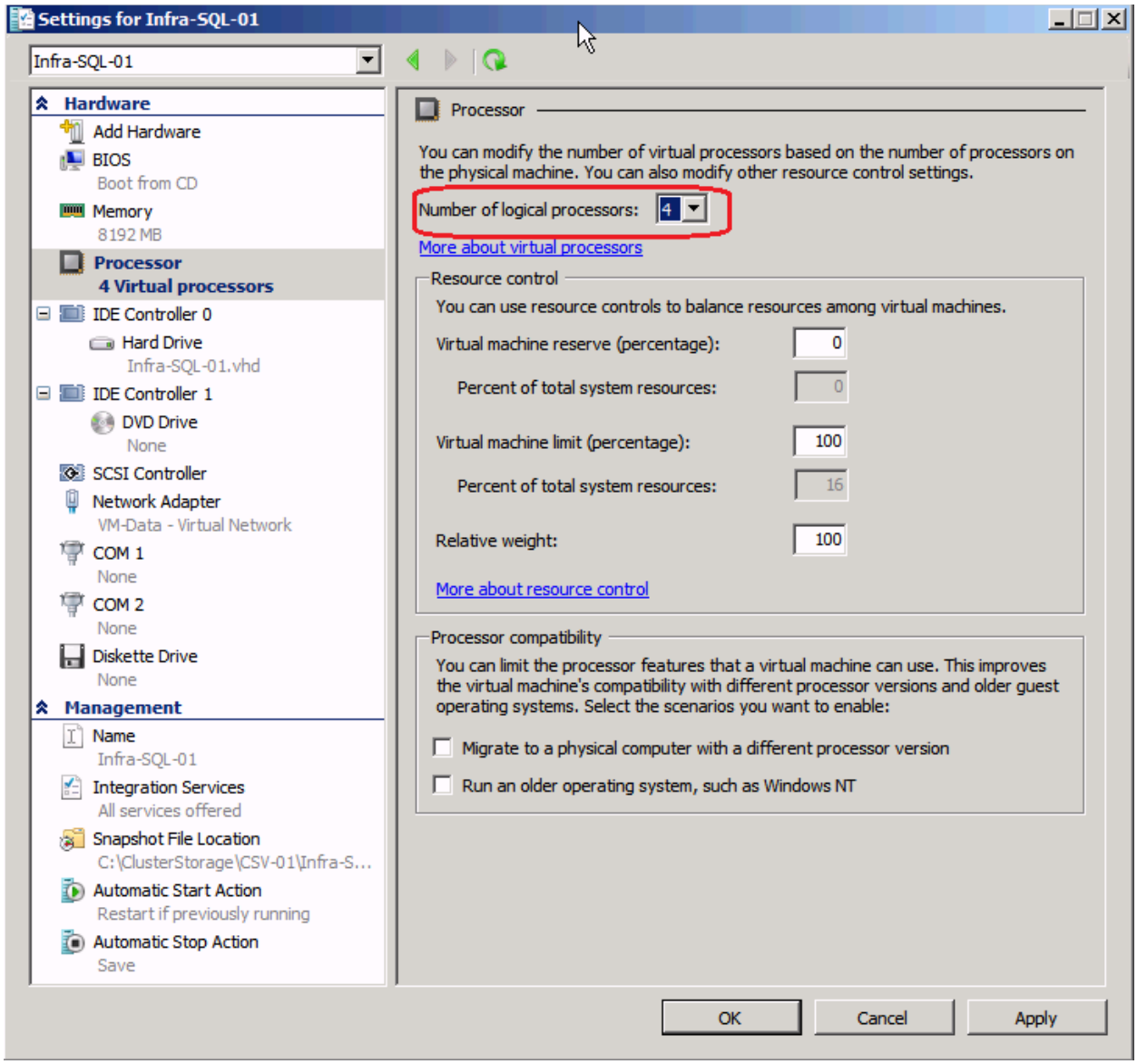
Table 17 Virtual Machine Settings

VM Name	Logical Processors	Network	VLAN ID
Infra-SQL-01	4	VM-Data	804
		iSCSI Fabric-A	802
		iSCSI Fabric-B	802
		App-Cluster-Comm	806
Infra-SQL-02	4	VM-Data	804
		iSCSI Fabric-A	802
		iSCSI Fabric-B	802
		App-Cluster-Comm	806
Infra-SCOM-01	2	VM-Data	804
Infra-SCVMM-01	2	VM-Data	804
		iSCSI Fabric-A	802
		iSCSI Fabric-B	802
Infra-Opalis-01	2	VM-Data	804

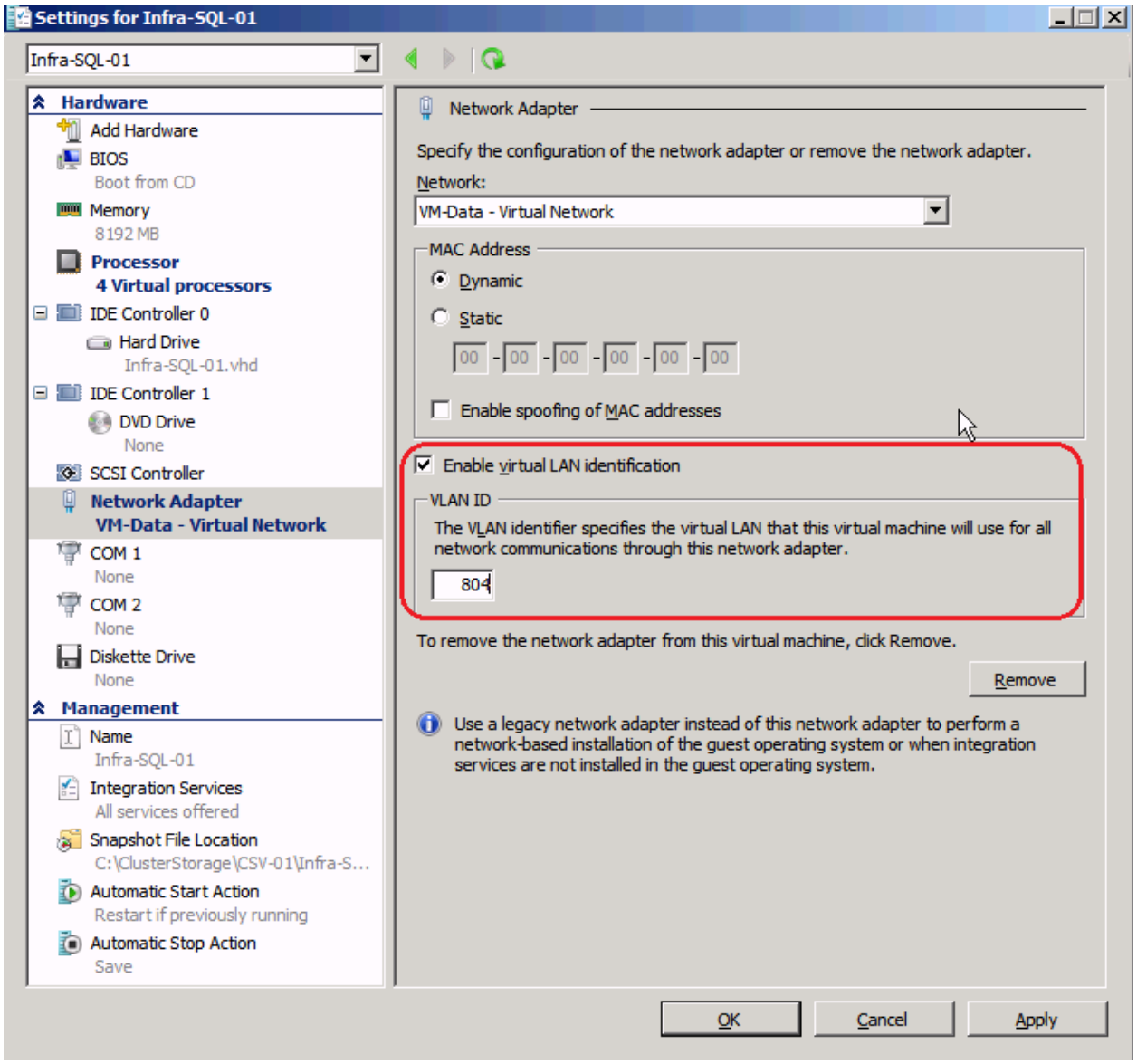
Update the virtual machine setting using the following procedure.

1. Using the Hyper-V Manager select the virtual machine in the center pane.
2. Click `Settings` in the lower right pane.
3. Click `Processor` in the left Hardware pane.
4. Configure the correct number of logical processors using the drop down box and the information in the table above.
5. Select the `VM-Data network adapter` in the right pane.
6. Check the box that enables `virtual LAN identification`.
7. Enter the VLAN ID in the text box from the table above.
8. Click `Apply`.
9. Select `Add Hardware` in the right pane to add additional network adapters.
10. Select `Network Adapter` and click the `Add` button.
11. Select the appropriate network in the Network dropdown box.
12. Check the box that enables `virtual LAN identification`.
13. Enter the VLAN ID in the text box from the table above.
14. Click `Apply`.
15. Repeat steps 9 through 14 to add additional network adapters.
16. Click `OK` to close the settings window.
17. Repeat steps 1 through 16 for all virtual machines.

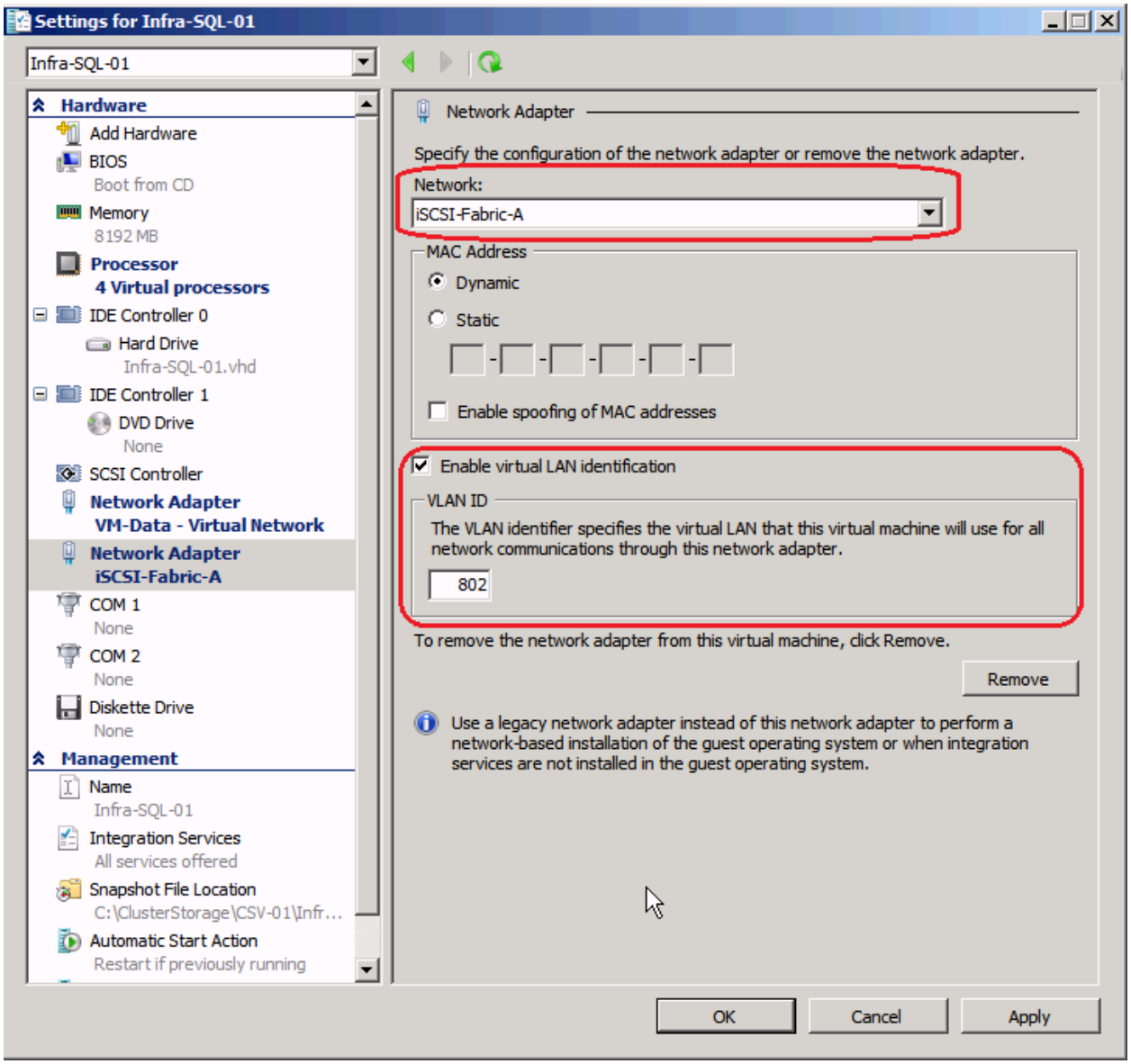
Configure Virtual Processor Count



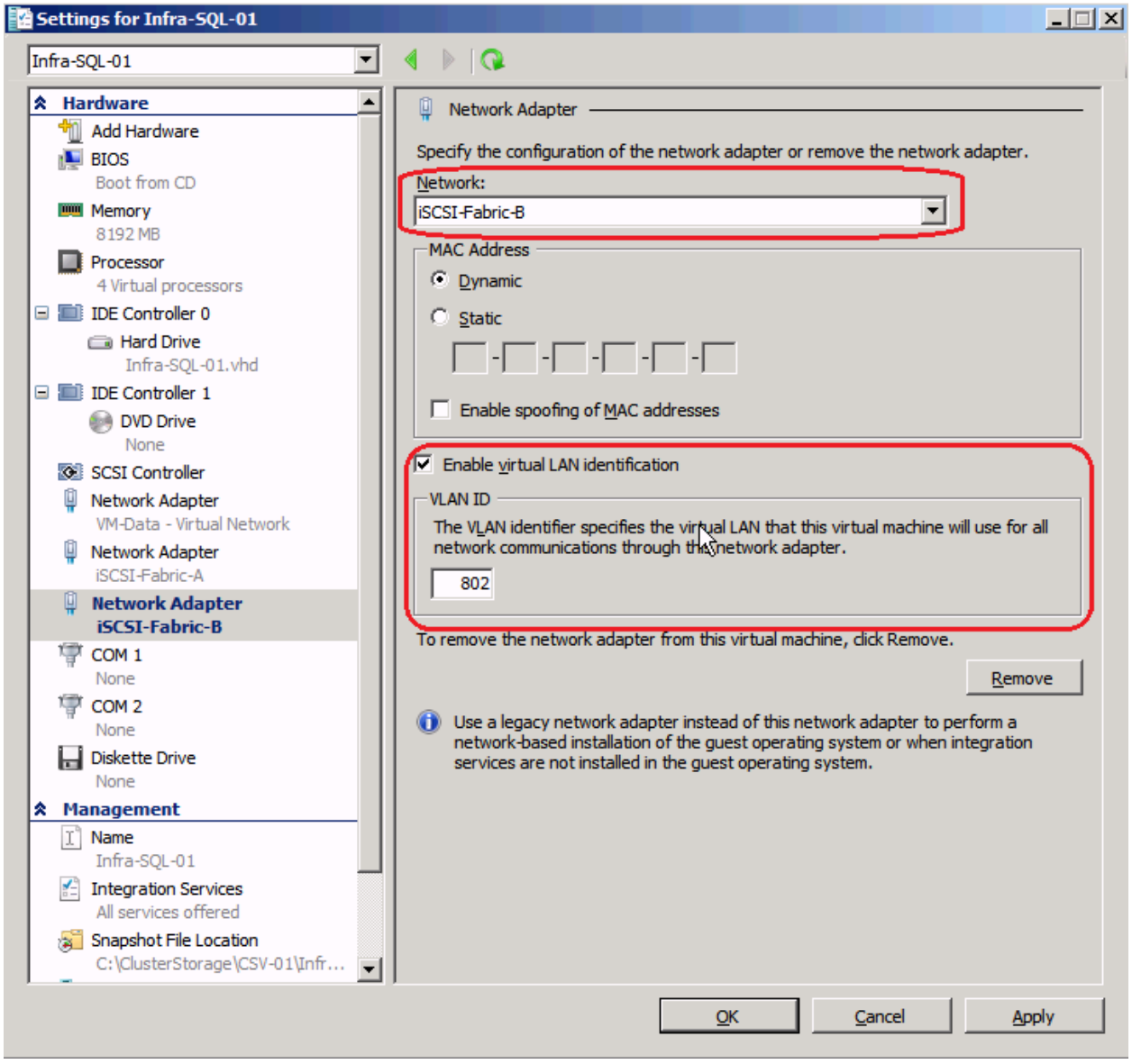
Configure Virtual LAN Identification

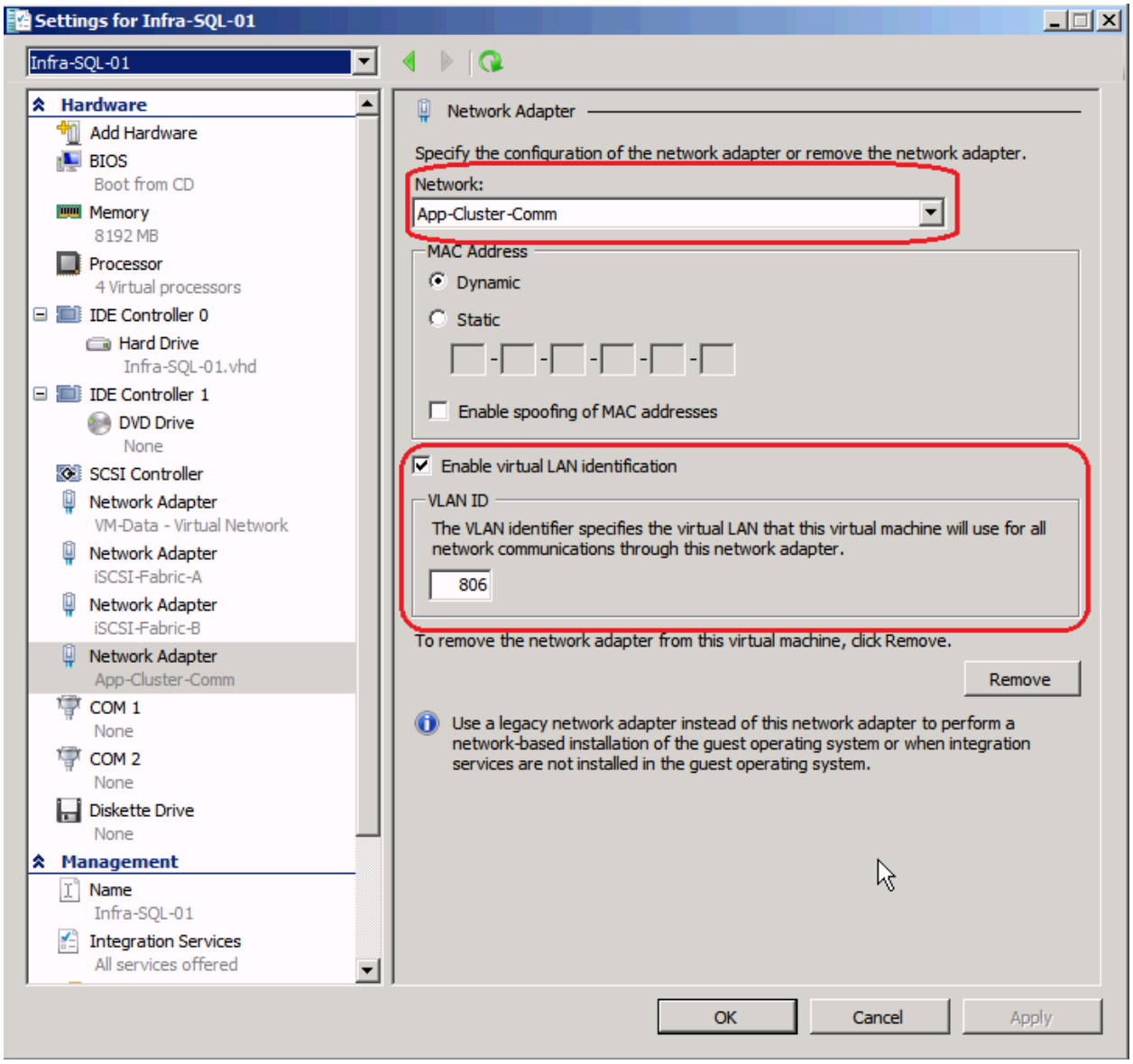


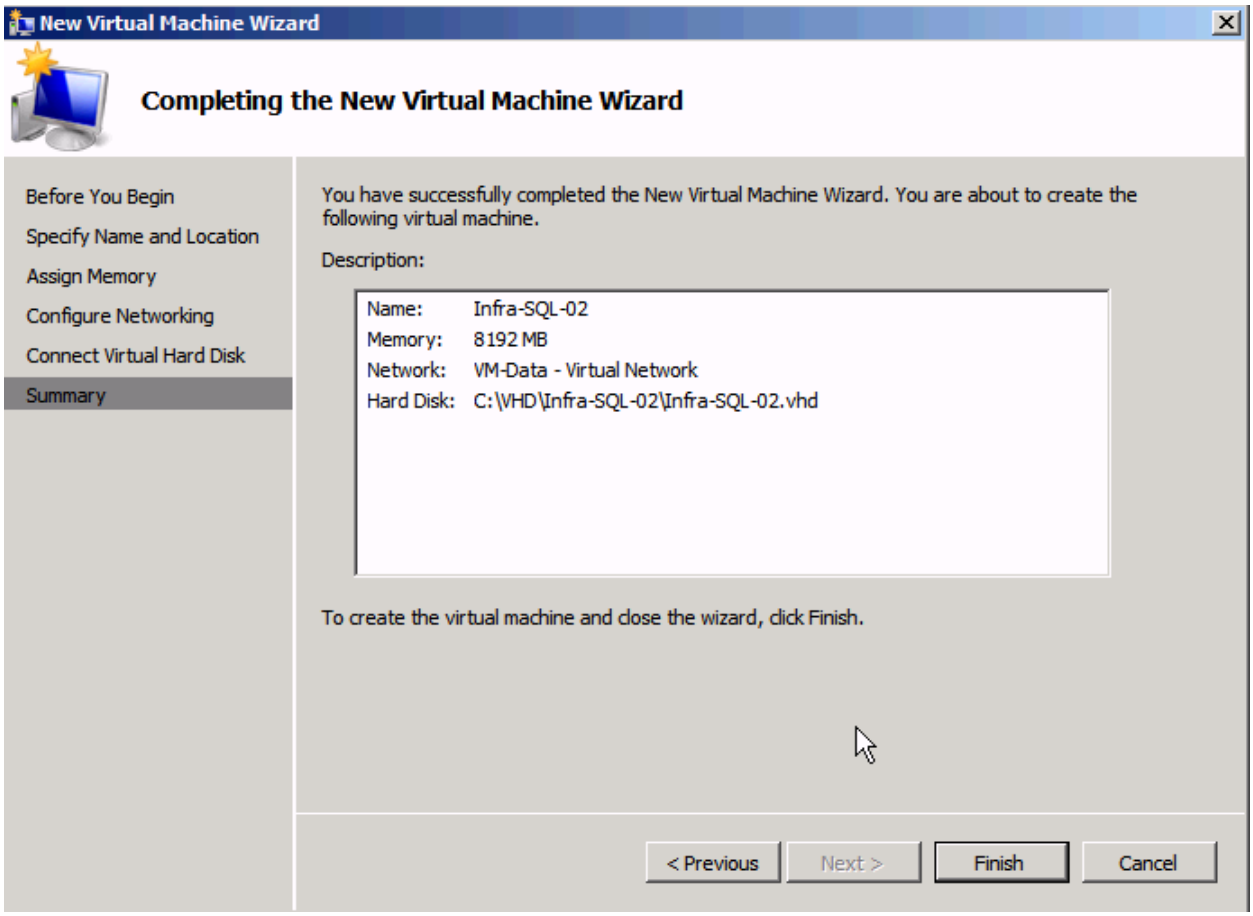
Add iSCSI Fabric A Interface

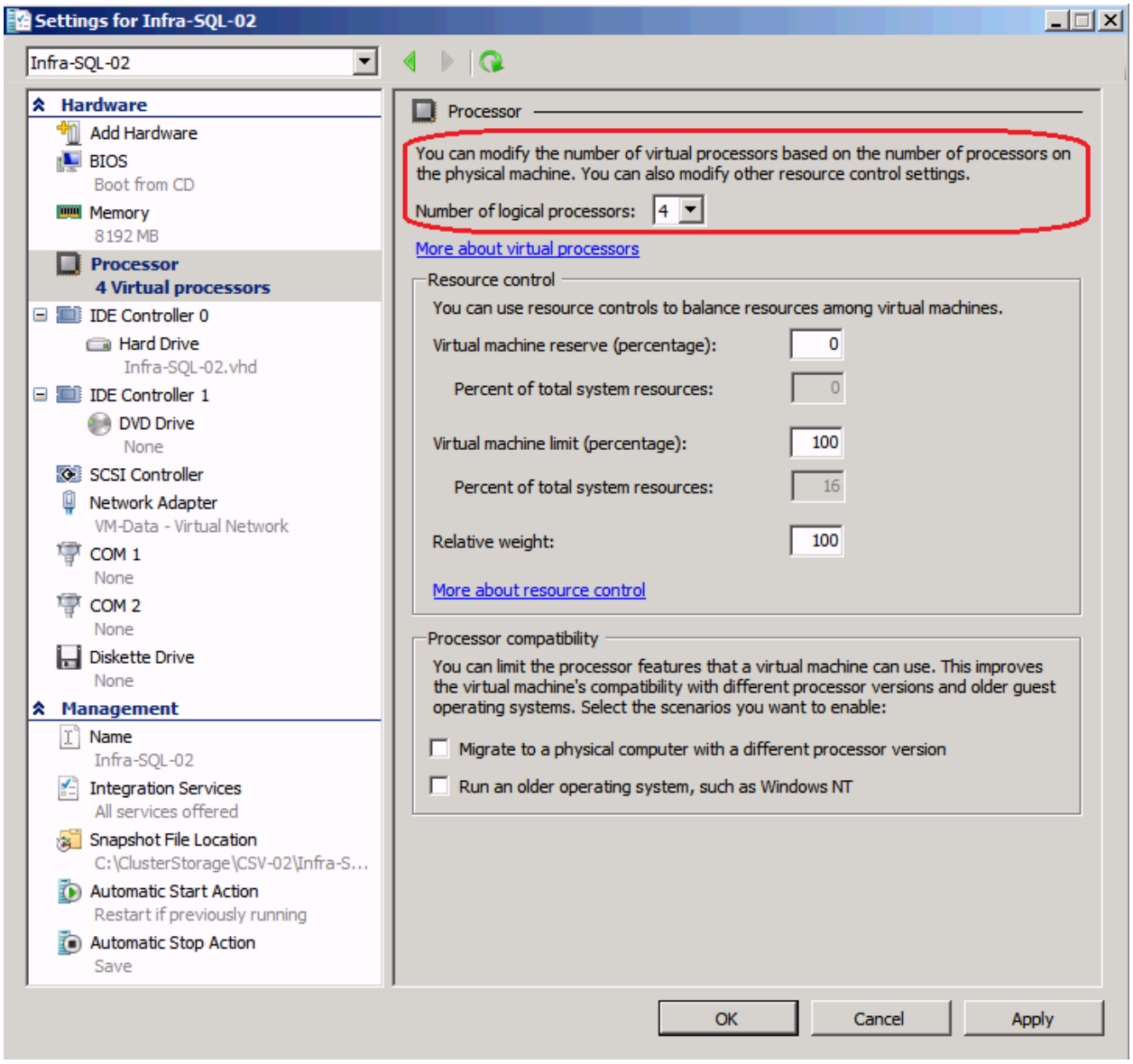


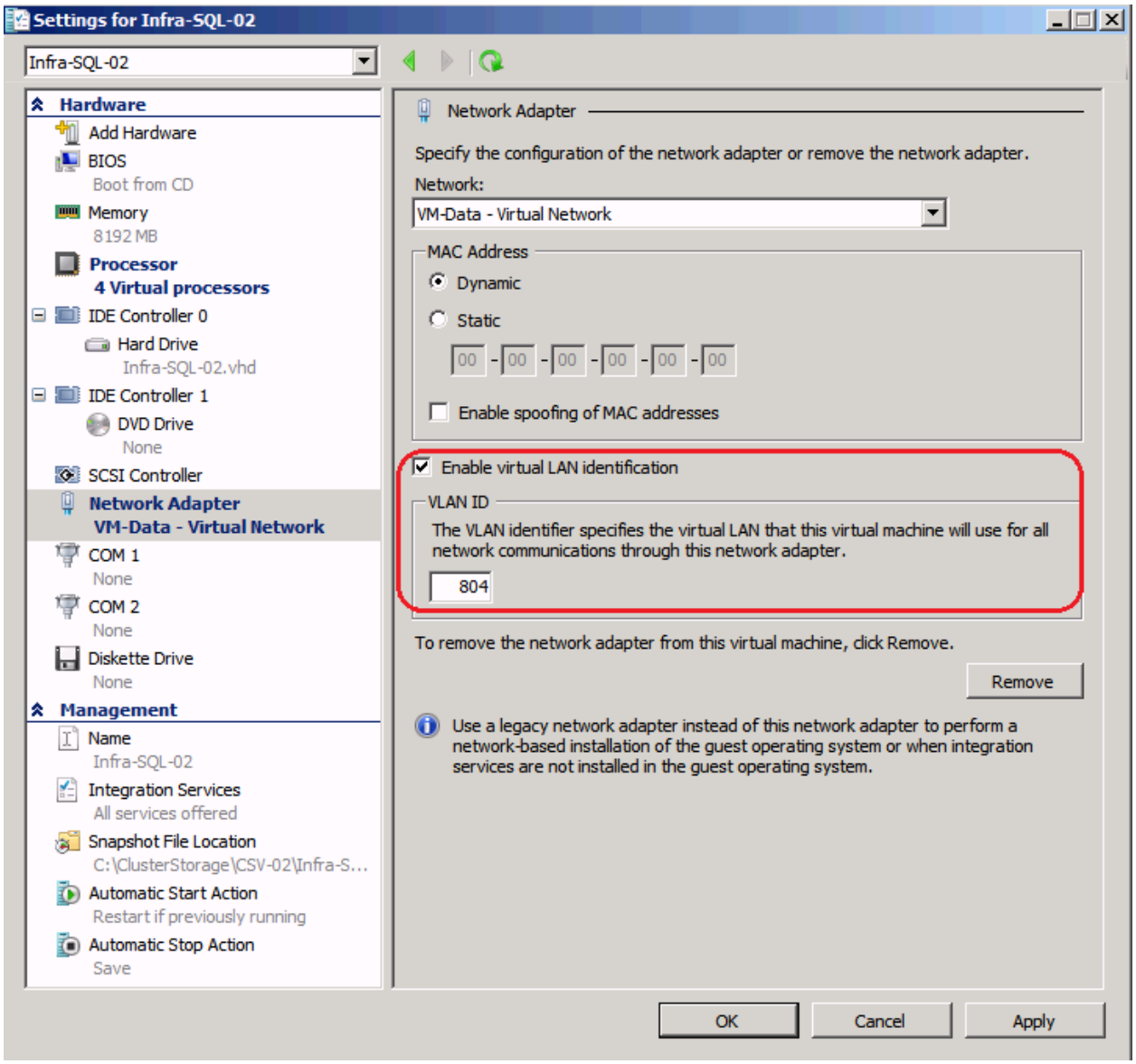
Add iSCSI Fabric B Interface

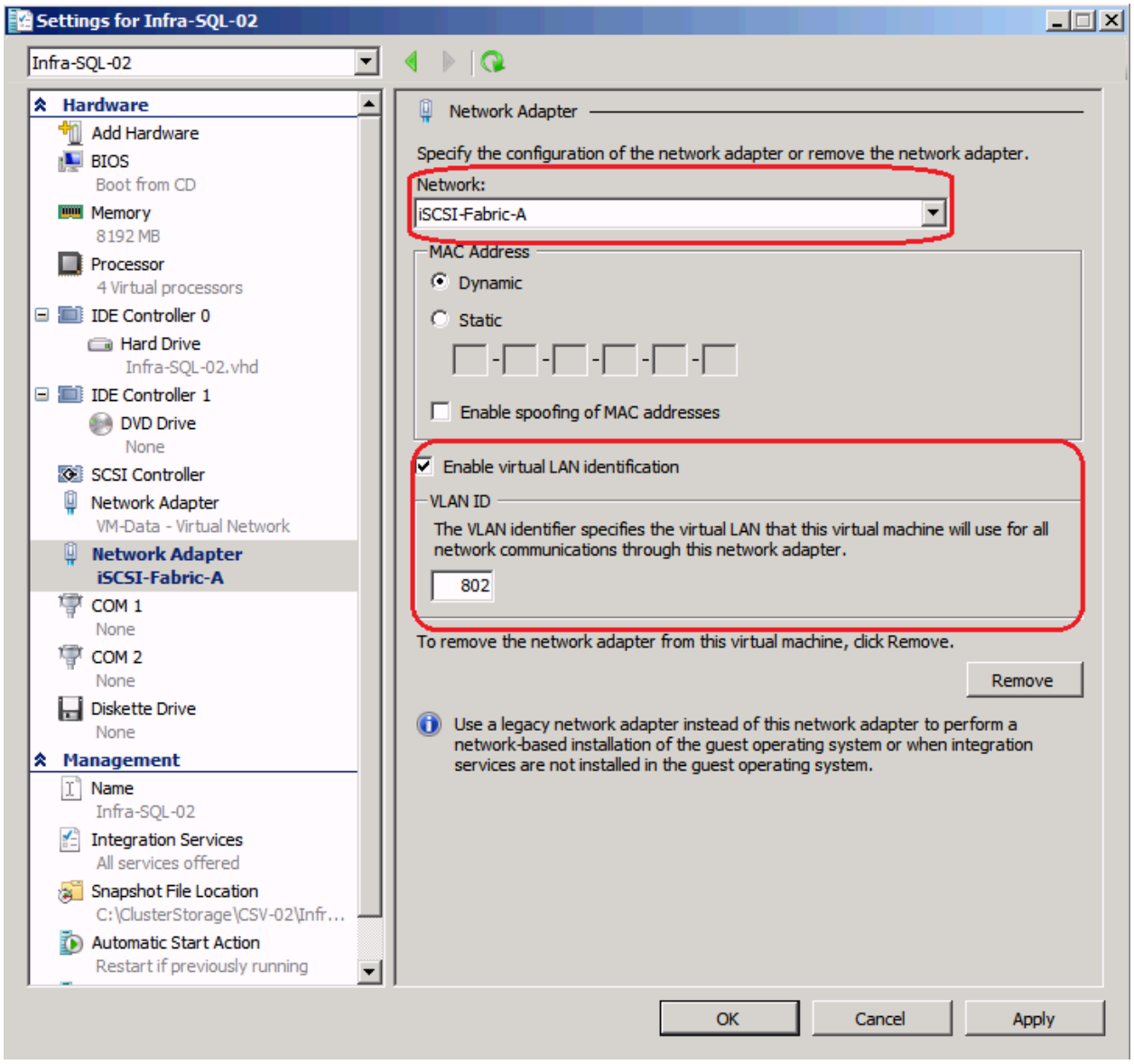


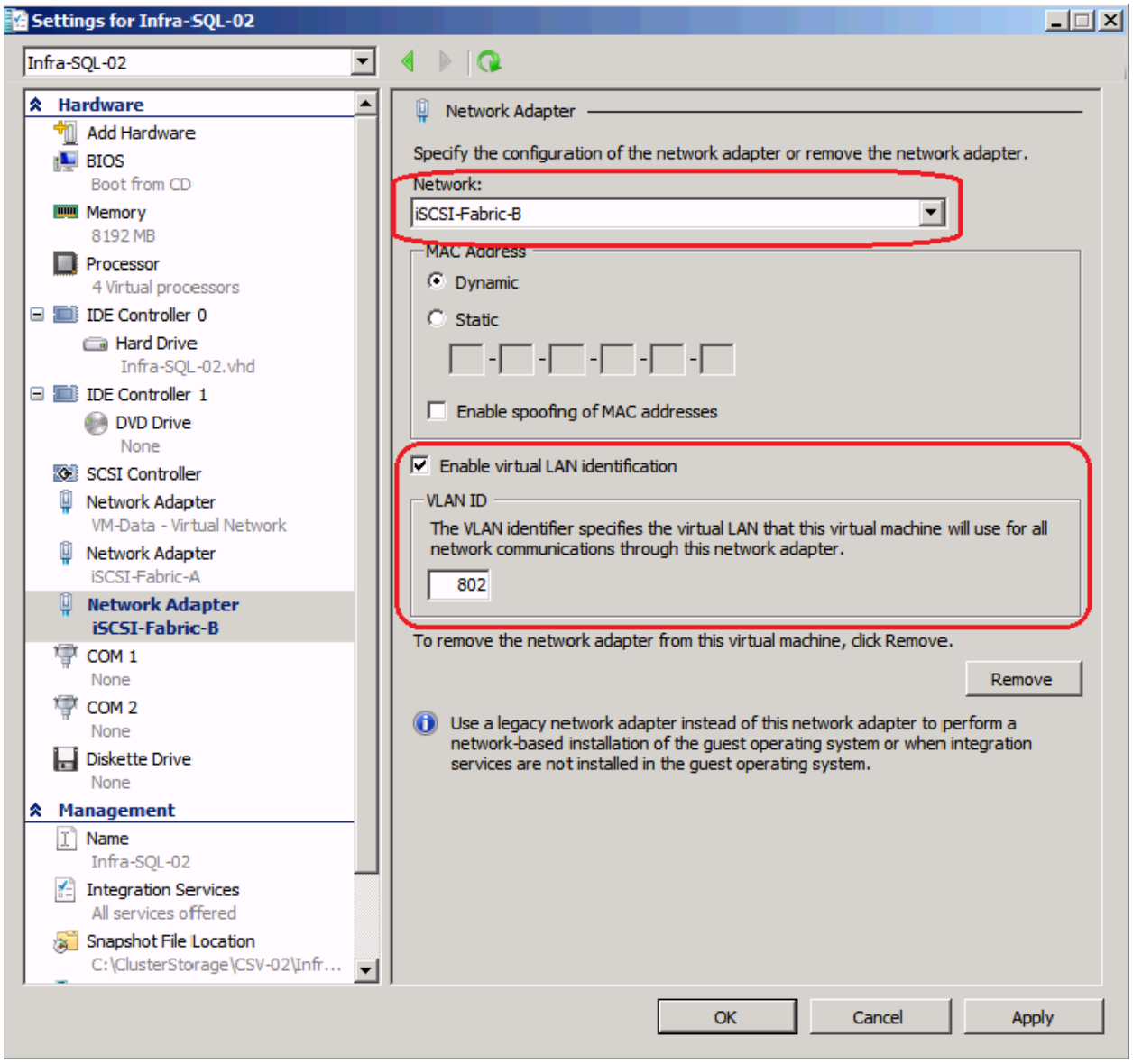


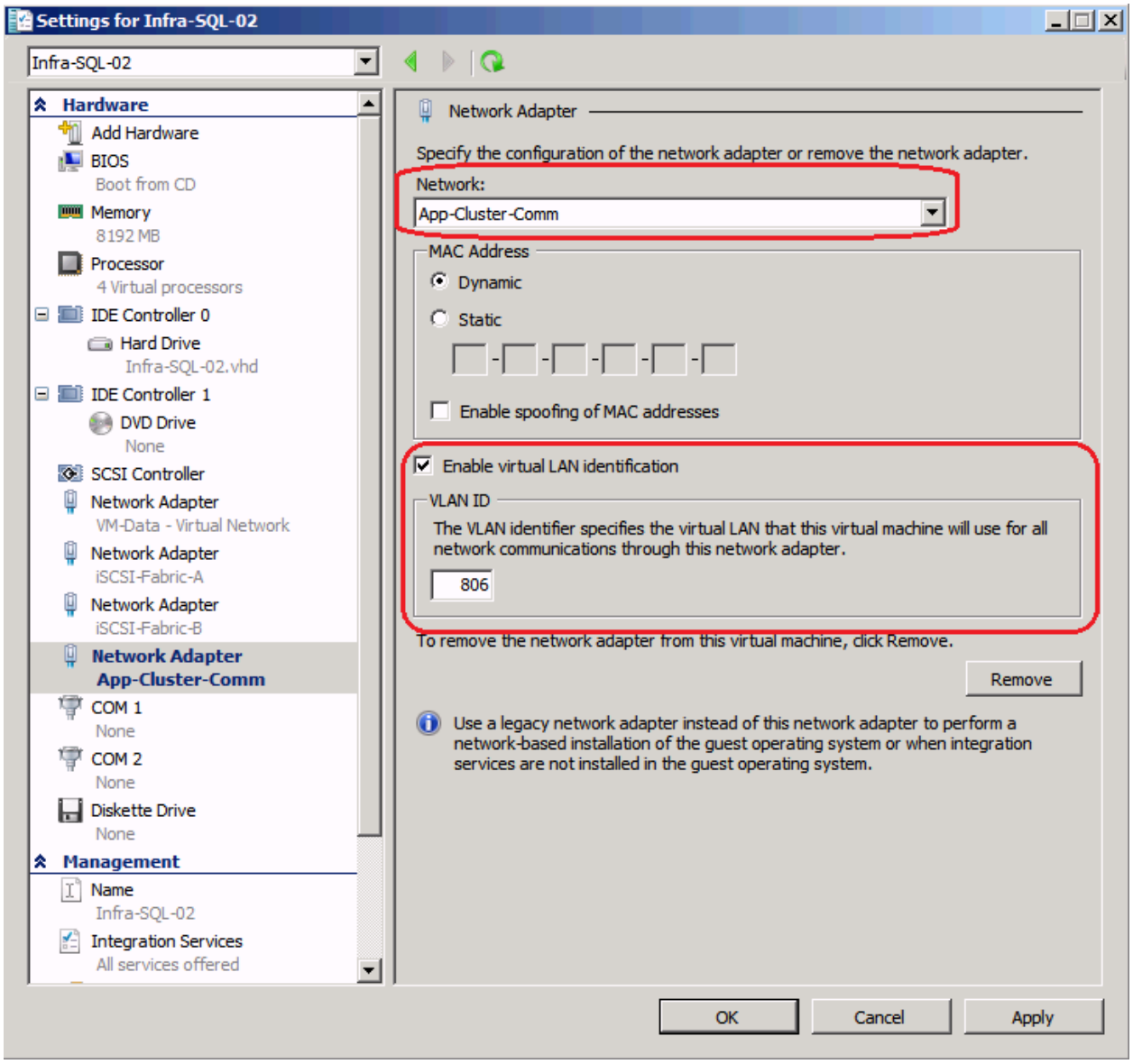


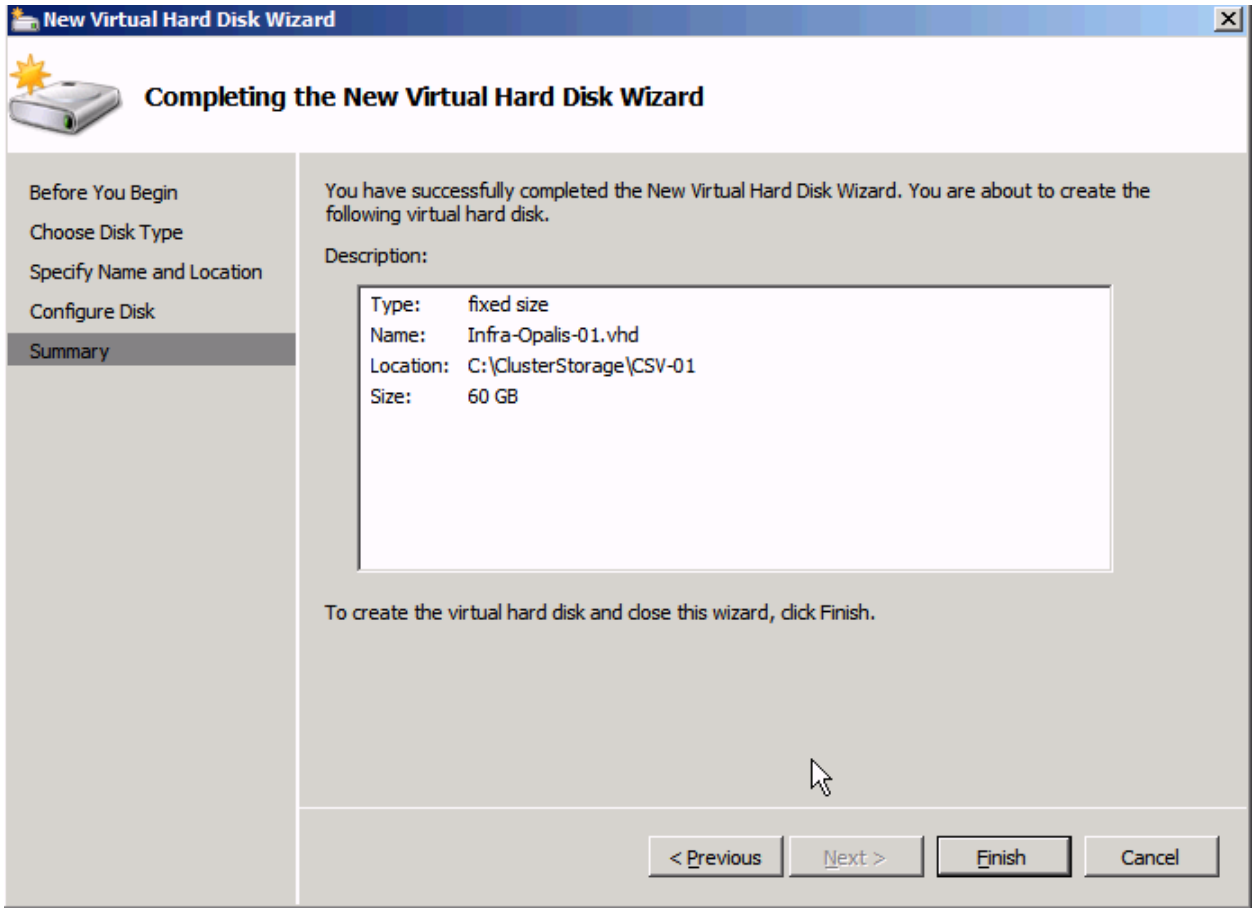


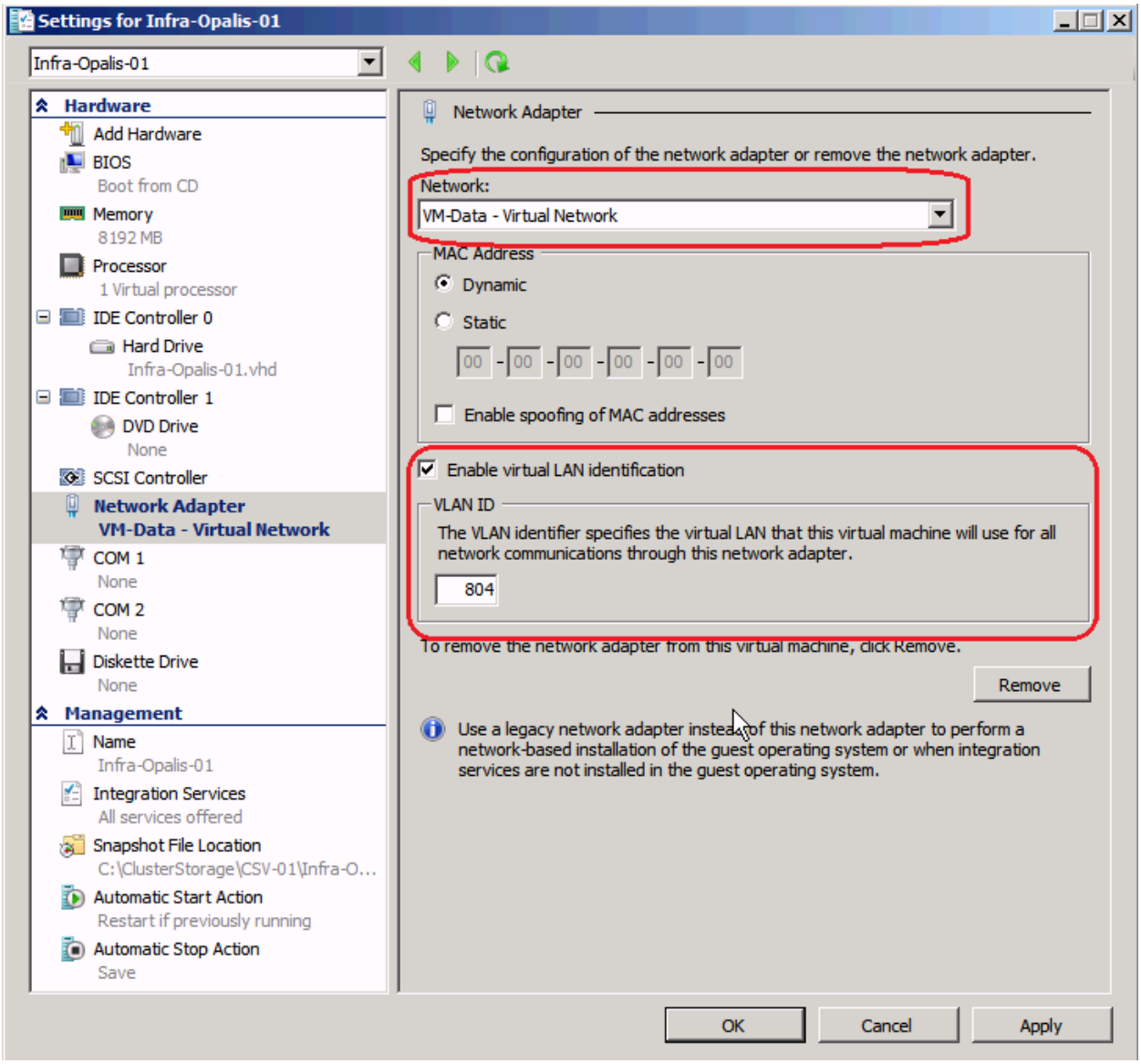










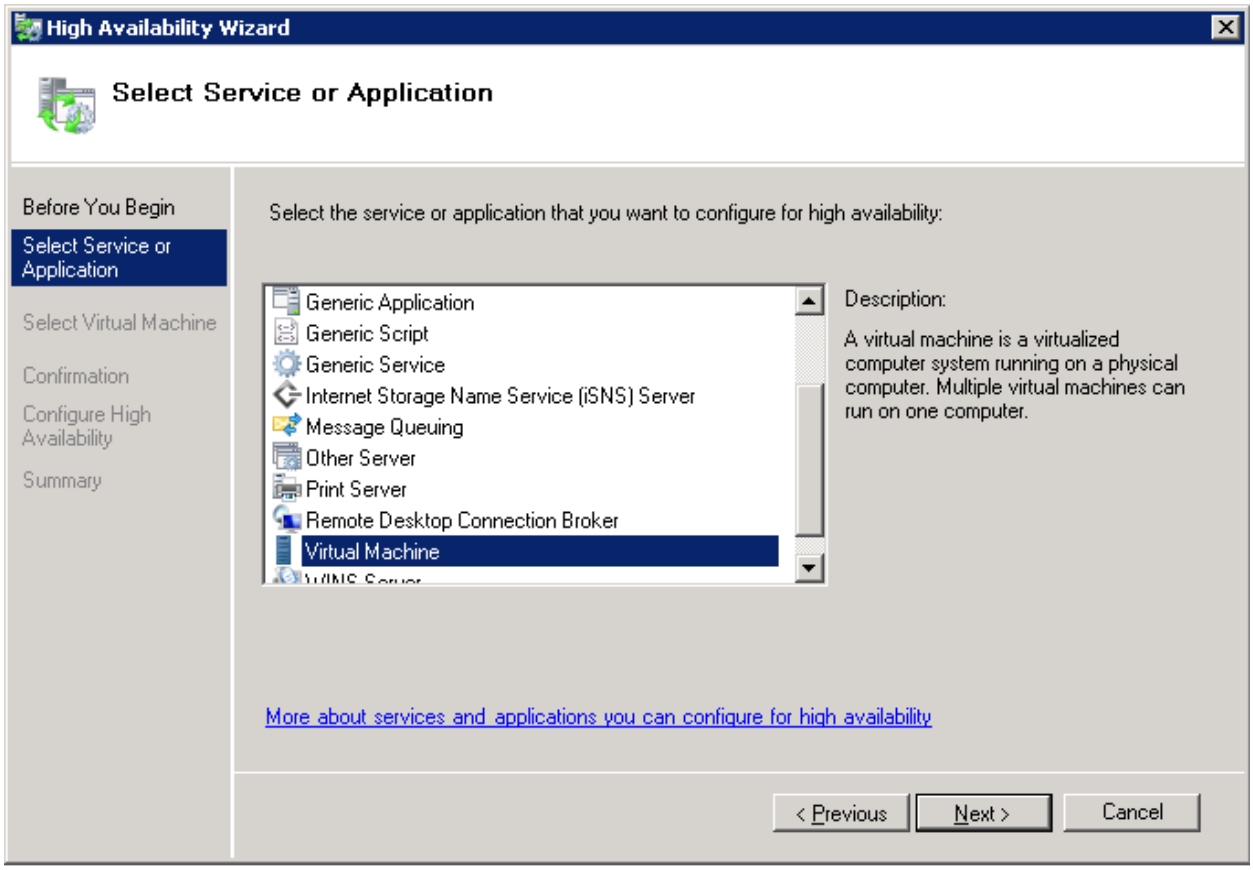


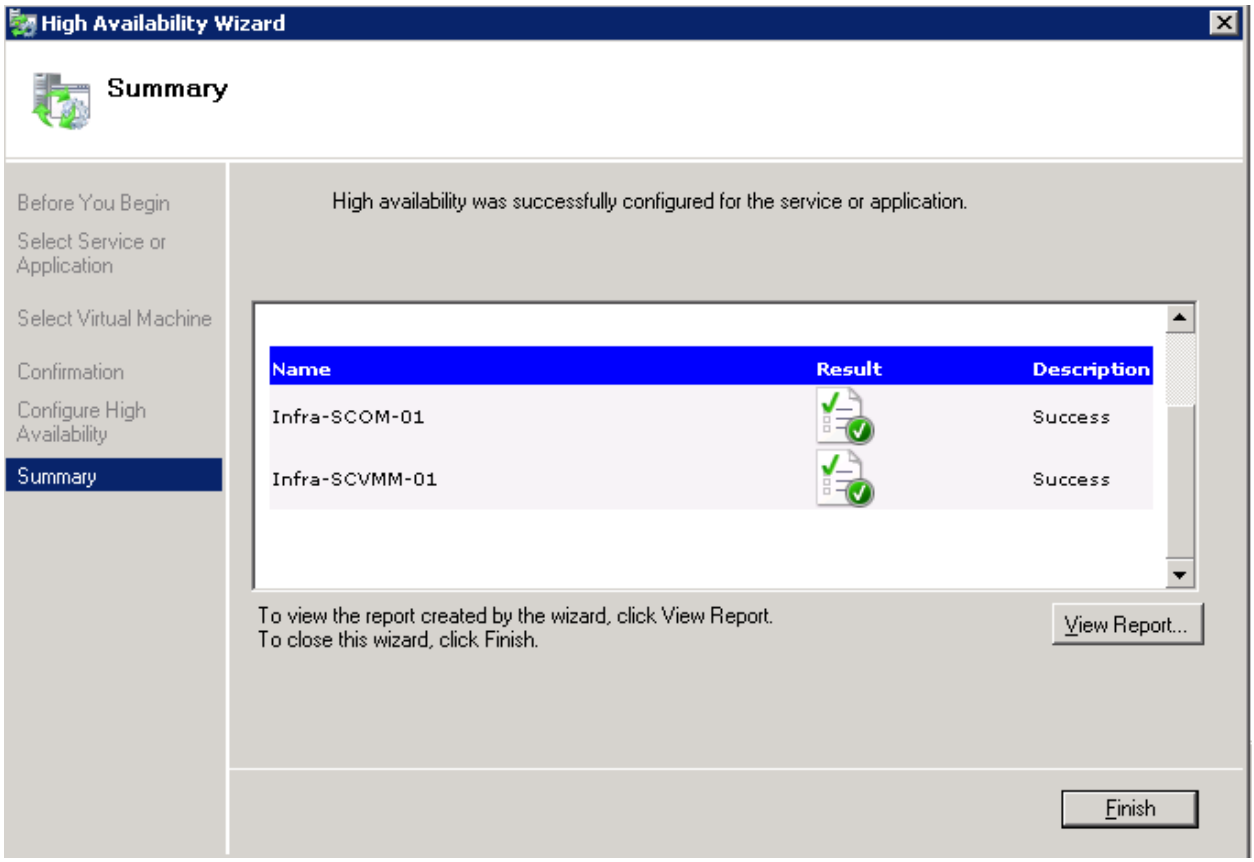
Create Clustered Application or Service

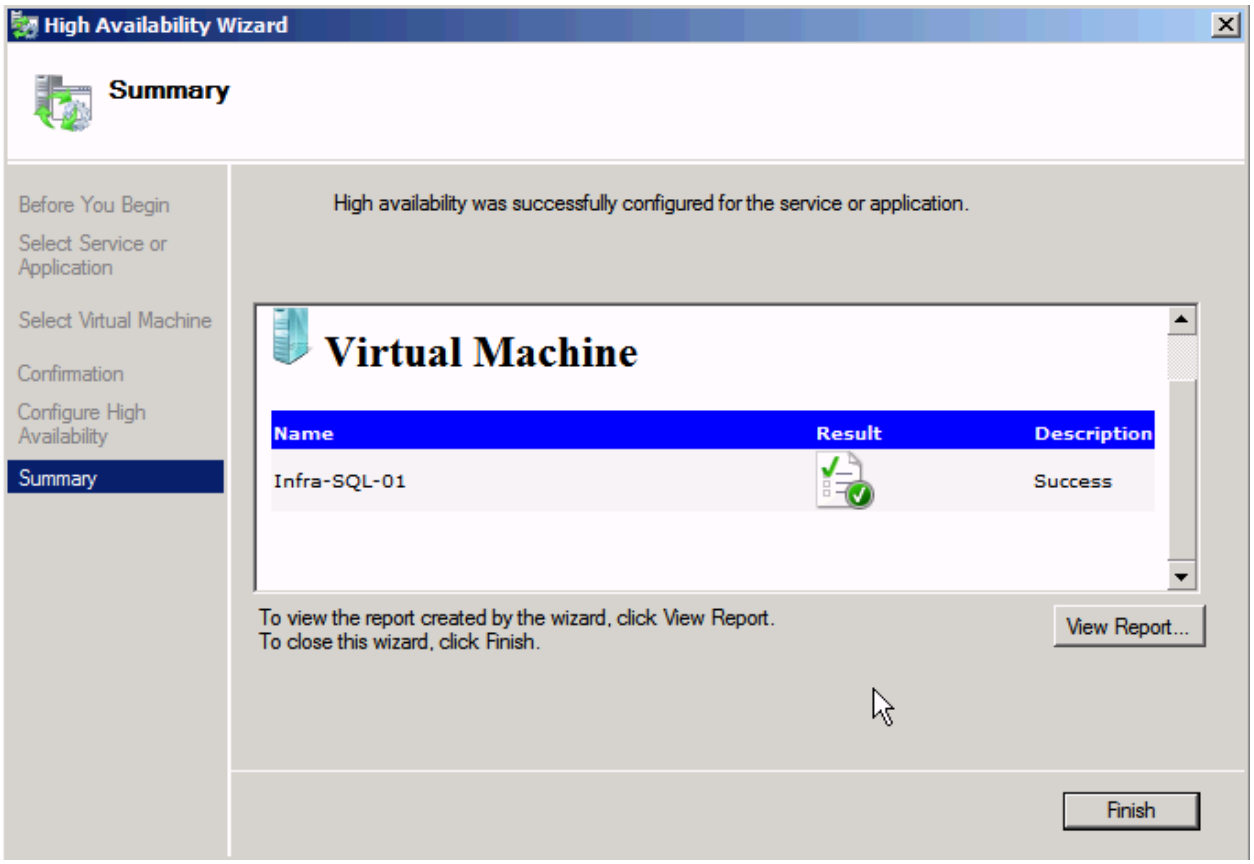
1. Navigate to Failover Cluster Manager and select the cluster name in the left pane.
2. Click `Configure a Service or Application` in the right pane.
3. Scroll down to select `Virtual Machine` and click `Next`.
4. Select the `Virtual Machines to cluster` and click `Next`.

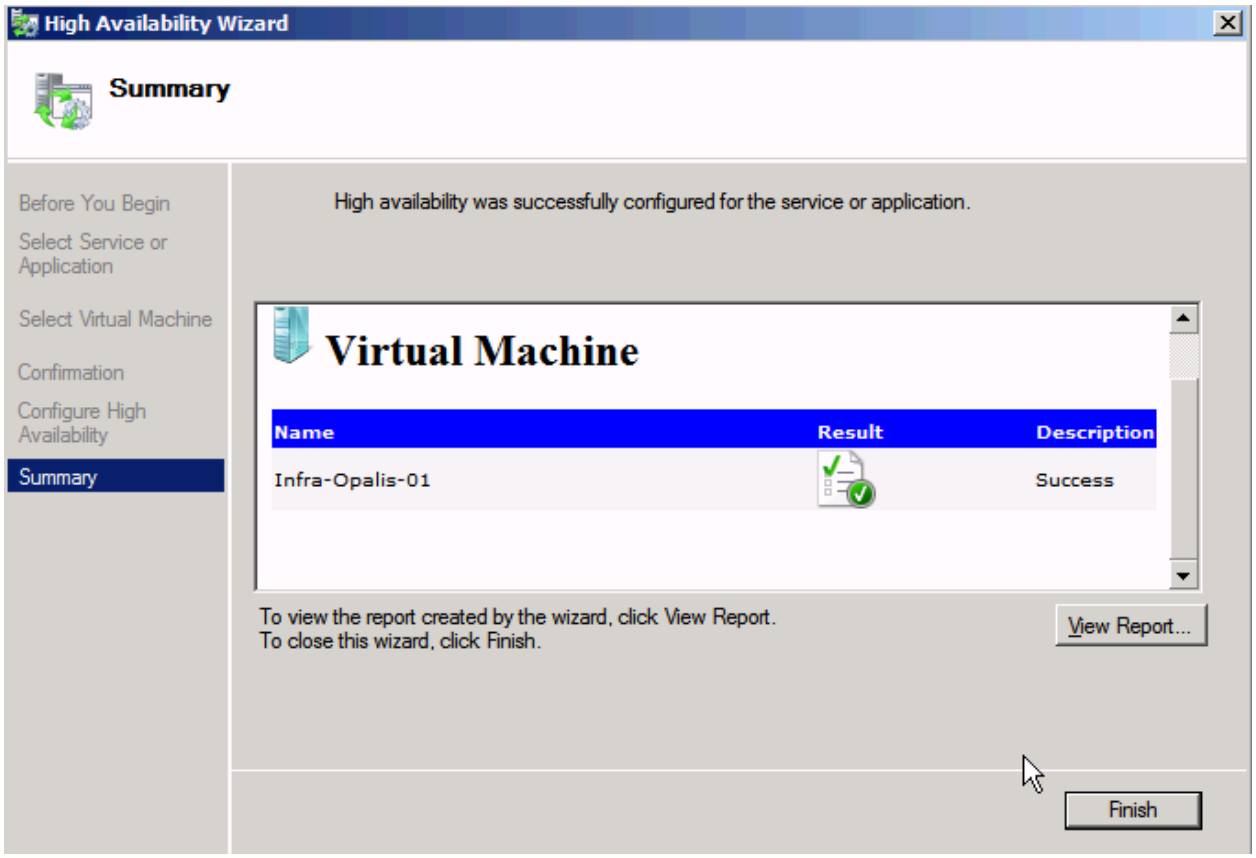
- Infra-SCOM-01
- Infra-SCVMM-01
- Infra-OPALIS-01

Note: Do not select the SQL Server or Domain Controller virtual machines. These virtual machines are not clustered.



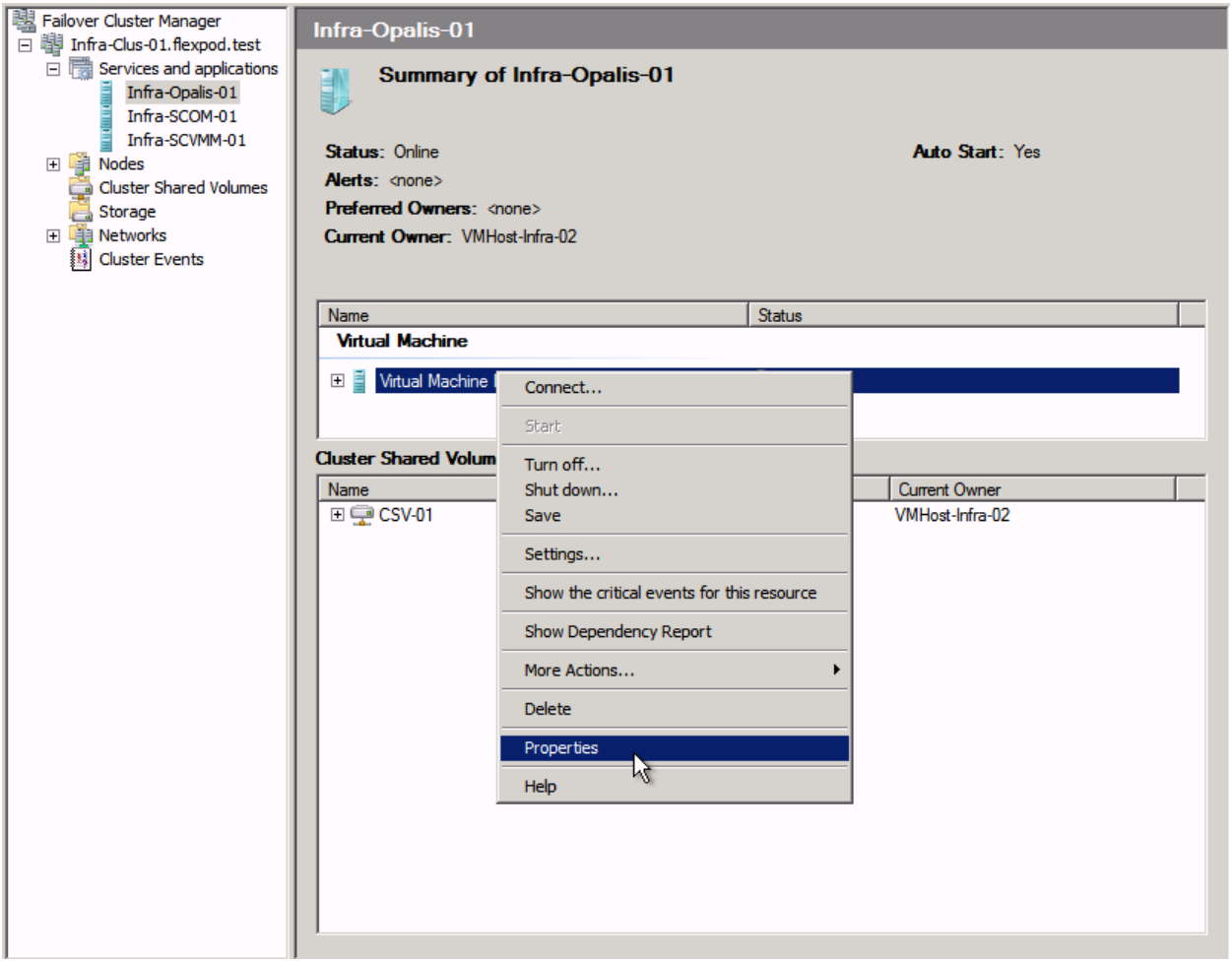


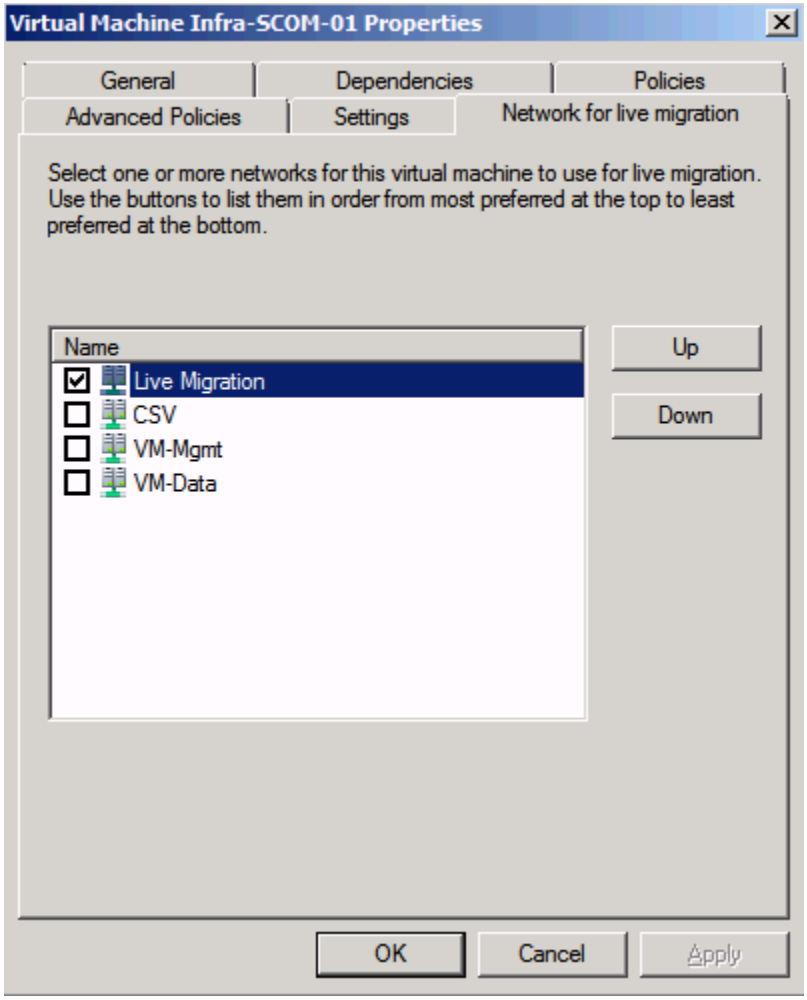




Configure Live Migration Network for the Virtual Machines

1. Navigate to any clustered virtual machine under `Services and applications` object in the left pane.
2. Right-click on the `virtual machine` in the center pane and select `Properties`.
3. Clear the checkbox for all networks except the Live Migration network.
4. Click `OK` to accept the settings.

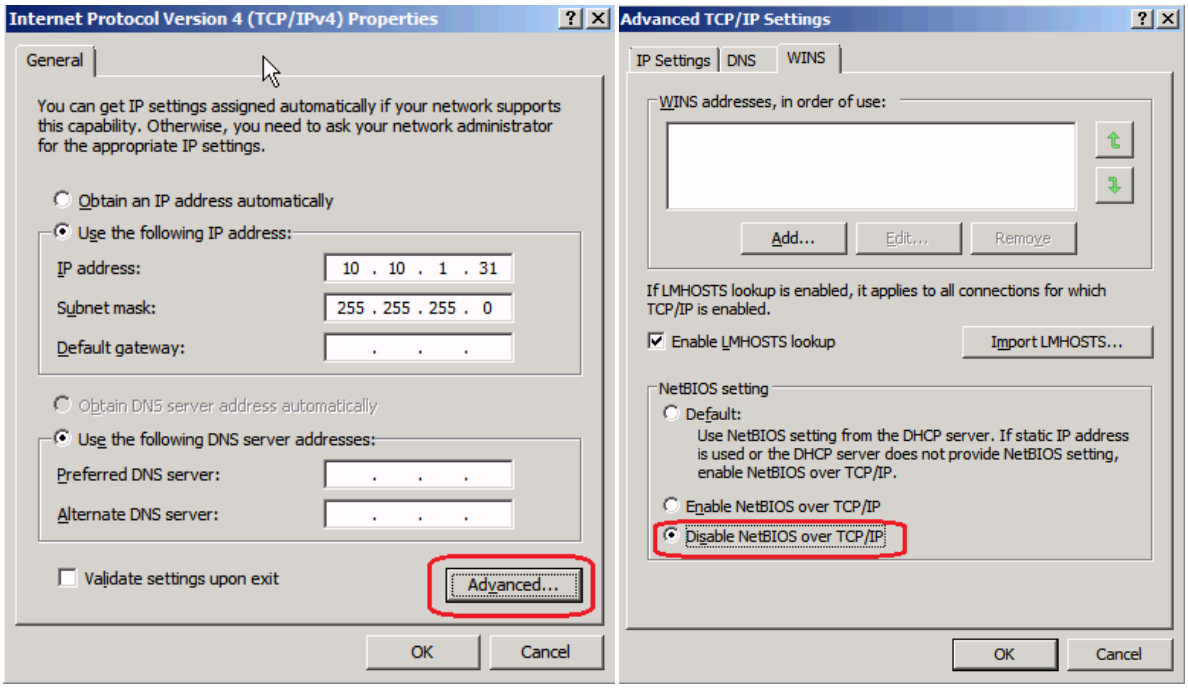




Optional Optimization for CSV and Live Migration Networks

Disable NetBios over TCP/IP for the CSV Network

1. Open `Network Connections`.
2. Right-click on the `CSV Network adapter` and select `Properties`.
3. Select `Internet Protocol Version 4 (TCP/IP)` and click `Properties`.
4. Click the `Advanced` button.
5. Select the option `Disable NetBios over TCP/IP` and click `OK`.



Installing Highly Available Microsoft System Center Components

Installing Clustered Microsoft SQL Server 2008

The main management component is a clustered Microsoft SQL Server® with two dedicated SQL Server instances. Each instance will require the following iSCSI LUNs listed in Table 1.

Table 18 SQL Server data locations

LUN	Purpose	Scope	Size
LUN 1, iSCSI	SQL Server databases	Per instance	Varies
LUN 2, iSCSI	SQL Server logging	Per instance	Varies
LUN 3, iSCSI	SQL Server cluster quorum	Per cluster	1GB
LUN 4, iSCSI	SQL Server DTC	Per cluster	1GB

When the infrastructure has been completely deployed, deploy the following databases and instances.

Table 19 Databases

DB Client	Instance Name	DB name	Authentication
VMM SSP	<Instance 1>	<SCVMMSSP>	Win Auth
Ops Mgr	<Instance 1>	<Ops Mgr_DB>	Win Auth
Ops Mgr	<Instance 2>	<Ops Mgr_DW_DB>	Win Auth
VMM	<Instance 1>	<VMM_DB>	Win Auth
Opalis	<Instance 2>	<Opalis_DB	Win Auth

This section provides step-by-step instructions for installing Server 2008.

For detailed installation help, reference the Setup Help file included with the SQL Server download or product DVD.

Active Directory Preparation

1. Create three domain user accounts to perform the following actions.

Note: These accounts require no special delegation:

- SQL Server Agent (ex. SQLAgent)
- SQL Server DB Engine (for example, SQLDatabase)
- Snap Drive User (for example, SnapDrive)

2. Global Security group for the System Center SQL Server Administrators.
3. Add the `<SQL Server Agent>` and `<SQL Server DB Engine>` to the `< System Center SQL Server Administrators >` group.

Configure Windows Failover Cluster for the SQL Server

1. Install Windows Server 2008 R2 SP1Enterprise in the SQL server virtual machines.
2. Update Windows Server with the latest available updates.
3. Install antivirus software and configure according to the guidelines provided in Knowledge Base article ID 961804 on the Microsoft Support Web site.
4. Log in and add the `<SnapDrive>` account and the `<System Center SQL Server Administrators>` group to the local administrator group.
5. Log in using the account from `<SnapDrive>`.
6. Enable the ISCSI Initiator by clicking `Start > Administrative Tools > iSCSI initiator`. Click `Yes` to start the Microsoft iSCSI service.
7. Click `Ok` to close the iSCSI Initiator Properties Panel.
8. Install all the prerequisites software from the sections below.

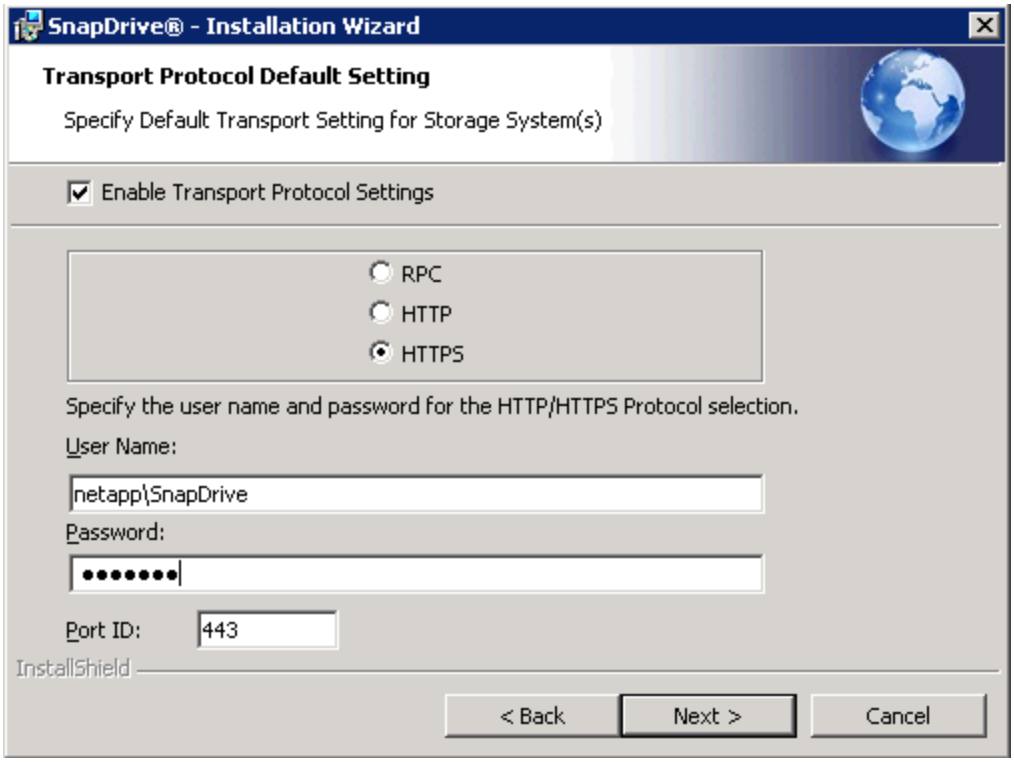
Windows Features

1. Open Server Manager and select `Features`.
2. Click the `Add Features` link launching the Add Features wizard.
3. Expand .NET Framework 3.5.1 Features.

4. Select the `.NET Framework 3.5.1 Feature`.
5. Select the `Failover Clustering` feature.
6. Select the `Multipath I/O` feature.
7. Click `Next > Install`.

NetApp SnapDrive 6.4

1. Download `NetApp SnapDrive 6.4`.
2. Install Microsoft Hotfixes `KB2494016-x64, KB2520235-x64`, and `KB2531907-x64`.
3. Launch the SnapDrive Installer, click `Next`, and Accept the EULA and click `Next`.
4. Select the `Storage based Licensing method` and click `Next`.
5. Enter your `User Name`, and `Organization` information, and click `Next`.
6. Enter the Account information for the `<SnapDrive >` account created earlier.
7. Click `Next`.
8. Click `Next` and then select the `Enable Transport Protocol Settings Option`.
9. Select `HTTPS`.
10. Enter the user name and password for the Storage System administrative account.
11. Click `Next > Next > Next > Install > Finish`.



NetApp DSM MPIO 3.5

1. Download NetApp DSM MPIO 3.5 package from the NOW.netapp.com Site.
2. Install Microsoft Hotfixes `KB2522766-x64` and `KB2528357-v2-x64`. A restart is required after each Hotfix.

3. Launch the DSM MPIO Installer.
4. Click Next then click OK to acknowledge the EULA requirement.
5. Accept the EULA and click Next.
6. Enter the DSM License Key and click Next.
7. Leave the system account selected and click Next.
8. Click Next, then Next again then Install and when complete Restart the system.

Set Firewall Exceptions

1. Open Windows Firewall with Advanced Security by clicking Start > Administrative Tools > Windows Firewall with Advanced Security.

SnapDrive

1. Highlight Inbound Rules and click New Rule.
2. Select Program and click Next.
3. Enter the program path for the SnapDrive Service for example, %ProgramFiles%\NetApp\SnapDrive\SWSvc.exe.
4. Click Next, then select Allow the Connection and click Next, then Next again.
5. Enter the rule Name <SnapDrive> and Description, and click Finish.

SQL Server

1. Click New Rule.
2. Select Port and click Next.
3. Select TCP and enter the Specific local port 1433. Click Next.
4. Select Allow the connection and click Next then Next again.
5. Give a rule Name <SQL Server> and Description, and click Finish.
6. Repeat for the Data warehouse SQL Server instance using a port of your specification (e.g, 1444).

SQL Server Discovery

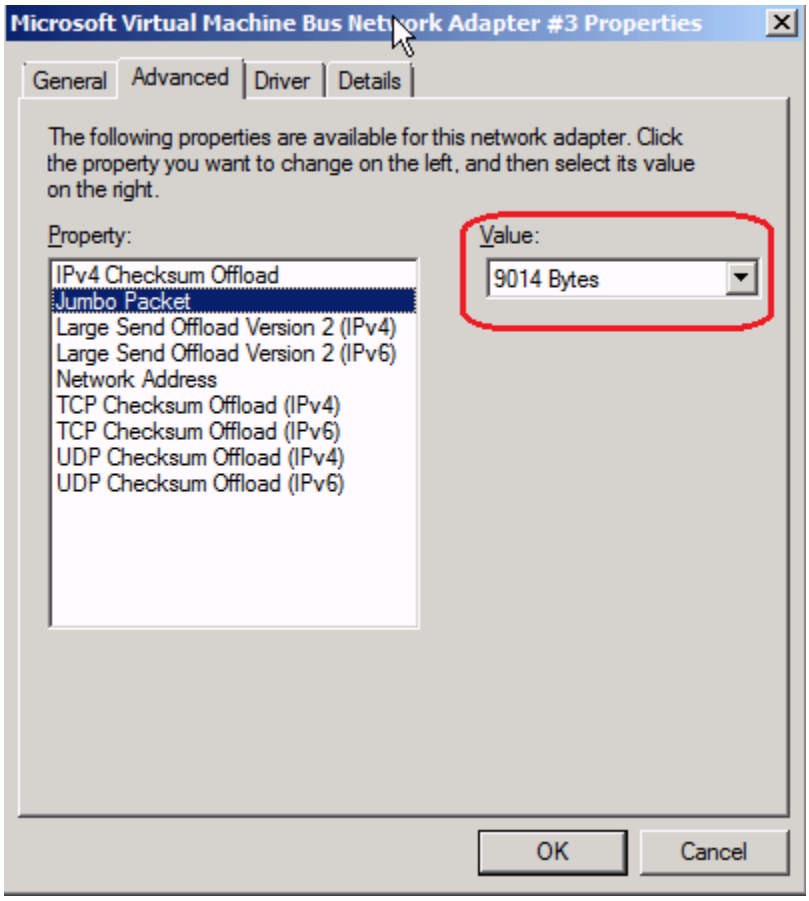
1. Click New Rule.
2. Select Port and click Next.
3. Select TCP and enter the Specific local port 445. Click Next.
4. Select Allow the connection and click Next, then click Next again.
5. Give a rule Name <SQL Server Discovery> and Description, and click Finish.

Enable Jumbo Frames for iSCSI NICs in SQL Cluster Virtual Machines

1. Open Network Connections.
2. Right-click on the iSCSI-Fabric-A Network adapter and click Properties, and then click the Configure button.
3. Select Advanced tab.

Note: Select `Jumbo Packet` in the Property list box and set the value to `9014 Bytes`. The 9014 Byte value in this dialog box is the correct Hyper-V synthetic adapter setting for UCS, Nexus and FAS array MTU setting of 9000 Bytes.

4. Repeat steps 2 through 4 for the second iSCSI Adapter and the App-Cluster Adapter.



Configure SQL Server Cluster

1. Log in to node `1` using a domain administrative account with local privileges.
2. Open `Server Manager` and browse to `Features > Failover Cluster Manager`.
3. Validate cluster feasibility:
   a. Select `Validate a Configuration`, then click `Next`.
   b. Add both nodes one at a time into the Enter Name text field, and click `Next`.
   c. Select `Run only tests I select` and click `Next`.
   d. Scroll down to the storage section and clear all the storage related checkboxes.

Note: These will run after you attach your iSCSI storage.

   e. Click `Next > Next`.
   f. Review the report and resolve any issues found by the validation wizard before continuing.
   g. Click `Finish`.
4. Create a majority node cluster:

a. In the Failover Cluster Manager, select `Create a Cluster`.
b. In the Welcome screen, click `Next`.
c. Add both nodes one at a time into the Enter Name text field, and click `Next`.
d. Select `Yes` to run all validation tests, and click `Next`, then `Next` again.
e. Select `Run` all test and click `Next`, then `Next` again.
f. Click `Finish`. At this time you may safely ignore any warnings or errors related to clustered disks.
g. Enter the `Cluster Name`, `Cluster IP`, and click `Next`.
h. Review the configuration, and click `Next`, then click `Finish`.

5. Provision cluster storage:
   a. Log in to node `1` using a domain administrative account with local privileges.
   b. Establish iSCSI Connections. Log in to the cluster host server and open `SnapDrive`. Browse to iSCSI Management within SnapDrive. Click `Establish iSCSI Session`.
      i. Enter the IP or name of the vFiler0 instance NetApp controller. Click `Next`.
      ii. Select the source and destination IP addresses associated with iSCSI network A.
      iii. If CHAP authentication is required configure it at this time, then click `Next`.
      iv. Review for accuracy and click `Finish`.
      v. Repeat steps i-v for iSCSI network B.
   c. Repeat for NetApp Controller B.
6. Create quorum:
   a. Log in to the cluster host server and open `SnapDrive`.
   b. Select `Disks` and click `Create Disk`.
   c. In the Welcome screen, click `Next`.
   d. Enter the IP/FQDN for the Storage Controller and click `Add`.
   e. When enumeration has completed, select the target volume where you intend to add the LUN.
   f. Add a LUN Name, LUN Description and click `Next`.
   g. Select `Shared (Microsoft Cluster Services only)` and click `Next`.
   h. Verify both nodes are shown for your cluster and click `Next`.
   i. Select `Assign a Drive Letter` and pick a drive letter.
   j. Set the LUN Size to the size designated earlier, click `Next` then `Next` again.
   k. Highlight each node in the Cluster and select the `iSCSI initiators` to map the new LUN.
   l. Click `Next`, then `Select Automatic` and click `Next`.
   m. Make sure that `Select a cluster group by this node is` selected.
   n. Select the `Cluster Group` name, and click `Next` and then click `Finish`.
   o. Repeat for SQL and Data Warehouse Server Data and SQL and Data Warehouse Server Log LUNs.
7. Create data LUNs (DTC):
   a. Log in to the cluster host server and open `SnapDrive`.
   b. Select `Disks` and click `Create Disk`.

c. In the Welcome screen, click `Next`.
d. Enter the IP/FQDN for the Storage Controller and click `Add`.
e. When the enumeration has completed, select the target volume where you intend to add the LUN.
f. Add a LUN Name and LUN Description. Click `Next`.
g. Select `Shared (Microsoft Cluster Services only)` and click `Next`.
h. Verify both nodes are shown for your cluster and click `Next`.
i. Select `Assign a Drive Letter` and pick a drive letter.
j. Set the LUN Size to the size designated earlier, click `Next`, then `Next` again.
k. Highlight each node in the Cluster, and select the `iSCSI initiators` to map the new LUN.
l. Click `Next` then select `Automatic` and click `Next`.
m. Make sure that `Select a cluster group by this node` is selected.
n. Select the `Available Storage group name`. Click `Next` then click `Finish`.
o. Repeat these steps for all remaining LUNs.

8. Change cluster quorum settings:
   a. From the node that currently owns the cluster open `Failover Cluster Manager`.
   b. Right-click the virtual cluster name for the cluster you built earlier, and select `More Actions > Configure Cluster Quorum Settings`.
   c. In the Before You Begin screen, click `Next`..
   d. Select `Node and Disk Majority` and click `Next`.
   e. Select the `Quorum disk` and click `Next`.
   f. Review the confirmation for accuracy and click `Next` then click `Finish`.
9. Validate cluster (from the node that currently owns the cluster):
   a. Open `Failover Cluster Manager` and right-click the virtual cluster name for the cluster you built earlier, and select `Validate This Cluster`.
   b. Click Next, then Select “Run All Tests” and click Next.
   c. Review the report and resolve any issues found by the validation wizard before continuing.
   d. Click `Finish`.
10. Create MSTC resource:
    a. From the Node that currently owns the cluster open `Failover Cluster Manager`.
    b. Open the virtual cluster name for the cluster you created earlier, and select `Services and applications`.
    c. From the actions pane, select `Configure a Service or Application`, then click `Next`.
    d. Select `Distributed Transaction Coordinator (DTC)` and click `Next`.
    e. Confirm the Name of the new resource, enter a IP Address and click `Next`.
    f. Select the DTC Drive provisioned earlier and click `Next`.
    g. Verify the configuration and click `Next` to create resource, and click `Finish`.
    h. Rename the cluster networks according to purpose. For example, `VM-Data`, `iSCSI-A`.
    i. Right-click on the two iSCSI networks and select `Properties`.

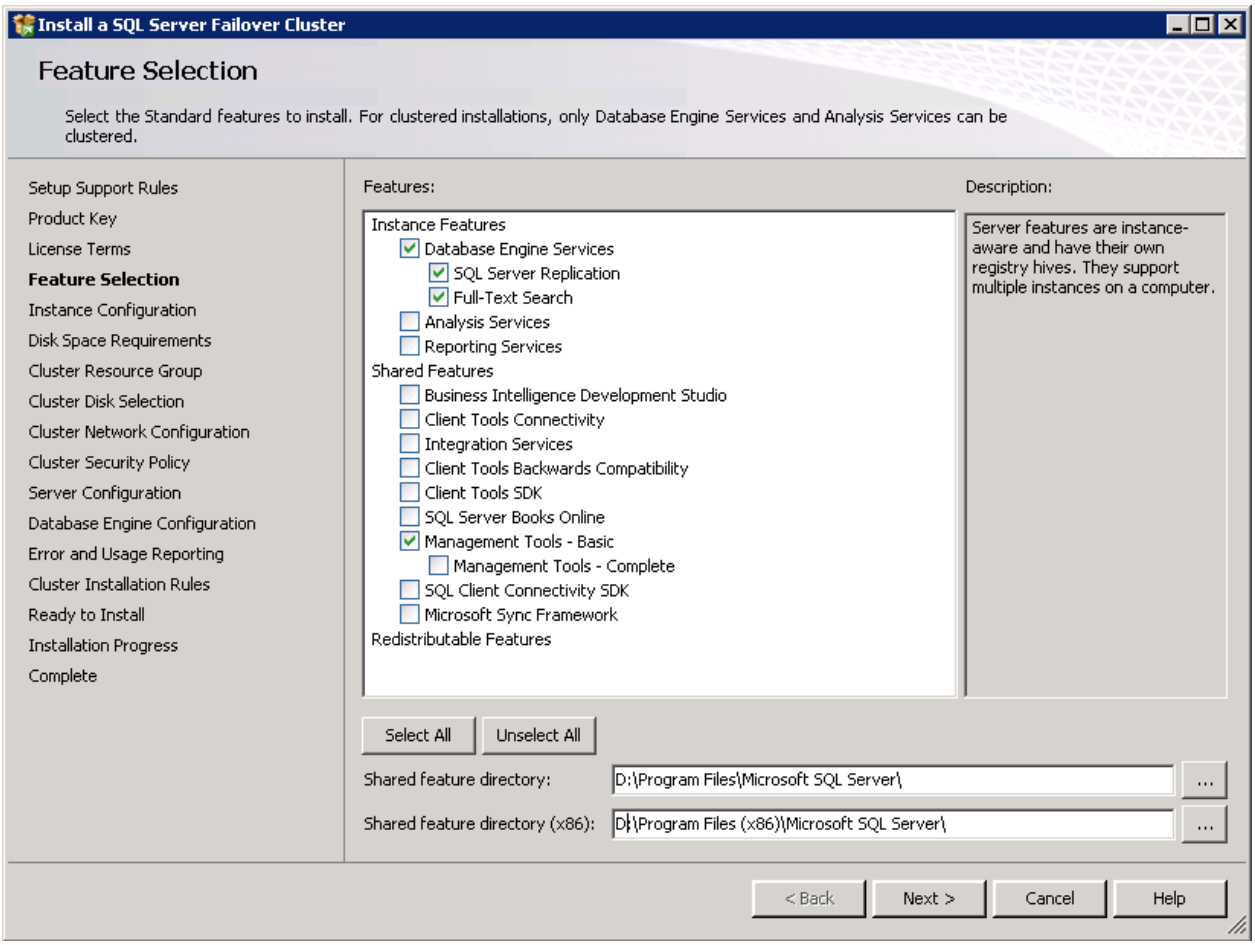
j. Select the radio button to Do `not allow cluster network communication on this network.`

k. Click `OK`.

Install SQL Server 2008 Cluster

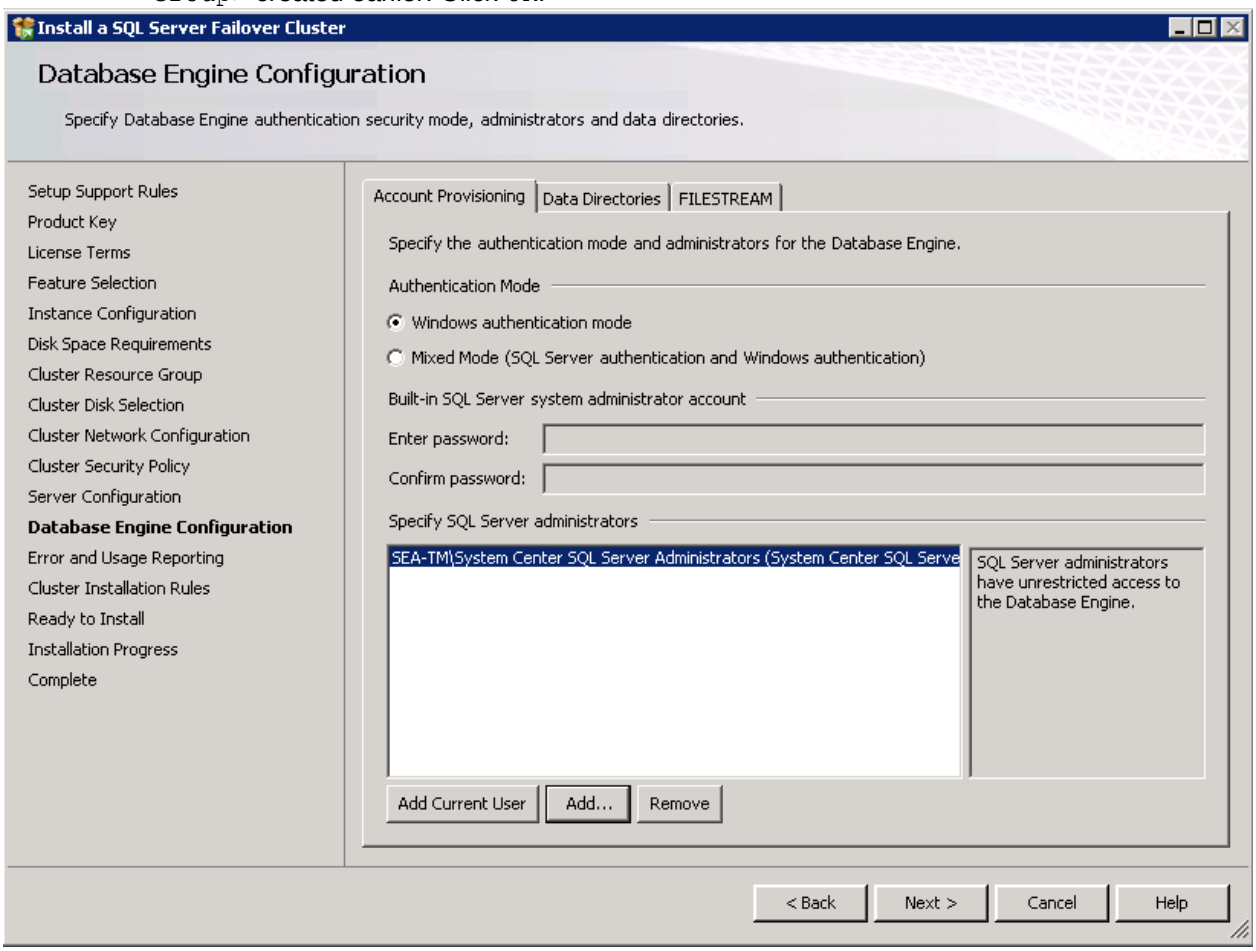
Step 1: Installing SQL Server on Node 1

1. Log in to Node `1` using a domain administrative account with local privileges.
2. Download `SQL Server 2008 Service Pack 1`.
3. Extract the Service Pack on to the SQL Server Drive by running the following command:
   `SQLServer2008R2SP1-KB252858-x64-ENU.exe /x:C:\SP1`
4. Install the SQL Server Setup support Files by running the following command:
   `C:\SP1\1033_enu_lp\x64\setup\sqlsupport_msi\sqlsupport.msirsfx.msi`
5. Click `Next`, accept the `License Agreement`, then click `Next`.
6. Enter the Name and Company information and click `Next`, click `Install`, then click `Finish`.
7. From a command prompt launch the setup.exe from the SQL Server 2008 DVD by running the following command:
   `<DVD Drive Letter>:\Setup.exe /PCUSource=C:\SP1`
8. Acknowledge any compatibility warnings. Click `Installation`.
9. Select `Installation`, `New SQL Server failover cluster installation`.
10. Acknowledge any compatibility warnings. Click `OK`.
11. Resolve any failed prerequisite checks and click `OK`.
12. Click `Install` to install setup support files.
13. Resolve any support rule errors and click `Next`.
14. Enter your Product key and click `Next`.
15. Accept the Microsoft Software License Terms. Click `Next`.
16. Feature selection:
    a. Under Instance features, select the following:
       1. Instance Features
       2. Database Engine Services
       3. Shared Features
       4. Management Tools - Basic
    b. Change the Shared feature directory and the shared feature directory (x86) to point to the HD designated for SQL Server.
    c. Click `Next`.

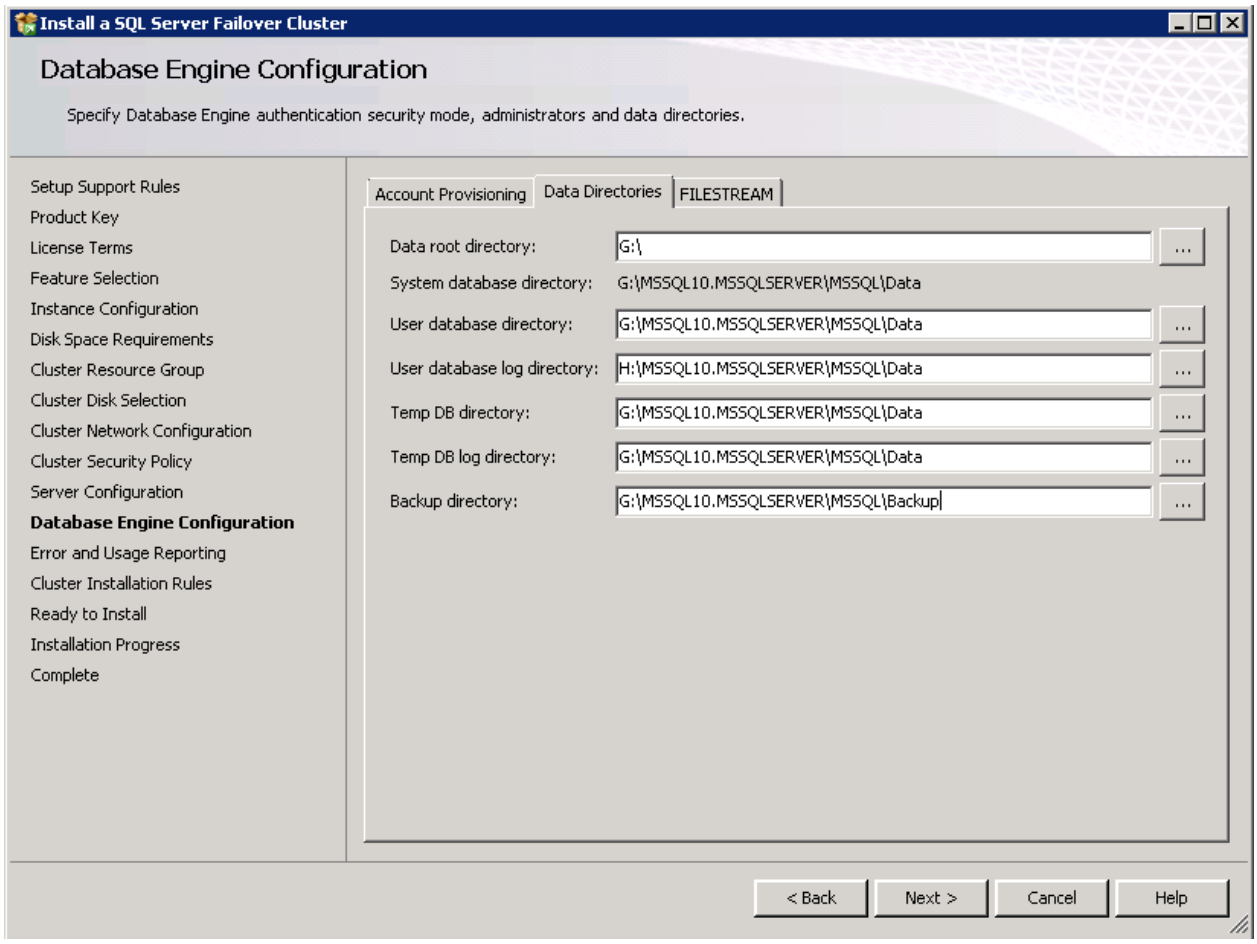


17. Enter the `SQL Server Network Name`.
18. Select `Default instance`. Change the Instance root directory to point to the SQL Server HD. Click `Next`.
19. In the Disk Space Requirements page, click `Next`.
20. Select the SQL Server (`MSSQLSERVER`) cluster resource. Click `Next`.
21. Select the shared disks for the Database and Logs and click `Next`.
22. Specify SQL Server Instance network settings and click `Next`.
23. Select `Use service SIDs` and click `Next`.
24. Service accounts:
    a. Enter the `<SQL Server Agent>` account information into the SQL Server Agent.
    b. Enter the `<SQL Server DB Engine>` account to the SQL Server Database Engine.
    c. Click `Next`.
25. Database engine configuration:
    a. In the Account Provisioning window:
        5. Select `Windows authentication` mode.
        6. Under Specify System Center SQL Server Administrators, click `Add`.

7. In the resulting popup enter the <System Center SQL Server Administrators Group> created earlier. Click OK.



26. In the Data Directories tab:
    a. Change the Data root Directory to the <Database LUN Drive Letter>.
    b. Change the User database log directory to the <Log LUN Drive Letter> and click Next.



27. Choose whether or not to send error reports to Microsoft and click `Next`.
28. Resolve any Cluster Installation Rules and click `Next`, then click `Install`.
29. Review the installation report. Click `Next`, then click `Close`.

Step 2: Adding Node 2 to SQL Server

1. Download `SQLServer2008 Service Pack 1`.
2. Extract the Service Pack onto the SQL Server Drive by running the following command:
   `SQLServer2008R2SP1-KB2528583-x64-ENU.exe /x:C:\SP1`
3. Install the SQL Server Setup support Files by running the following command:
   `C:\SP1\1033_enu_lp\x64\setup\sqlsupport_msi\sqlsupport.msi`
4. Click `Next`, Accept the License Agreement, and then click `Next`.
5. Enter the Name and Company information.
6. Click `Next`, click `Install`, then click `Finish`.
7. From a command prompt launch the setup.exe from the SQL Server 2008 DVD by running the following command:
   `<DVD Drive Letter>:\Setup.exe /PCUSource=C:\SP1`

8. Acknowledge any compatibility warnings and click `Run Program`.
9. Select `Installation`, `Add node to a SQL Server failover cluster`.
10. Acknowledge any compatibility warnings. Click Run Program.
11. Resolve any failed prerequisite checks and click `OK`.
12. Click `Install` to install setup support files.
13. Resolve any Support Rule errors and click `Next`.
14. Enter your Product key and click `Next`.
15. Accept the Microsoft Software License Terms. Click `Next`.
16. Select SQL Server instance name `MSSQLSERVER`. Click `Next`.
17. Enter the Passwords for all service accounts, and click `Next`.
18. Choose whether or not to send error reports to Microsoft. Click `Next`.
19. Resolve any Cluster Installation Rules and click `Next`, and then click `Install`.
20. Review the Add Node Progress. Click `Next` and then click `Close`.

Step 3: Verify Cluster Operation

1. Open the `Failover Cluster Manager`.
2. Expand `Services and applications` and select `SQL Server (MSSQLSERVER)`.
3. Select `Move this service or application to…`, then click `Move to node <Node 2>`.
4. At the confirmation prompt click `Move SQL Server (MSSQLSERVER to <Node 2>`.
5. Repeat for the DTC cluster resource.
6. Failback all resources to node `1`.

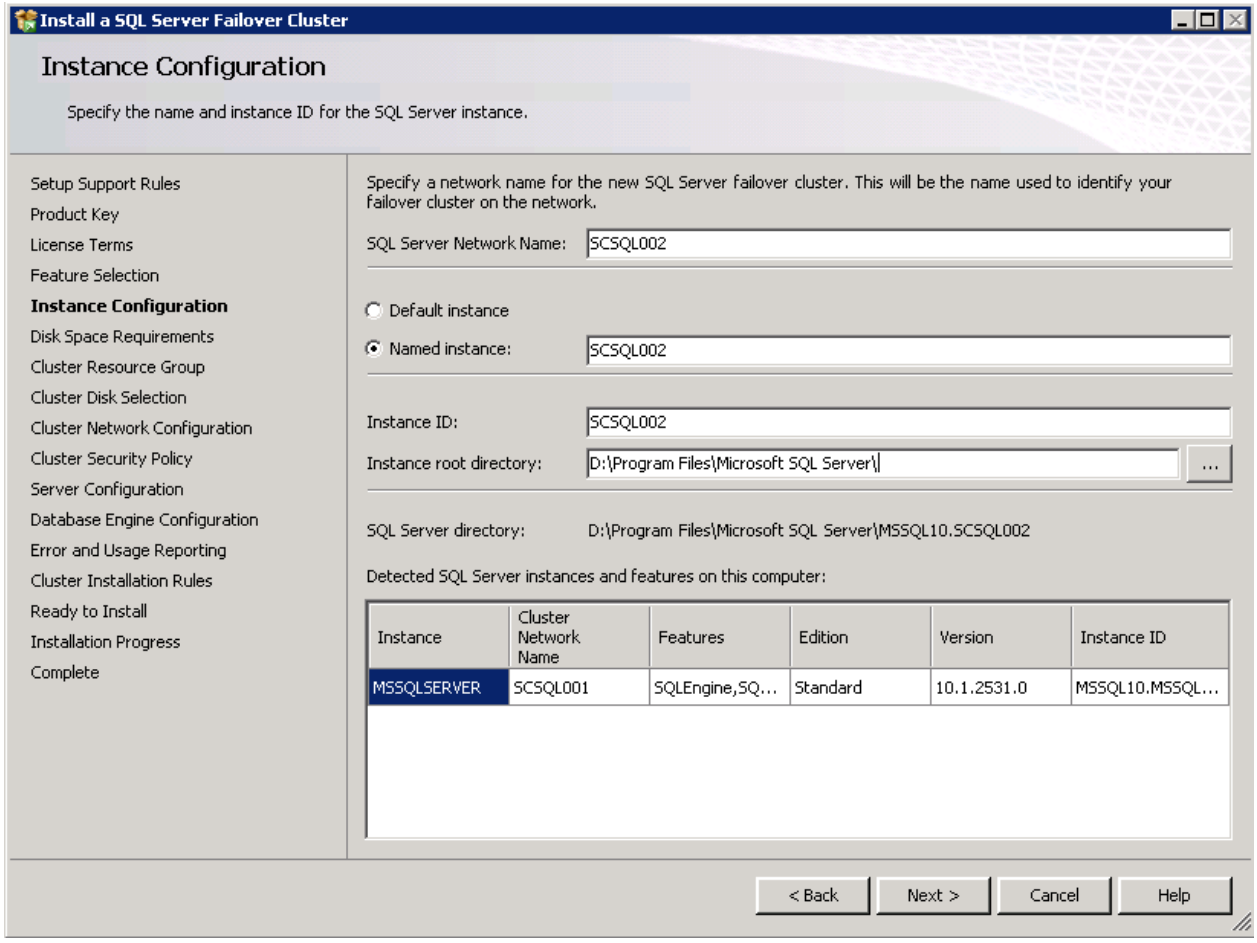
Step 4: Add SQL Server Instance

1. Log in to node `2` using a domain administrative account with local privileges.
2. From a command prompt launch the setup.exe from the SQL Server 2008 DVD by running the following command:

   ```
   <DVD Drive Letter>:\Setup.exe /PCUSource=<C:\SP1
   ```

3. Acknowledge any compatibility warnings. Click `Run Program`.
4. Select `Installation`, `Add Node to a SQL Server Failover cluster`.
5. Acknowledge any compatibility warnings. Click `OK`.
6. Resolve any failed prerequisite checks.
7. Click `Install` to install setup support files.
8. Resolve any Support Rule errors and click `Next`.
9. Enter your Product key and click `Next`.
10. Accept the Microsoft Software License Terms, Click `Next`.
11. Under Instance features, select the following and click `Next`.
    `Database Engine Services`
12. Instance configuration:
    a. Enter the SQL Server Network Name.

b. Select `Named Instance` and enter an instance name.



13. In the Disk Space Requirements page, click `Next`.
14. Select the `SQL Server (<Data Warehouse Instance name>) cluster resource` and click `Next`.
15. Select the shared disks for the Database and Logs, and click `Next`.
16. Specify SQL Server Instance network settings and click `Next`.
17. Select `Use service SIDs` and click `Next`.
18. Service accounts:
    a. Enter the `<SQL Server Agent>` password information into the SQL Server Agent.
    b. Enter the `<SQL Server DB Engine>` password to the SQL Server Database Engine.
    c. Click `Next`.
19. Database Engine Configuration:
    a. Account provisioning:
        8. `Select Windows authentication mode`.
        9. Under Specify System Center SQL Server Administrators click `Add`.
        10. In the resulting popup enter the `<System Center SQL Server Administrators Group>` created earlier.

11. Click OK .
12. Click Next.

b. Data directories:

1. Change the Data root Directory to the <Database LUN Drive Letter>.
2. Change the User database log directory to the <Log LUN Drive Letter>.
3. Click Next.

20. Choose whether or not to send error reports to Microsoft and click Next.
21. Resolve any Cluster Installation Rules and click Next, then click Install.
22. Review the installation report and click Next, then click Close.

Step 5: Add Node 1 to SQL Server Cluster

1. From a command prompt Launch the Setup.exe from the SQL Server 2008 DVD by running the following command:

   <DVD Drive Letter>:\Setup.exe /PCUSource=C:\SP1

2. Acknowledge any compatibility warnings. Click Run Program.
3. Select Installation, Add node to a SQL Server failover cluster.
4. Acknowledge any compatibility warnings, click Run Program.
5. Resolve any failed prerequisite checks, and click OK.
6. Click Install to install setup support files.
7. Resolve any Support Rule errors and click Next.
8. Enter your Product key, and click Next.
9. Accept the Microsoft Software License Terms, click Next.
10. Select SQL Server instance name <Data Warehouse Instance name>. Click Next.
11. Enter the passwords for all service accounts. Click Next.
12. Choose whether or not to send error reports to Microsoft. Click Next.
13. Resolve any Cluster Installation Rules. Click Next and then click Install.
14. Review the Add Node Progress and click Next and then click Close.

Step 6: Configure Remote Access

1. Log in to the Data Warehouse SQL Server instance.
2. Open SQL Server Configuration Manager by clicking Start > All Programs > Microsoft SQL Server 2008 > Configuration Tools > SQL Server Configuration Manager.
3. Expand SQL Server Network Configuration, and select Protocols for <Data Warehouse Instance name>.
4. Right-click TCP/IP and select Properties.
5. Click the IP Address tab.
6. Scroll down and for every interface you want to enable SQL Server communications, change enabled to True and enter the port added to the firewall earlier (for example, 1444).
7. Click Apply.

Step 7: Verify Cluster Operation

1. Open `Failover Cluster Manager`.
2. Expand Services and applications and `select SQL Server (<Data Warehouse Instance name>)`.
3. Select `Move this service or application to…`, Click `Move to node <Node 1>`.
4. At the confirmation prompt click `Move SQL Server (<Data Warehouse Instance name>to <Node 1>`.
5. Repeat for the DTC cluster resource.
6. Failback all resources to Node `1`.

System Center Operations Manager Installation

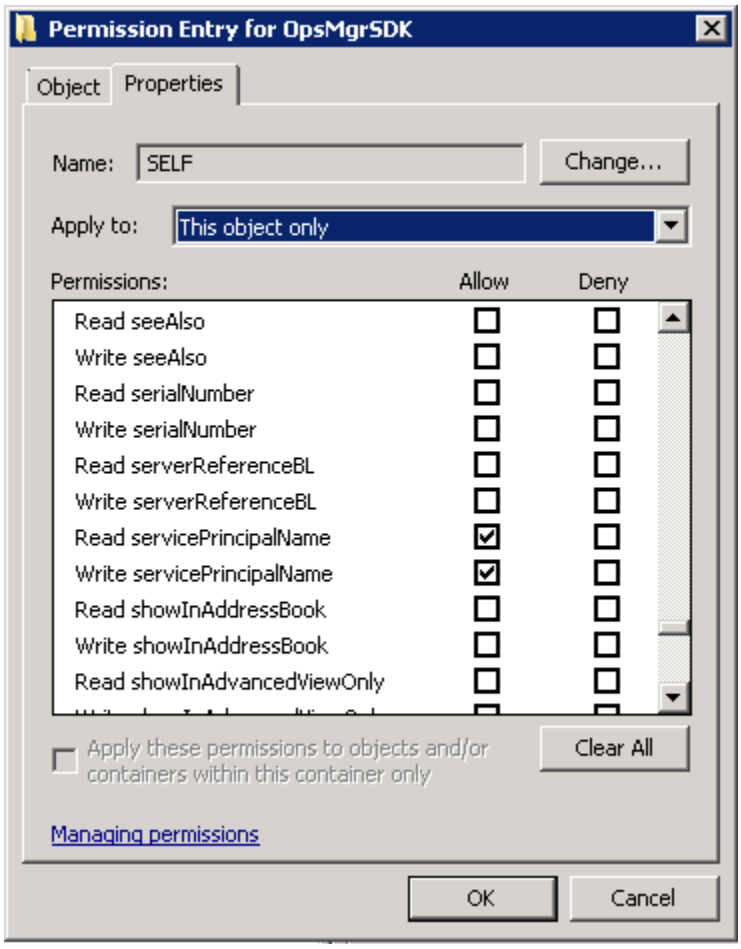
For detailed installation help, refer to the Setup Help file included with the SCOM download or product DVD.

Important: Before installing SCOM components, see the System Requirements section to make sure you have all prerequisite software and hardware installed.

Installing System Center Operations Manager 2007 R2

Step 1: Active Directory Preparation

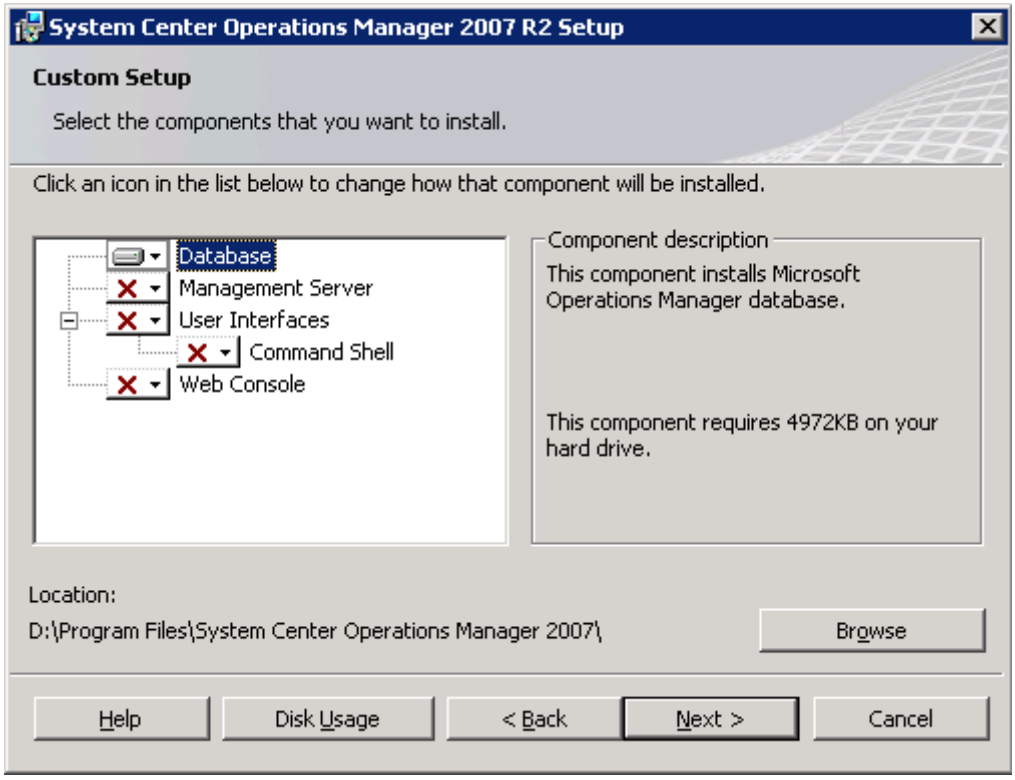
1. Create five domain user accounts to perform the following actions. With the exception of the SDK and Action account, no special delegation is required. The Action account needs to have local administrator permissions on any Windows system you intend to manage, as this is the account use to install the Operations Manager Agent. The SDK account needs to be able to modify its own SPN.
   a. Management Server Action (for example, OpsMgrAction)
   b. SDK and Configuration Service (for example, OpsMgrSDK)
   c. Data Reader (for example, OpsMgrReader)
   d. Data Warehouse Write Action (for example, OpsMgrWrite)
   e. Operations Manager Administrator (for example, OpsMgrAdmin)
2. Create a Global Security group for the Operations Manager Administrators.
3. Add the `<Operations Manager administrator>` and `< SDK and Configuration Service >` accounts to the `<Operations Manager Administrative>` group.
4. Add the `<Operations Manager administrator>` account to the `<SQL Server Administrators>` group.
5. With a Domain Administrators account open ADSIEdit:
   a. Find the SDK domain user account, right-click and select `Properties`.
   b. Select the `Security` tab, click `Advanced`.
   c. Click `Add`. Type `SELF` in the object box and click `OK`.
   d. Select the `Properties` tab.
   e. Change the Apply to: `This object only`.
   f. Scroll down and select the `Allow checkbox for Read servicePrincipalName` and `Write servicePrincipalName`.



g. Click `OK > OK > OK`, and close `ADSIEdit`.

Step 2: Deploy Operations Manager Database

1. Log in to SQL Server instance, through a domain account that is a member of the `<SQL Server Administrators>` group.
2. Launch `SetupOM.exe` from SCOM DVD.
3. Select `Check Prerequisites: Select Operational Database`, and click `Check`.
4. Resolve any issues and click `Close`.
5. Select Install Operations Manager 2007 R2 and in the Welcome screen click `Next`.
6. Accept license agreement and click `Next`.
7. Enter User Name, Organization and click `Next`.
8. Select only the database component and click `Next`.



9. Enter the Management Group name.
10. Under Operations Manager Administrators, click `Browse`. Enter the `<Operations Manager Administrative group>`.
11. Click `Next` , then click `Next`.
12. Verify that the Data File and Log File locations are going to the correct LUNS and click `Next`.
13. Select whether or not to send error reporting to Microsoft. Click `Next`.
14. Click `Install`.
15. Click `Finish`.

Step 3: Install Windows Server 2008 R2 SP1 Enterprise in the SCOM Virtual Machine

1. Update Windows Server with the latest available updates and any prescribed Anti-Virus software.
2. Log in and add the `<Operations Manager Administrative group>` and `<SDK and Configuration Service>` account to the local administrators group.
3. Log in with the `<Operations Manager Administrator>` account to install the prerequisite software.

Step 4: Install Prerequisite Software

Windows Features

1. Open Server Manager and select `Features`, then `Add Features`, this launches the Wizard.
2. Expand .NET Framework 3.5.1 Features and select the `.NET Framework 3.5.1` sub-feature.
3. Scroll down to SNMP Services and select the `SNMP Service`, then click `Next >Install > Close`.

IIS Server Role

1. Open Server manager and select `Roles`, then click `Add Roles`, this launches the Wizard.
2. Select `Web Server (IIS)`, click `Next`, and make sure the following Role Services are selected.

- IIS Web Server
- Common HTTP
  - Static Content
  - Default Document
  - Directory Browsing
  - HTTP Errors
- Application Development
  - ASP .NET
  - .Net Extensibility
  - ISAPI Extensions
  - ISAPI Filters
- Health and Diagnostics
  - HTTP Logging
  - Request Monitor
- Security
  - Windows Authentication
  - Request Filtering
- Performance
  - Static Content Compression
- Management Tools
  - IIS Management Console
  - IIS 6 Management Compatibility
    - IIS 6 Metabase Compatibility
    - IIS 6 WMI Compatibility

3. Click `Next`.
4. Click `Install`.
5. Click `Close`.

Install ASP.NET Ajax Extensions 1.0

Download and Install the ASP.NET Ajax Extensions from http://go.microsoft.com/fwlink/?LinkID=89064&clcid=0x409 and then restart.

Step 6: Install SQL Server Reporting Services

1. Download `SQLServer2008 Service Pack 1`.
2. Extract the Service Pack onto the SCOM Server Drive by running the following command:
   `SQLServer2008SP1-KB968369-x64-ENU.exe /x:C:\SP1`

3. Install the SQL Server Setup support Files by running the following command:

C:\SP1\x64\setup\1033\sqlsupport.msi

h. Click Next, Accept the license agreement and click Next.

a. Enter the Name, and Company information. Click Next then click Install.

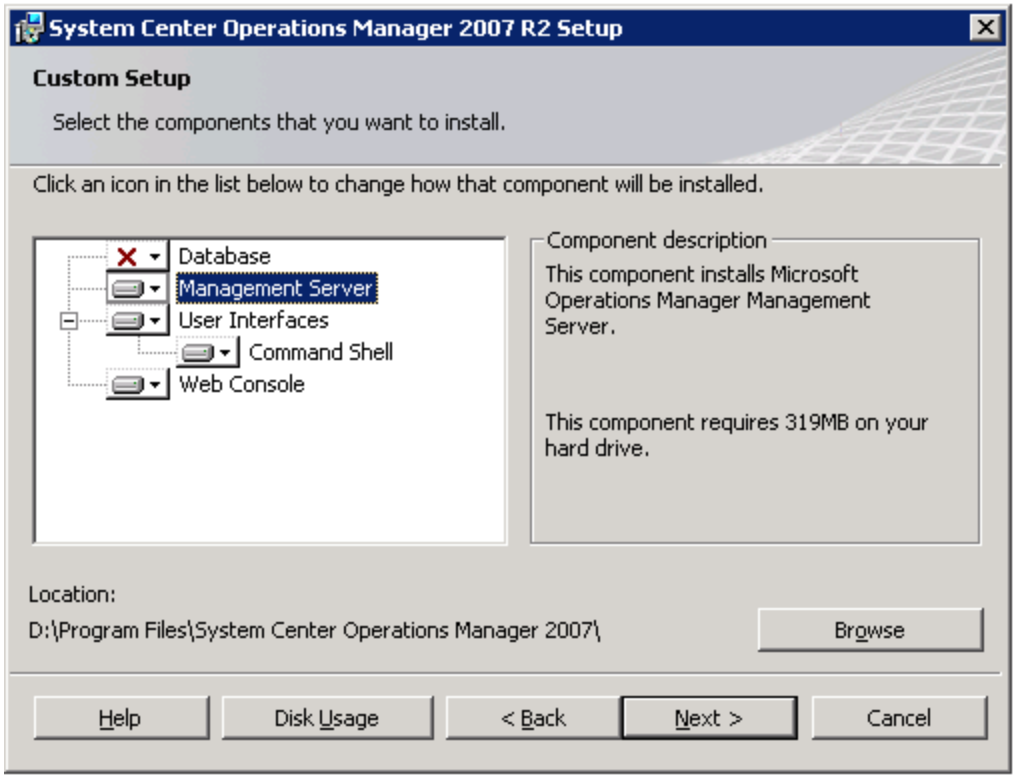
4. From a command prompt launch the Setup.exe from the SQL Server 2008 DVD by running the following command:
   <DVD Drive Letter>:\Setup.exe /PCUSource=<SCOM Drive Letter>:\SP1

5. Acknowledge any compatibility warnings. Click Run Program.
6. Select Installation, New SQL Server stand-alone installation.
7. Acknowledge any compatibility warnings. Click Run Program.
8. Resolve any failed prerequisite checks and click OK.
9. Click Install to install setup support files.
10. Resolve any Support Rule errors and click Next.
11. Enter your Product key, and click Next, then Accept the Software License Terms. Click Next.
12. Under Instance features Select the following:
    a. Reporting Services
13. Change the Shared feature directory and Shared feature directory (x86) to the <SCOM drive letter>.
14. Change the Instance root directory to the <SCOM drive letter> and click Next then Next again.
15. Select NT AUTHORITY\NETWORK SERVICE for the reporting service account name and click Next.
16. Click Next.
17. Choose whether or not to send error reports, and usage data to Microsoft, and click Next.
18. Fix any Installation Rule errors, and click Next, then Next again, then Install.
19. Review the installation report and click Close.

Step 5: Install Operations Manager

1. Launch SetupOM.exe from the Operations Manager DVD.
2. Click Check Prerequisites.
3. From the Prerequisite Viewer, select Server, Console, PowerShell, Web Console, and Reporting, click Check.
4. Resolve any issues found before continuing, and click Close.
5. Click Install Operations Manager 2007 R2.
6. Click Next on the welcome screen.
7. Accept the EULA and click Next.
8. Enter your Username, and Organization information. Click Next.
9. In the Custom Setup screen:
   a. Select the Management Server, User Interfaces, Command Shell, and Web Console.
   b. Change the installation path for each component by highlighting them one at a time, and clicking Browse. Change the path to the <SCOM Drive Letter>.

c. Click `Next`.



10. Enter the FQDN for the virtual SQL Server Instance created earlier. Click `Next`.
11. Enter the account information for the `<Management Server Action>` account. Click `Next`.
12. Enter the account information for the `<SDK and Configuration Service>` account. Click `Next`.
13. Select `Use Windows Authentication` and click `Next`.
14. Choose whether or not to participate in the customer experience improvement program, and click Next.
15. Clear the `Start Console` checkbox and click `Finish`.
16. Encryption key backup:
    a. Click `Next` then select `Backup the Encryption key` and click `Next`.
    b. Enter a UNC path not on the operations manager server and click `Next`.
    c. Enter a password to secure the encryption key and click `Next`, then click `Finish`.

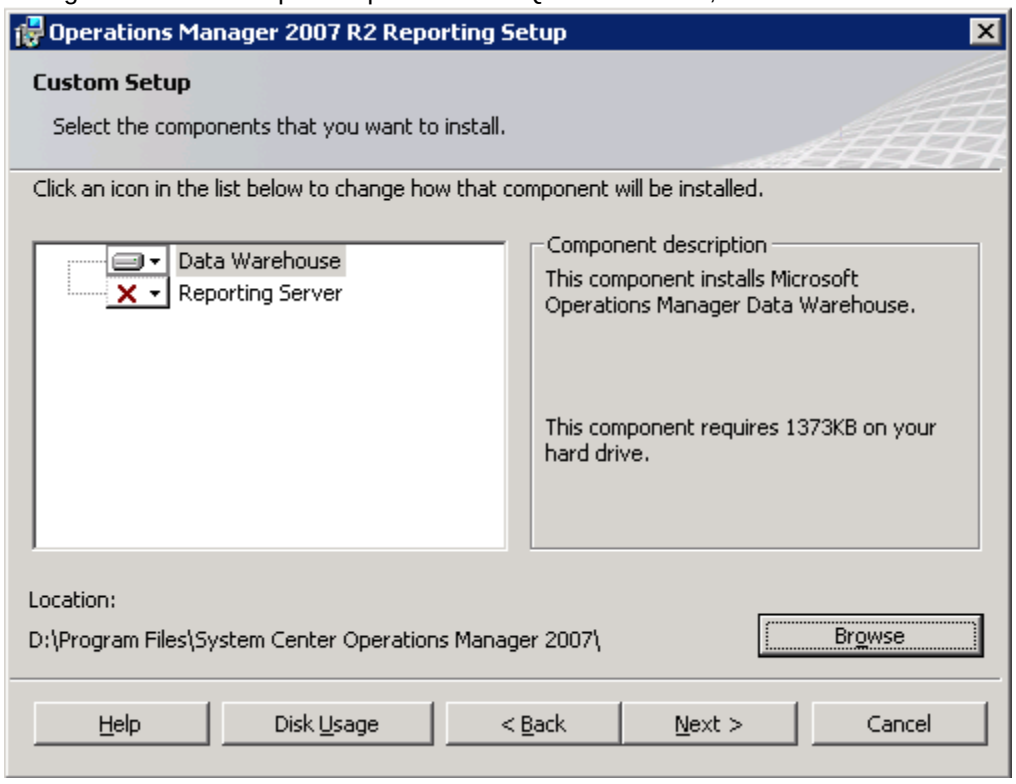
Step 6: Configure Web Console Security

1. Open IIS Manager by selecting `Start > Administrative Tools > Internet Information Services (IIS) Manager`.
2. Click the root of the IIS management server `(servername <domain>\user)`.
3. In the center pane, scroll down and open `Server Certificates`.
4. In the actions pane click `Create Self-Signed Certificate`. Enter a name for the new certificate, click `OK`.
5. Expand `Server, expand Sites`, and select `Operations Manager 2007 Web Console`.

6. In the actions pane click `Bindings` and do as follows:
   d. Click `Add`.
   e. Change the type to `https`, and select the new certificate.
   f. Click `OK` and then click `Close`.

Step 7: Provision Data Warehouse Database

1. Log in to data warehouse SQL Server instance, using a domain account that is a member of the `<SQL Server Administrators>` group.
2. Launch `SetupOM.exe` from SCOM DVD.
3. Select Check Prerequisites:
   a. Select `Data Warehouse` and click `Check`.
   b. Resolve any issues found and click `Close`.
4. Select `Install Operations Manager 2007 R2 Reporting`.
5. In the Welcome screen, click `Next`.
6. Accept license agreement and click `Next`.
7. Enter User Name, Organization and click `Next`.
8. In the Custom Setup screen:
   a. Select only the Data Warehouse component.
   b. Change the installation path to point to the SQL Server VHD, and click `Next`.

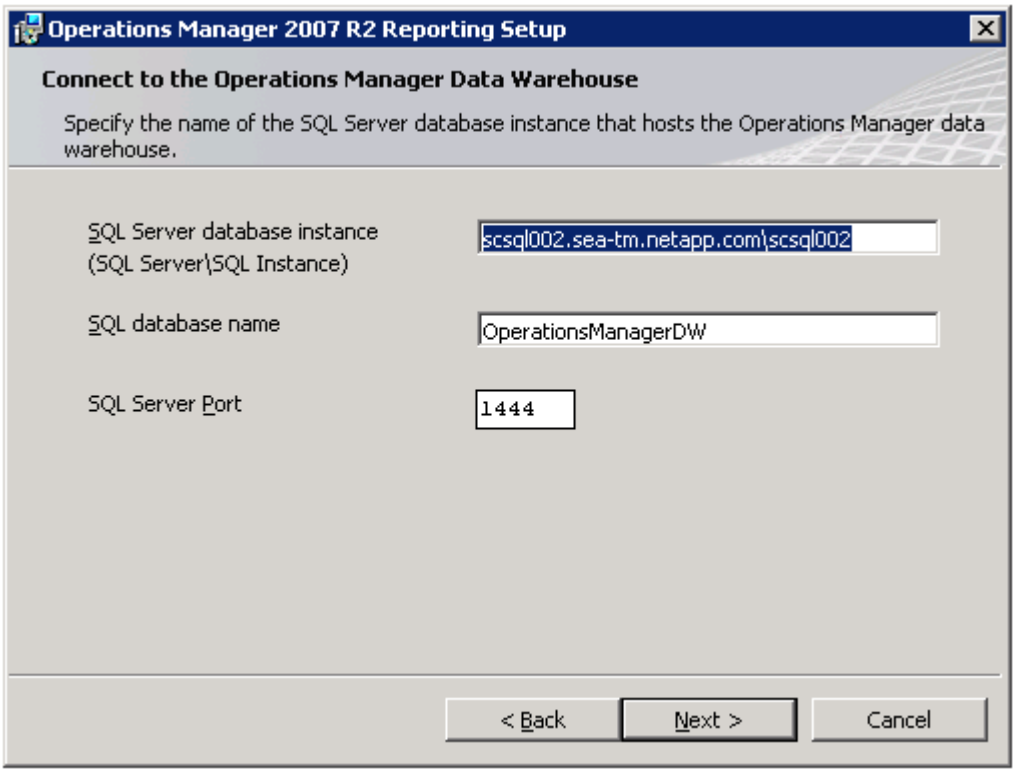


9. Select the `SQL Server Data Warehouse Instance` and click `Next`.
10. Verify that the Data File and Log File locations are going to the correct LUNS and click `Next`.

11. Click `Install`.
12. Click `Finish`.

Step 8: Install Operation Manager Reporting

1. Log in to Operations Manager Server.
2. Launch the SQL Server Reporting Services by clicking `Start > All Programs > Microsoft SQL Server 2008 > Configuration Tools > Reporting Services Configuration Manager`.
3. Click `Connect`.
4. Verify that the Report Service Status is Started.
5. Select Web Service URL from the left pane.
6. Click `Apply` to create the Web instance.
7. Select `Database` from the left pane.
8. Click `Change Database`.
9. Select `Create a new report server database` and click `Next`.
10. Enter the FQDN for the SQL Database Failover Cluster.
11. Click `Next`.
12. Accept all defaults and click `Next`.
13. Leave the credentials set to `Service Credentials` and click `Next`.
14. Click `Next` to provision the database.
15. Click `Finish`.
16. Select `Report Manager URL` from the left pane.
17. Click `Apply` to create the virtual directory.
18. Select `E-mail Settings` from the left pane.
19. Enter the Sender Address and SMTP server and click `Apply`.
20. Click `Exit` to close the Report Server Configuration server.
21. Launch SetupOM.exe from SCOM DVD.
22. Select `Install Operations Manager 2007 R2 Reporting`.
23. In the Welcome screen, click `Next`.
24. Accept license agreement and click `Next`.
25. Enter User Name, Organization and click `Next`.
26. Select Reporting Server and click `Next`.
27. Enter the FQDN for the SCOM Server and click `Next`.
28. In the Data Warehouse screen, enter:
    a. Enter the Name and Instance of the Data Warehouse SQL Server instance.
    b. Enter the SQL Server Port that was configured for remote access.
    c. Click `Next`.



29. Select the Reporting server and click `Next`.
30. Enter the account information for the `<Data Warehouse Write Action>` account, and click `Next`.
31. Enter the account information for the `<Data Reader>` account and click `Next`.
32. Choose whether or not to send operational data reports to Microsoft and click `Next`.
33. Click `Install`.
34. Click `Finish`.

Configure Operations Manager

1. Log in to Operations Manager Server.
2. Open the Operations Manager Console, by clicking `Start > All Programs > System Center Operations Manager 2007 R2 > Operations Console`.
3. Add devices to manage:
   a. From the top center pane click `Required: Configure computers and devices to manage`.
   b. Select `Windows Computers` and click `Next`.
   c. Select `Advanced discovery` and click `Next`.
   d. Select Browse for or type computer names and click `Browse`.
   e. Enter all management and Hyper-V hosts and click `Next`.
   f. Select `Use selected Management Server Action Account`, click `Discover`.

g. Select `all devices to monitor`, click `Next`, and then click `Finish`.

4. Enable Agent proxy for cluster hosts.
   a. From the Operations Manager Console select `Administration`.
   b. In the right pane expand Device management and select `Agent Managed`.
   c. Select the first cluster host. Right-click, and select `Properties`.
   d. Click the `Security` tab.
   e. Check `Allow this agent to act as a proxy and discover managed object on other computers`.
   f. Click `OK`.
   g. Repeat for each cluster host in your environment.
5. Add Management Packs:
   a. Download and install the following Management Packs from Microsoft. Note the installers only extract the management packs into the correct folders, accept all defaults.
      - Windows Server Operating System Management Pack for Operations Manager 2007
      - Windows Server Internet Information Services 7 Management Pack for Operations Manager 2007
      - Windows Server Failover Clustering Management Pack for Operations Manager 2007
      - Windows Server Hyper-V Management Pack for Operations Manager 2007
      - SQL Server Monitoring Management Pack

   b. From the Operations Manager Console, select `Administration`.
   c. In the top left under Actions: click `Import management packs`.
   d. Click `Add > Add from disk...`
   e. Browse to `%ProgramFiles(x86)%\System Center Management Packs`.
   f. In the following order expand each folder for all the management packs just added, when expanded Select all the .MP files and click `Open`.
      1. Windows Server Base OS System Center Operations Manager 2007 MP
      2. Internet Information Services MP
      3. Windows Cluster Operations Manager 2007 MP
      4. Windows Server Hyper-V Operations Manager 2007 MP
      5. SQLServerMP

   g. When all the MP has been added to the wizard, click `Install`.
   h. Click `Yes`.
   i. When all MP have finished importing click `Close`.

Install System Center Virtual Machine Manager

Step 1: Active Directory Preparation

1. Create two domain user accounts to perform the following actions. These account require no special delegation.
   – SCVMM Database (for example, SCVMMDatabase)
   – SCVMM Service (for example, SCVMMService)

2. Create a Global Security group for the SCVMM Server Administrators.
3. Add the <SCVMM Service> and < Management Server Action > accounts to the <SCVMM Server Administrators> group.
4. Add the <SCVMM Service> to the <Operations Manager Administrators> group.
5. Add the <SCVMM Database> to the <SQL Server Administrators> group.

Step 2: Install Windows Server 2008 R2 SP1Enterprise in the SCVMM Virtual Machines

1. Update Windows Server with the latest updates.
2. Install antivirus software.
3. Log in and add the <SCVMM Server Administrators> group, <SnapDrive>, and <SCVMM Service > accounts to the local administrators group.
4. Log in using an account with both domain and local administrative privileges.

Step 3: Install Prerequisite Software

Windows Features

1. Open Server Manager and select Features.
2. Click the Add Features link launching the Add Features wizard.
3. Expand .NET Framework 3.5.1 Features.
4. Select the .NET Framework 3.5.1 Feature.
5. Select the Multipath I/O feature.
6. Click Next > Install > Close.

Add Web Server Role

1. Open Server Manager and select Roles.
2. Click Add Role.
3. Select Web Server (IIS) and click Next.
4. In the introduction to IIS page, click Next.
5. Select the following role service:

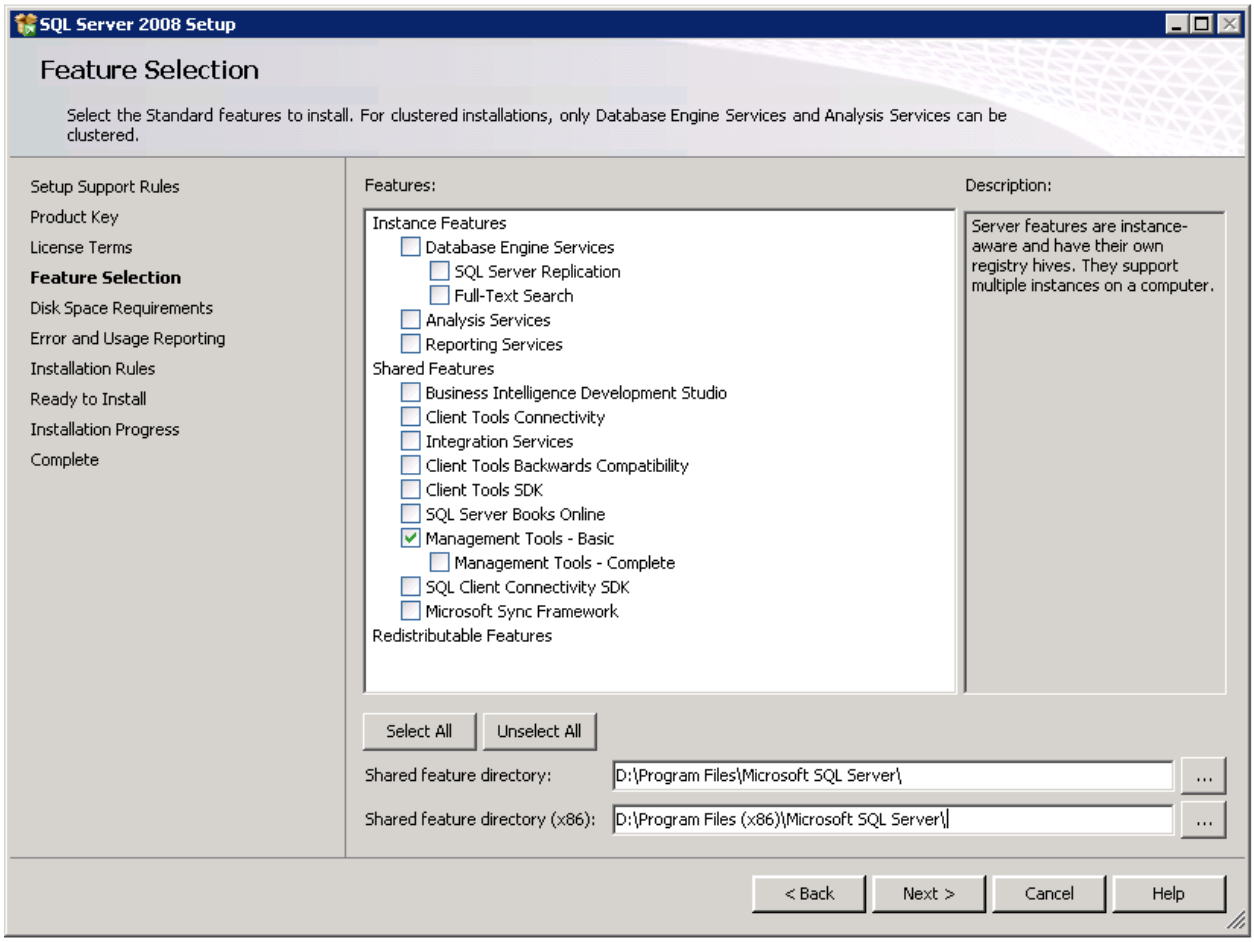
- IIS Web Server
- Common HTTP
  - Static Content
  - Default Document
  - Directory Browsing
  - HTTP Errors
- Application Development
  - ASP .NET
  - .Net Extensibility
  - ISAPI Extensions
  - ISAPI Filters
- Health and Diagnostics
  - HTTP Logging

- Request Monitor
- Security
  - Request Filtering
- Performance
  - Static Content
- Management Tools
  - IIS Management Console
  - IIS 6 Management Compatibility
    IIS 6 Metabase Compatibility
    IIS 6 WMI Compatibility

6. Click `Next > Install > Close`.

Install SQL Management Tools - Basic

1. Download `SQLServer2008 Service Pack 1`.
2. Extract the Service Pack onto the SCVMM Server Drive by running the following command:
   `SQLServer2008SP1-KB968369-x64-ENU.exe /x:<SCVMM Drive Letter>:\SP1`
3. Install the SQL Server Setup support Files by running the following command:
   `<SCVMM Drive Letter>:\SP1\x64\setup\1033\sqlsupport.msi`
4. Click `Next`. Accept the license agreement and click `Next`.
5. Enter the Name, and Company information, click `Next`, and then click `Install`.
6. From a command prompt launch the Setup.exe from the SQL Server 2008 DVD by running the following cmd.
   `<DVD Drive Letter>:\Setup.exe /PCUSource=<SCVMM Drive Letter>:\SP1`
7. Acknowledge any compatibility warnings and click `Run Program`.
8. Select `Installation`, `New SQL Server stand-alone installation`.
9. Acknowledge any compatibility warnings and click `Run Program`.
10. Resolve any failed prerequisite checks and click `OK`.
11. Click `Install` to install setup support files.
12. Resolve any Support Rule errors. Click `Next`.
13. Enter your Product key, and click `Next`.
14. Accept the Microsoft Software License Terms. Click `Next`.
15. In the Feature Selection screen:
    a. Under Instance features select the following:
       1. Shared Features
       2. Management Tools –Basic
    b. Change the Shared feature directory and the Shared feature directory (x86) to the `<SCVMM drive letter>` and click `Next`.



16. Choose whether or not to send error reports and usage data to Microsoft, and click `Next`.
17. Fix any Installation Rule errors. Click `Next`, click `Install`, then click `Next`.
18. Review the installation report and click `Close`.

Enable iSCSI

1. Enable the ISCSI Initiator by clicking `Start > Administrative Tools > iSCSI initiator`. Click `Yes` to start the Microsoft iSCSI service.
2. Click `OK` to close the iSCSI Initiator Properties Panel.

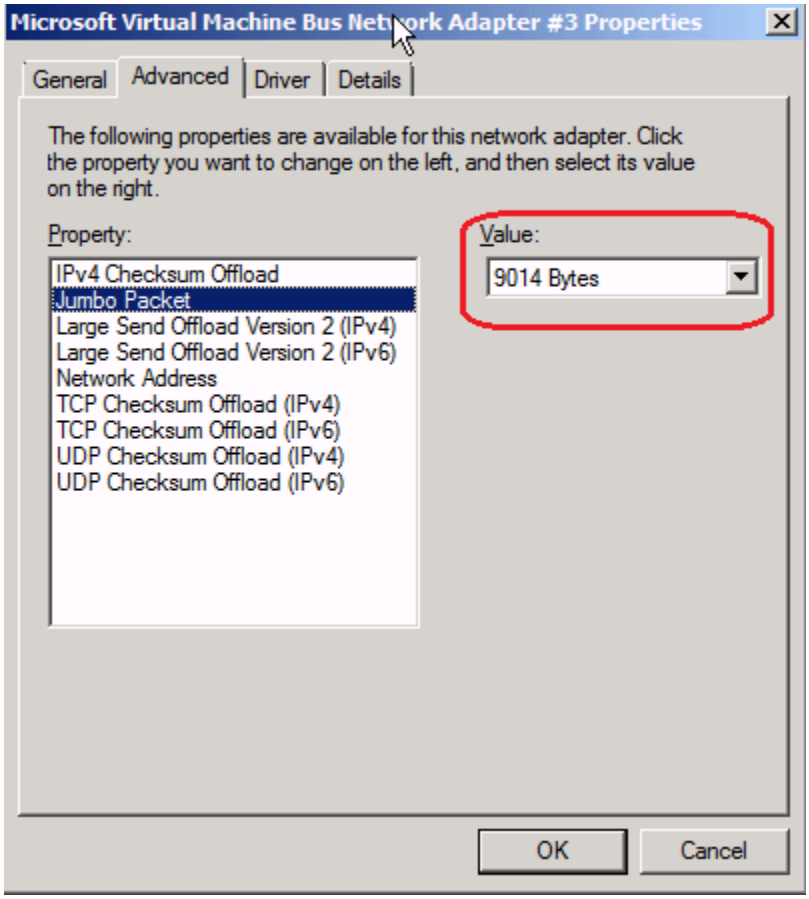
Enable Jumbo Frames for iSCSI NICs in SCVMM Virtual Machine

1. Open Network Connections.
2. Right-click on the `iSCSI-Fabric-A Network` adapter and click `Properties`, then click the `Configure` button.
3. Select `Advanced` tab.
4. Select `Jumbo Packet` in the property list box and set the value to `9014 Bytes`.

Note: The 9014 Byte value in this dialog box is the correct Hyper-V synthetic adapter setting for UCS, Nexus and FAS array MTU setting of 9000 Bytes.

5. Repeat steps 2 through 4 for the second iSCSI Adapter..

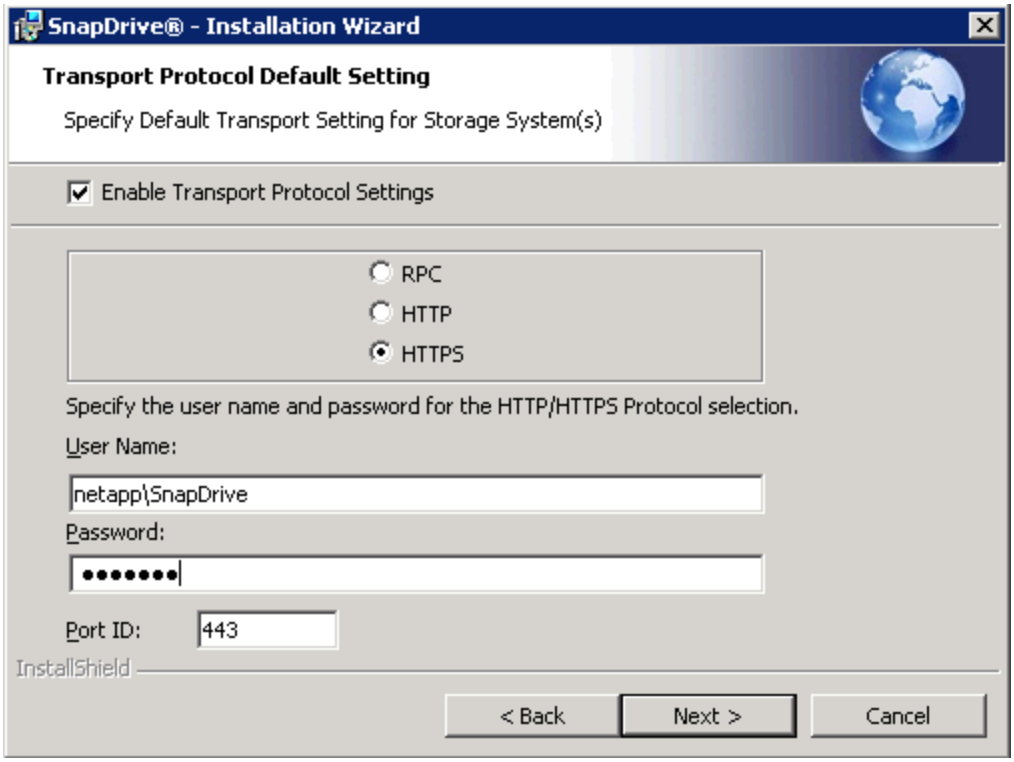
6.



NetApp SnapDrive 6.4

1. Download NetApp SnapDrive 6.4.
2. Launch the SnapDrive Installer, click `Next` and Accept the EULA and click `Next`.
3. Select the `Storage based Licensing` method and click `Next`.
4. Enter your User Name, and Organization information, and click `Next`.
5. Enter the Account information for the `<SnapDrive >` account created earlier.
6. Click `Next`.
7. Click `Next` and then select the `Enable Transport Protocol Settings Option` `Select HTTPS`.
8. Enter the UserName and Password for Storage Systems root user .

9. Click `Next > Next > Next > Install > Finish`.



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NetApp DSM MPIO 3.5

1. Download NetApp DSM MPIO 3.5 package from the NOW.netapp.com Site.
2. Install Microsoft Hotfixes `KB2522766-x64` and `KB2528357-v2-x64`. A restart is required after each Hotfix.
3. Launch the DSM MPIO Installer.
4. Click `Next` then click `OK` to acknowledge the ALUA requirement.
5. Accept the EULA and click `Next`.
6. Enter the DSM License Key and click `Next`.
7. Leave the system account selected and click `Next`.
8. Click `Next`, then `Next` again then Install and once complete restart the system.

Step 4: Provision Storage

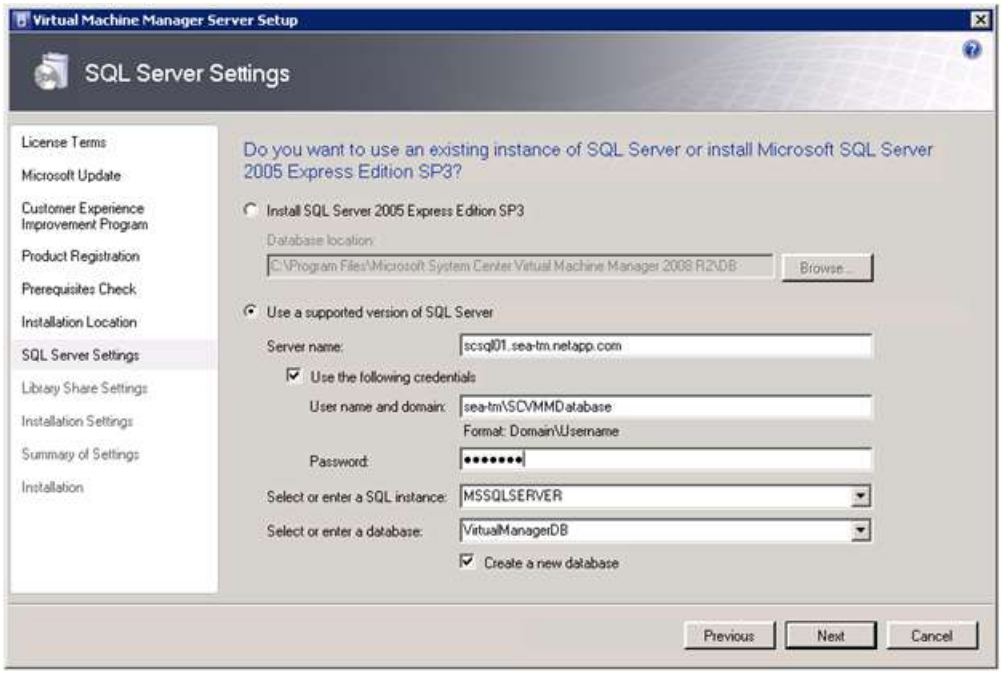
1. Log in to the SCVMM server using a domain administrative account with local privileges.
2. Establish iSCSI Connections.
   a. Open `SnapDrive`.
   b. Browse to iSCSI Management within SnapDrive.
   c. Click `Establish iSCSI Session`.
      1. Enter the IP/name of the NetApp controller. Click `Next`.
      2. Select the source and destination IP addresses associated with iSCSI network A.
      3. If CHAP authentication is required configure at this time.

4. Click `Next`. Review for accuracy and then click `Finish`.
5. Repeat for iSCSI network B.

3. Create VM library drive:
   a. Open `SnapDrive` and selects `Disks` and click `Create Disk`.
   b. In the Welcome screen, click `Next`.
   c. Enter the IP/FQDN for the vFiler0 Controller, and click `Add`.
   d. When the enumeration has completed, select the target volume where you intend to add the LUN.
   e. Add a LUN Name, LUN Description, and click `Next`.
   f. Select `Dedicated`. Click `Next`.
   g. Select `Assign a Drive Letter`, and pick a drive letter.
   h. Set the LUN Size, for example 500g, and click `Next`.
   i. Select the iSCSI initiators to map the new LUN to, and click `Next`.
   j. Select `Automatic` and click `Next` and then click `Finish`.

Step 5: Install System Center Virtual Machine Manager

1. From the product DVD or network share, double-click `setup.exe`.
2. In the Setup menu, click `VMM Server`.
3. In the License Terms page, click `I accept the terms of this agreement`. Click `Next`.
4. In the Customer Experience Improvement Page (CEIP) page, click `Yes` to participate or `No` to opt out of the CEIP. Click `Next`.
5. In the Product Registration page, enter your name and the name of your company. Click `Next`.
6. In the Prerequisites Check page, review any alerts or warnings about inadequate hardware or uninstalled software prerequisites. You can continue if you receive warnings, but alerts must be resolved before you can proceed with the installation. Click `Next`.
7. In the Installation Settings page, select the appropriate path for your System Center SCVMM2008 program files location. These should be placed on the SCVMM VHD provisioned earlier.
8. In the SQL Server Settings page:
   a. Select Use a supported version of SQL Server.
   b. Enter the FQDN of the virtual SQL Server Cluster.
   c. Select Use the following credentials.
   d. Enter the <SCVMM Database> account and password.
   e. Select the default MSSQLSERVER instance.
   f. Select Create a new database and click `Next`.



9. In the Library Share Settings page, click `Change` to change the share location. Select the LUN provisioned earlier, click `Make New Folder` ,rename the new folder to `Virtual machine Manager Library Files`. Select the `Virtual machine Manager Library Files Folder`. Click `OK` .
10. Click `Next`.

    During installation, the Setup Wizard creates a folder named VHDs and two virtual hard disks of different sizes (16GB and 60GB) that you can use to create a new virtual machine or use as additional disk drives.

11. In the Port Assignments page, assign the ports you want to use for communications and file transfers between SCVMM components. If Windows Firewall is turned on the wizard will attempt to add firewall exceptions for each port.

    Important : You can change the default port settings to avoid conflicts with other applications in your environment. However, the port settings that you assign for the SCVMM server must identically match the port settings you assign when installing associated SCVMM components.

12. Under VMM Service Account, select `Other account`. Enter the `<SCVMM Service>` account information. Click `Next`, and then click `Install`.
13. In the Installation page, after setup is complete, click the link in the Status window to check for the latest SCVMM updates.

Step 6: Install System Center Virtual Machine Manager Administrator Console

1. From the product DVD or network share, double-click `setup.exe`.
2. In the Setup menu, click `VMM Administrator Console`.
3. In the License Terms page click `I accept the terms of this agreement`. Click `Next`.
4. In the Customer Experience Improvement Page (CEIP) page, click `Next`.

5. In the Prerequisites Check page, review any alerts or warnings about inadequate hardware or uninstalled software prerequisites. You can continue if you receive warnings, but alerts must be resolved before you can proceed with the installation. Click `Next`.
6. In the Installation Settings page, select the appropriate path for your System Center SCVMM2008 program files location. These should be placed on the SCVMM VHD provisioned earlier.
7. In the Configuration Settings page, do one of the following:
   a. Click `Next` to use the default port (8100) for the SCVMM Administrator Console to communicate with the SCVMM server.
   b. Assign a different port that you want to use for the SCVMM Administrator Console to communicate with the SCVMM server, and then click `Next`.

   Important: The port settings that you assign for the SCVMM Administrator Console must identically match the port settings that you assigned in the SCVMM server.
8. Click `Install`.
9. In the Installation page, after setup is complete, check for the latest VMM updates, and open `VMM Administrator Console`. Click `Close`.

   The Connect to Server dialog box opens the first time you open the console.
10. In the Connect to Server dialog box.
11. Click `Connect` to connect to the local SCVMM server (localhost) using the default port (8100).
12. In the Server name box, type the name of the computer where the SCVMM server is installed, followed by a colon and the port that you want to use to connect the SCVMM Administrator Console to the SCVMM server, and then click `Connect`.

Step 7: Configure SCVMM

1. From the Virtual Machine Manager (VMM) console, select `All Hosts`. From the Actions pane select `Add host`.
2. Select Windows Server-based host on an Active Directory domain, and enter credentials for a domain account that has permissions to both search AD, and to install the agent on the Hyper-V hosts.
3. Click `Search` and do the following:
   a. Select the `Hyper-V` checkbox, and click `Search`.
   b. Select every Hyper-V host you want to add to SCVMM, and click `Add`, then `Yes`, then `Yes`, then `OK`.
4. Click `Next`, `Next`, then `Next` again.
5. Click `Add Hosts`.

Step 8: Install the OnCommand Plugin 3.0 Rapid Provisioning cmdlets

1. Download OnCommand Plugin 3.0 from the NOW™ site. Although the cmdlets are a separate product from OnCommand Plugin, they share a common installer.
2. Launch the OnCommand Plugin executable file.
3. In the Welcome screen click `Next`.
4. Accept the EULA, and click `Next`.
5. Enter User Name and Organization. Click `Next`.
6. Change the installation path to point to the SCVVM VHD (for example, `D:\Program Files\NetApp\OnCommand\MS_Plugin\`) Click `Next`.

7. Select only the `Cmdlets` feature and click `Next >Install > Finish`.
8. Enter the credentials for the SCVMM Service account and click `Next`.
9. Open the Rapid Provisioning PowerShell prompt by launching the OnCommand® Cmdlets link on the desktop.
10. Type `Set-ExecutionPolicy –ExecutionPolicy AllSigned`. Type `Y` to confirm.
11. Close and reopen OnCommand® Cmdlets.
12. Enter `A` to always run NetApp Cmdlets.
13. Run `Add-OCStorageSystem` for each Controller.
14. Test by running `Get-OCStorage`.

Step 9: Installing the Virtual Machine Manager Self-Service Portal (Optional)

The Self-Service Portal Setup wizard installs all three of the self-service portal components.

Table 20 Service accounts requested during self-service portal setup

Account Name	Requested during	Used for	Prerequisites	High Security
Service Account	VMMSSP server component setup	Running the Windows Service implementation of the VMMSSP server component, the Virtual Machine Manager Self-Service Portal 2.0 service, and underlying services and processes. The server component also uses this account for external communication, such as: • Communicating with the VMM server and performing tasks that require interacting with the VMM server. • Communicating with the VMMSSP database.	Make sure this is an Active Directory domain account. Before you install the VMMSSP server component, make sure this account has administrative permissions on the VMM Administrator Console. You must also make sure that this account is granted **Local Administrator** permissions on the computer where you plan to install the server component.	Use a low-privilege domain account
Application Pool Identity	VMMSSP Web site component setup	Running the application pool used for the VMMSSP Web site component. The VMMSSP Web site component also uses this account for external communication, such as: • Communicating with the VMMSSP server and database components. • Running tasks that require interacting with the other self-service portal components.	This account can be a domain account.	Use a low-privilege domain account.

Table 21 Ports and protocols for the self-service portal

Connection Type	Protocol	Default Port	Where to Change the Setting
VMMSSP Web site to/from VMMSSP server	WCF	8000	During self-service portal setup. After setup, in the **<services>** section of the Microsoft.DITSC.ProvisioningService.exe.config file. For more information, see "Tuning the Self-Service Portal with Global Parameters" in the *Virtual Machine Manager Self-Service Portal 2.0: Datacenter Administration Guide*.
Client to/from VMMSSP Web site	HTTP/HTTPS	Without SSL: 80 With SSL: 443	During self-service portal setup. After setup, in the **Site Bindings** dialog box for the VMMSSP Web site in IIS. For information about configuring SSL for the portal, see the "Post Installation: Hardening the Self-Service Portal Website" section in this guide.
VMMSSP Web site to/from VMMSSP database	Tabular Data Stream (TDS)	1433	During self-service portal setup.
VMMSSP server to/from VMMSSP database	TDS	1433	During self-service portal setup.
VMMSSP Web site to/from virtual machine hosts	Remote Desktop Protocol (RDP)	2179	This port cannot be changed.

Preparation Checklist

Before you install the self-service portal, be sure that you have prepared the following:

- A service account and an application pool identity for the self-service portal, as defined in Table 20.

  Important: You must create the service account and application pool identity before you run the Self-Service Portal Setup wizard. The wizard does not create new accounts.
- If appropriate, a SQL Server maintenance account as described in the section Active Directory Preparation.
- If appropriate, firewall port exceptions for the ports listed in Table 21.

  Important: You must have administrator permissions on the computers on which you intend to install the self-service portal components. You also must be a member of the local Administrators group on the computer running SQL Server.

To Install the VMMSSP Server Component and Database Component

Note: This procedure assumes that you have a separate database server available, running SQL Server 2008 Enterprise Edition or Standard Edition.

1. Download the SetupVMMSSP.exe file and place it in the computer on which you want to install the VMMSSP server component.

2. To begin the installation process, on the computer on which you are installing the server component, right-click `SetupVMMSSP.exe`, and click Run as administrator.
3. In the Welcome page, click `Install`.
4. Review and accept the license agreement and click `Next`.
5. Click `VMMSSP server component` and click `Next`.
6. In the Check Prerequisites for the Server Component page, wait for the wizard to complete the prerequisite checks, and then review the results. If any of the prerequisites are missing, follow the instructions provided. When all of the prerequisites are met, click `Next`.
7. Accept or change the file location and then click `Next`.
8. Configure the VMMSSP database:
    a. In Database server, type the name of the database server that will host the new VMMSSP database (or that hosts an existing database).
    b. Click `Get Instances` to get the SQL Server instances available in the database server. In SQL Server instance, select the SQL Server instance that manages the new (or existing) database.
    c. In Port, type the port number that the SQL Server instance uses for incoming and outgoing communication. The default port is `1433`.
    d. Under Credentials, click the type of authentication that the database will use for incoming connections (Windows authentication or SQL Server authentication).
    e. If you clicked SQL Server authentication, type the user name and password of a SQL Server account to use to access the database.
    f. If you want the self-service portal to create a new database (for example, if you are running the Setup wizard for the first time), click `Create a new database`.

       Important: If you are installing the self-service portal for the first time you must select the option to create a new database.

       Note: The self-service portal database name is DITSC, and cannot be changed.
    g. If you want the self-service portal to use an existing database, click `Use an existing database`. The DITSC database is selected, and cannot be changed.

       Important: If you are upgrading from the release candidate version of the self-service portal, make sure you have followed the procedure in “Upgrading from the Release Candidate Version of the Self-Service Portal” before continuing.
    h. When you finish configuring the self-service portal database, click `Next`.
9. Type the user name, password, and domain of the service account for the VMMSSP server component. Click `Test account` to make sure that this account functions. When finished, click `Next`.

Note: For more information about considerations and requirements for the service account, see section 0 Active Directory Preparation.

10. Enter the settings to configure the server component. These settings include the port numbers of the WCF endpoint for the TCP protocol. When finished, click `Next`.

Note: The VMMSSP server component uses the TCP endpoint port to listen for client requests. The WCF service uses the HTTP endpoint port for publishing the self-service portal service metadata. The metadata will be available using HTTP protocol with a GET request. For more information about WCF endpoints, see the Fundamental Windows Communication Foundation Concepts topic in the MSDN Library.

11. In the Datacenter administrators box, type the names of the accounts that you want to be able to administer the self-service portal. In the self-service portal, these users will be members of the DCIT Admin user role and have full administrative permissions.

Note: For more information about the DCIT Admin user role, see the section 0 Active Directory Preparation.

12. In the Installation Summary page, review the settings that you selected, and then click `Install`. When the installation finishes, click `Close`.

To Install the VMMSSP Web Site Component

Important: This procedure assumes that you have already installed the VMMSSP server component, and that you have placed the downloaded SetupVMMSSP.exe file on all computers on which you plan to install the VMMSSP Web site component.

1. To begin the installation process, on the computer on which you are installing the VMMSSP Web site component, right-click `SetupVMMSSP.exe` and then click `Run as administrator`.
2. On the Welcome page, click `Install`.
3. Review and accept the license agreement and then click `Next`.
4. Click `VMMSSP Web site component` and then click `Next`.
5. In the Check Prerequisites for the VMMSSP Website Component page, wait for the wizard to complete the prerequisite checks, and then review the results. If any of the prerequisites are missing, follow the instructions provided. When all of the prerequisites are met, click `Next`.
6. Accept or change the file location and then click `Next`.
7. You can use this setting to install the component on a computer other than the one running the Setup wizard.
8. Use the following steps to configure the IIS Web site for the self-service portal. For information about the IIS Web site properties required to configure the portal, see Understanding Sites, Applications and Virtual Directories on IIS 7.

Note: For information about the application pool identity required to configure the VMMSSP Web site component, see the “Service Accounts” section earlier in this document.

   a. In IIS Website name, type the name that IIS will use for the self-service portal. The default name is `VMMSSP`.
   b. In Port number, type the port number that IIS will use for the self-service portal. The default port is 80.
   c. In Application pool name, type a name for the application pool that the Setup wizard will create for the VMMSSP Web site. The default name is `VMMSSPAppPool`.
   d. Type the domain, user name, and password of the account that you have configured for the application pool to use. For information about the application pool identity for the self-service portal, see the “Service Accounts” section earlier in this document.
   e. When you finish configuring the IIS properties for the self-service portal, click `Next`.

9. Use the following steps to configure the VMMSSP database.

f. In Database server, type the name of the database server that hosts the database that you configured for the VMMSSP server component.

g. To see a list of the SQL Server instances associated with the specified database server, click Get Instances. In SQL Server instance, select the SQL Server instance that manages the new (or existing) VMMSSP database.

h. In Port, type the port number that the SQL Server instance uses for incoming and outgoing communication. The default port is `1433`.

i. Under Credentials, click the type of authentication that the database uses for incoming connections (Windows authentication or SQL Server authentication).

j. If you clicked SQL Server authentication, type the user name and password of a SQL Server account to use to access the database. Make sure that this account information matches the information you configured when you installed the VMMSSP server component.

k. Click `Use an existing database`. The self-service portal automatically locates the existing DITSC database.

l. When you finish configuring the database, click `Next`.

10. Enter the settings to configure how the VMMSSP Web site communicates with the VMMSSP server component. These settings include the host name of the WCF server (the name of the computer running the VMMSSP server component) and the TCP endpoint port number to communicate with the server component. When finished, click `Next`.

11. On the Installation Summary page, review the settings that you selected, and then click `Install`. When the installation finishes, click `Close`.

To Enable SSP Rapid Provisioning

1. In the Self-Service Portal, navigate to `Self Service Portal Settings > Customize Virtual Machine Actions > MasterActionXML`.
2. Select `CopyActionXML`.
3. Type the name for the new action script.

   For example, enter `ONTapRapidProvisioning`.
4. To create a virtual machine action, navigate to `CreateVM > Edit`.
5. Paste the `ONTapCreateVM.txt` content into the Script section of the edit window.
6. Paste the `ONTapCreateVMLocked.txt` content into the LockedScript section.
7. Set the options for the create action script.
   a. For the Successful Return Code, enter 0.
   b. Select the Timeout box and enter 9999.
   c. Clear the Continue on Error box.
8. 8. Click `Save` and `Close`.
9. 9. To delete a virtual machine action, navigate to `DeleteVM > Edit`.
10. 10. Paste the `ONTapDeleteVM.txt` content into the Script section of the edit window.
11. 11. Paste the `ONTapDeleteVMLocked.txt` content into the LockedScript section.
12. 12. Set the options for the delete action script.
    a. For the Successful Return Code, enter 0.
    b. Select the Timeout box and enter 9999.
    c. Clear the Continue on Error box.

13. 13. Click `Save` and `Close`.
14. 14. Navigate to `Infrastructure > ServiceRole > Edit`.
15. 15. From the Action XML drop-down list, select `ONTapRapidProvisioning`.

Note: This step makes sure that the use of the script during the CreateVM or DeleteVM action. This script name must match the name you used to create the script.

Step 10: SCOM Administrative Console

1. From the SCOM DVD or network share double-click `SetupOM.exe`.
2. Select `Install Operation Manager 2007 R2`.
3. In the Welcome screen, click `Next`.
4. In the License Terms page, click `I accept the terms of this agreement` and click `Next`.
5. In the Product Registration page, enter your name and the name of your company. Click `Next`.
6. In the feature selection page, select only the User Interface, and Command Shell. Change the installation to target the SCVMM VHD, and click `Next`.
7. In the Customer Experience Improvement Page (CEIP) page, click `Yes` to participate or `No` to opt out of the CEIP, and click `Next`.
8. Click `Install`.
9. Uncheck `Start the Console`.
10. Click `Finish`.

Configure SCVMM SCOM Integration

1. Log in to the SCOM server with a domain account that is both a SCVMM and SCOM Administrator.
2. From the product DVD or network share, double-click setup.exe.
3. In the Setup menu, click Configure Operations Manager.
4. In the License Terms page click I accept the terms of this agreement and click Next.
5. In the Microsoft Update page select either Use Microsoft Update or I don't want to use Microsoft Update. Click Next.
6. In the Customer Experience Improvement Page (CEIP) page, and click Next.
7. In the Prerequisites Check page, review any alerts or warnings about inadequate hardware or uninstalled software prerequisites. You can continue if you receive warnings, but alerts must be resolved before you can proceed with the installation. Click Next.
8. In the Installation Settings page, select the appropriate path for your System Center SCVMM2008 program files location. These should be placed on the SCOM VHD provisioned earlier. (ex. D:\Program Files\Microsoft System Center Virtual Machine Manager 2008 R2).
9. In the Port Assignment page, enter the FQDN for the SCVMM server and the port specified during SCVMM installation.
10. Click Install.
11. In the Installation page, after setup is complete, click the link in the Status window to check for the latest SCVMM updates.

    The Connect to Server dialog box opens the first time you open the console.

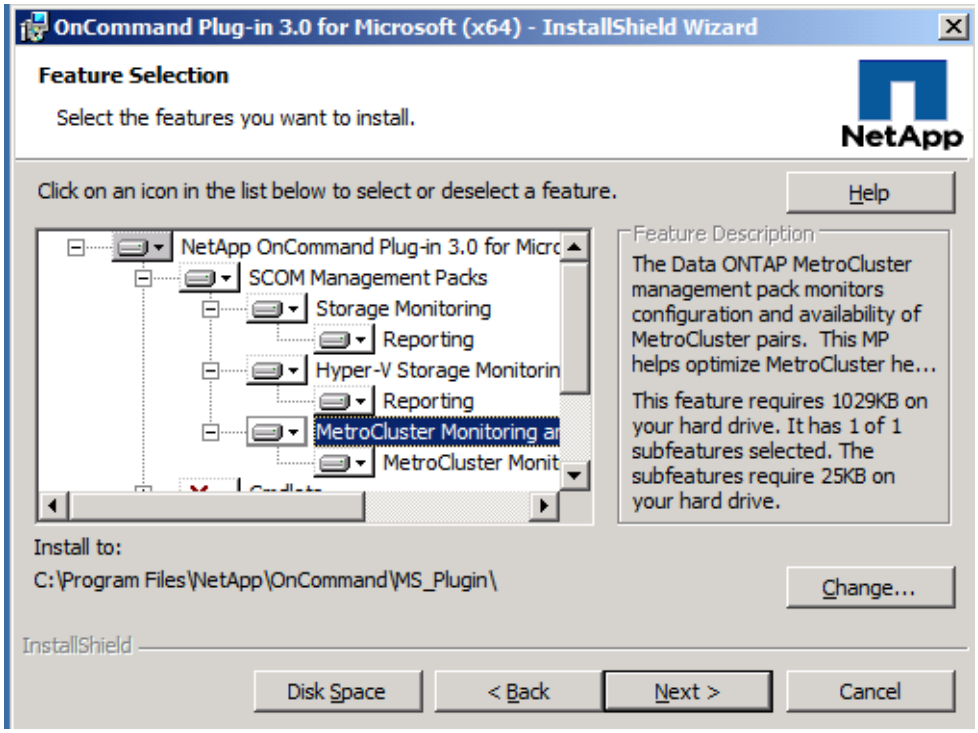
12. In the Server name box, enter the name of the computer where the SCVMM server is installed, followed by a colon and the port that you want to use to connect the SCVMM Administrator Console to the SCVMM server and click Connect.

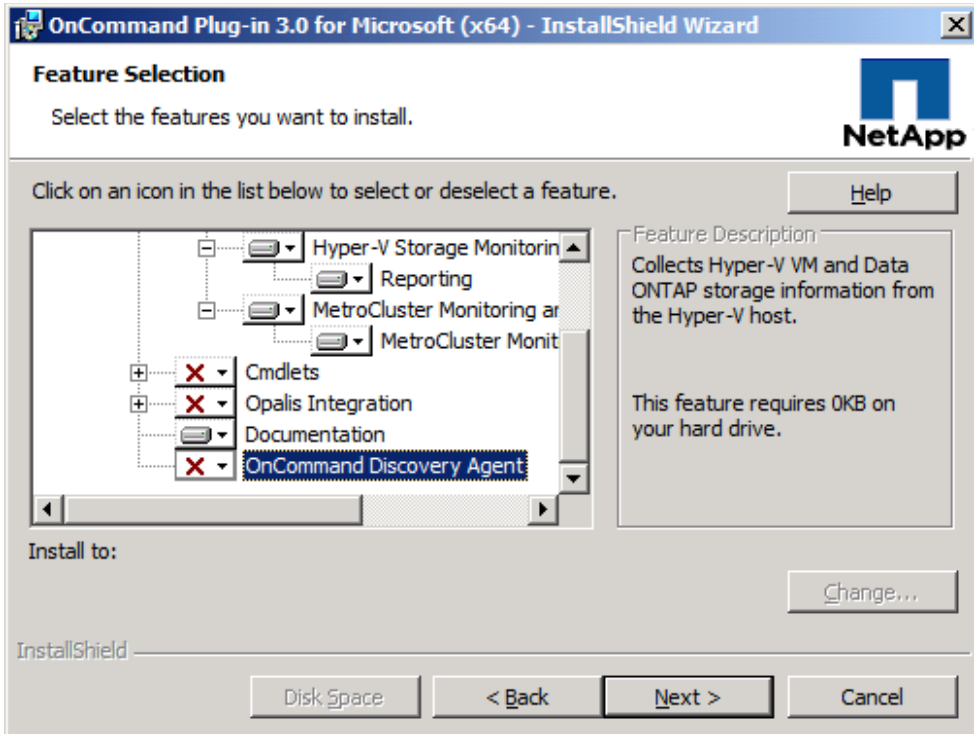
    Important: The port settings that you assign for the SCVMM Administrator Console must identically match the port settings that you assigned in the SCVMM server.

13. Click Install.
14. In the Installation page, after setup is complete, select the start console checkbox and click close.
15. The Connect to Server dialog box opens, enter the FQDN to the SCVMM server, and click connect.
16. Enable PRO Scripts:
    d. From within the VMM console click the PowerShell icon, launching a PowerShell console.
    e. At the prompt, type A to select [A]lways to always trust remote signed scripts from this snap-in. If you do not see a prompt, the policy already allows PRO to run scripts.
17. Enable PRO Tips:
    a. From the Administration pane, select General.
    b. Right-click Pro Settings and select Modify.
    c. Click Enable PTO Tips.
    d. Click OK.
18. Configure System Center integration.
    e. From within the VMM console, click Administration and then System Center.
    f. Right-click Operations Manager Reporting URL, and select Modify.
    g. Enter http://<SCOM Server>/ ReportServer and click OK.
    h. Right-click Operations Manager Server and select Modify.
    i. Enter the FQDN of the Operations Manager Server and click OK.
19. Close the VMM console.

Install OnCommand Plugin 3.0 for Microsoft SCOM

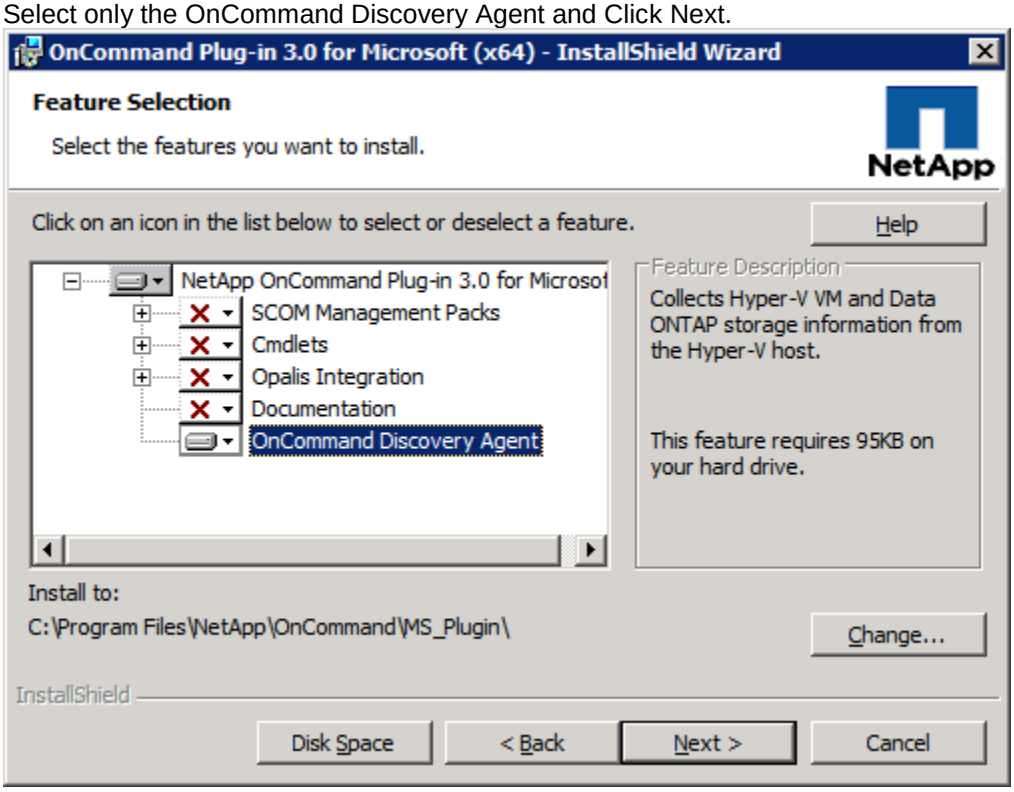
1. In the SCOM Server, log in to Operations Manager using a domain account with permissions.
2. Download OnCommand Plugin 3.0 for Microsoft (x64) from the NOW site.
3. Launch the installer:
    a. In the welcome screen, click Next.
    b. Accept the EULA and click Next.
    c. Enter a User Name, and Organization information, and click Next.
    d. Click Next.
    e. Select the following features under Products and click Next:
    1. SCOM Management Packs
        a. Storage Monitoring with Reporting
        b. Hyper-V Storage Monitoring with Reporting
        c. MetroCluster™ Monitoring and Management (optional)
    2. Documentation





4. Enter the credentials for the OpsMgr Administrator and click Next.
5. Click Install, then Finish.

6. Deploy the OnCommand Plugin 3.0 Agent.
   a. Log in to each Hyper-V host and run the OnCommand Plugin installer.
   b. From the welcome screen click Next.
   c. Accept the EULA and click Next.
   d. Click Next.
   e. Select only the OnCommand Discovery Agent and Click Next.



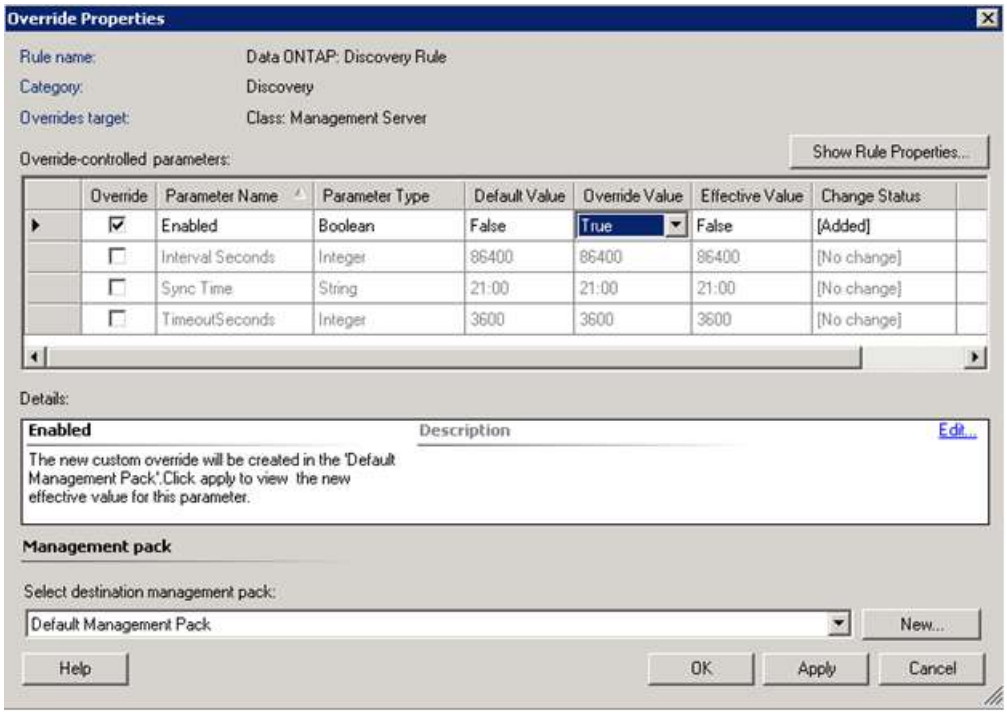
   6. Click Install then Click Finish.
   7. Repeat for each Hyper-V host.
7. Configure SNMP:
   a. Open Server Manager. Select Configuration and select Services.
   b. Scroll down to SNMP Service, right-click and select Properties.
   c. Click the Security tab.
   d. Under Accepted community names, click Add.
   e. Under Community rights select READ ONLY, and enter a Community Name. This community name should be the SNMP v1 ro community name on the two storage controllers.
   f. Under Accept SNMP packets from these hosts click Add.
   g. Enter the hostname or IP Address for the NetApp controller.
   h. Repeat for each controller in your environment, and then click OK.
8. Enable Data ONTAP discovery:
   a. From the Operations Manager Console, click Authoring > Management Packs Objects > Rules.
   b. In the top look for box enter Data ONTAP, and click Find Now.

c. Scroll down to Type: Management Server.

d. Right-click Data ONTAP: Discovery Rule and click Overrides > Override the Rule > For all objects of class: Management Server.

e. Select the OverRide checkbox for the row where Parameter Name is Enabled.

f. Change the Override Value selection to True, and then click OK.

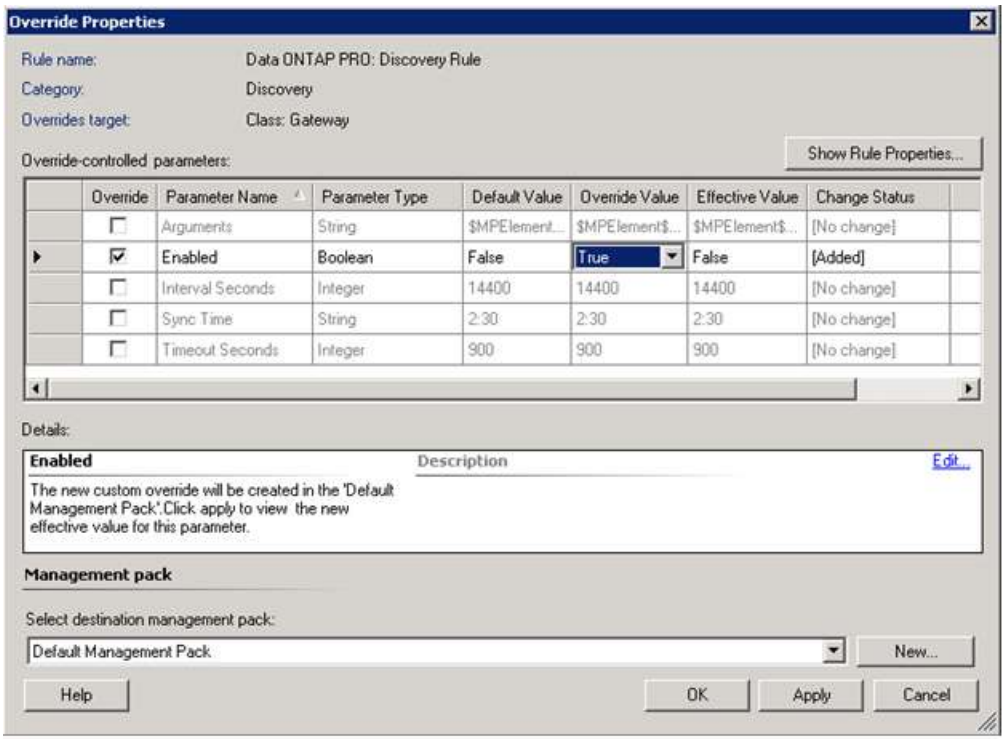


g. Go to Type: Data ONTAP Virtualization: Management Server

h. Right-click Data ONTAP PRO: Discovery Rule, and click Overrides > Override the Rule > For all objects of class: Data ONTAP Virtualization: Management Server.

i. Select the Override checkbox for the row where Parameter Name is Enabled.

j. Change the Override Value selection to True, and then click OK.



k. (Optional) If MetroCluster is a part of your installation, you can enable the Data ONTAP MetroCluster: Discovery Rule.

9. Discover NetApp controllers:
   l. From the Operations Manager Console, select administration.
   a. From the left pane click Discovery Wizard.
   b. Select Network Device and click Next.
   c. Enter an IP Range, and the community string entered on the storage systems and click Discover.
   d. Select the checkboxes next to the IP addresses of the two storage controllers and click Next.
   e. Click Finish.
10. Add NetApp controllers:
   a. From the Operations Manager Console select Monitoring.
   b. Expand Monitoring and select Discovered Inventory.
   c. From the Action pane, select Change Target Type. (If there is no action pane, select View > Actions, or press Ctrl+T.)
   d. In the resulting popup select Management Server and click OK.
   e. From the Actions pane under Health Service Tasks, Select Data ONTAP: Run discovery task.
   f. After the task is finished, click close.
11. Add controller credentials:
   a. From the Operations Manager Console select Monitoring.
   b. Expand Monitoring, and select Discovered Inventory.
   c. From the Actions pane under Health Service Tasks, Select Data ONTAP: Manage Controller Credentials.

d. Enter the login credentials for each controller. Note that it may be necessary to use the Data ONTAP: Add Controller Task to add the controllers before putting in credentials.

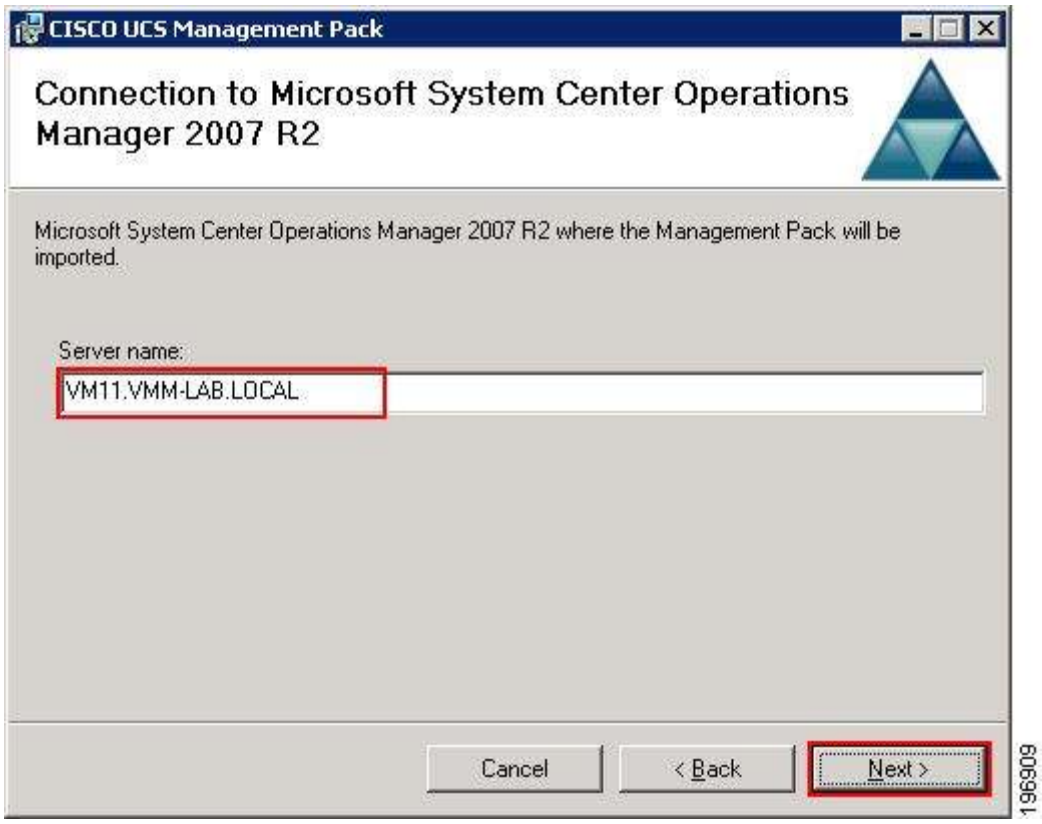
Install Cisco UCS MP for Microsoft SCOM

In the Operation Manager KMS Server, log in to Operations Manager using a domain account with permissions.

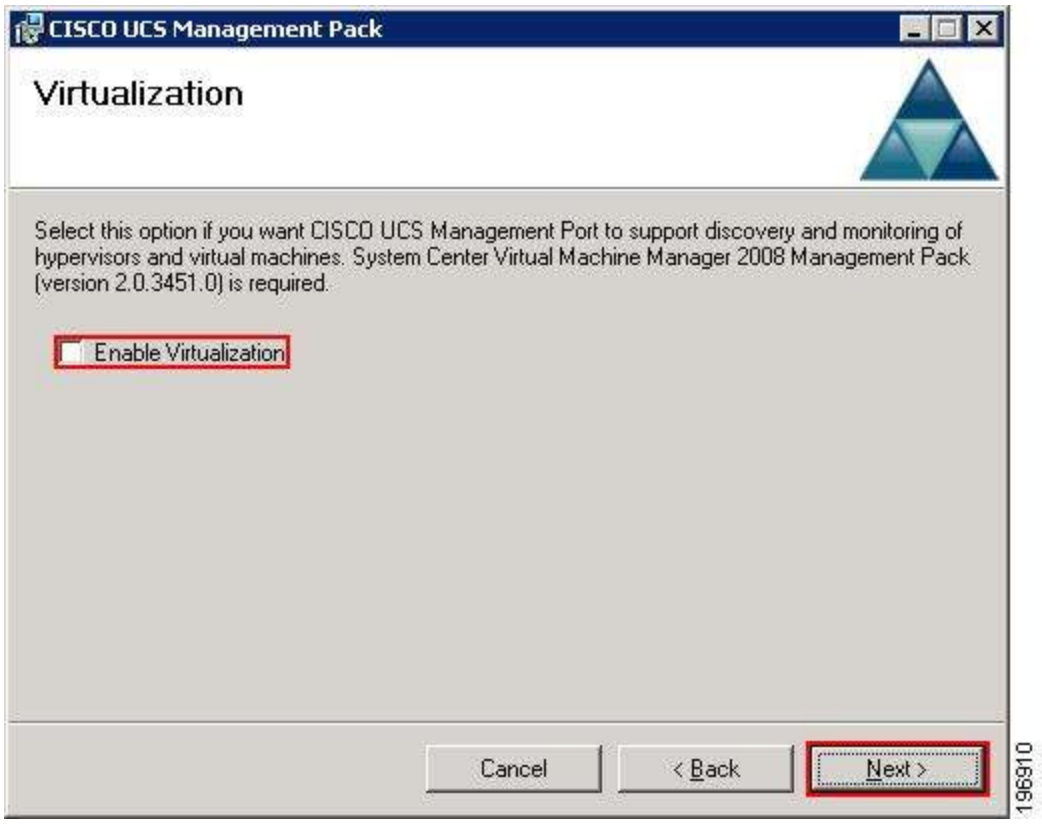
To install the management pack, follow these steps:

1. Start Cisco.UCS.MP.Install.msi and click Next.

2. Enter a server name in the Server Name field. Click Next.



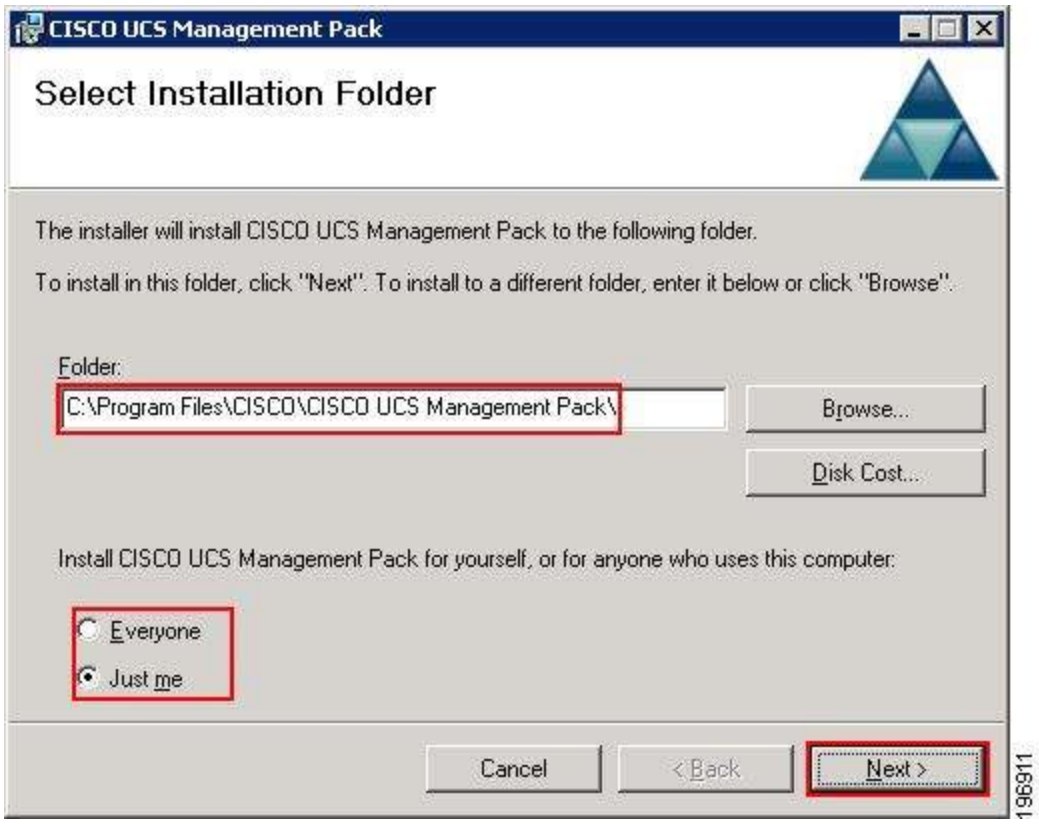
3. Select the Enable Virtualization checkbox if you want to support the discovery and monitoring of hypervisors and virtual machines. Click Next.



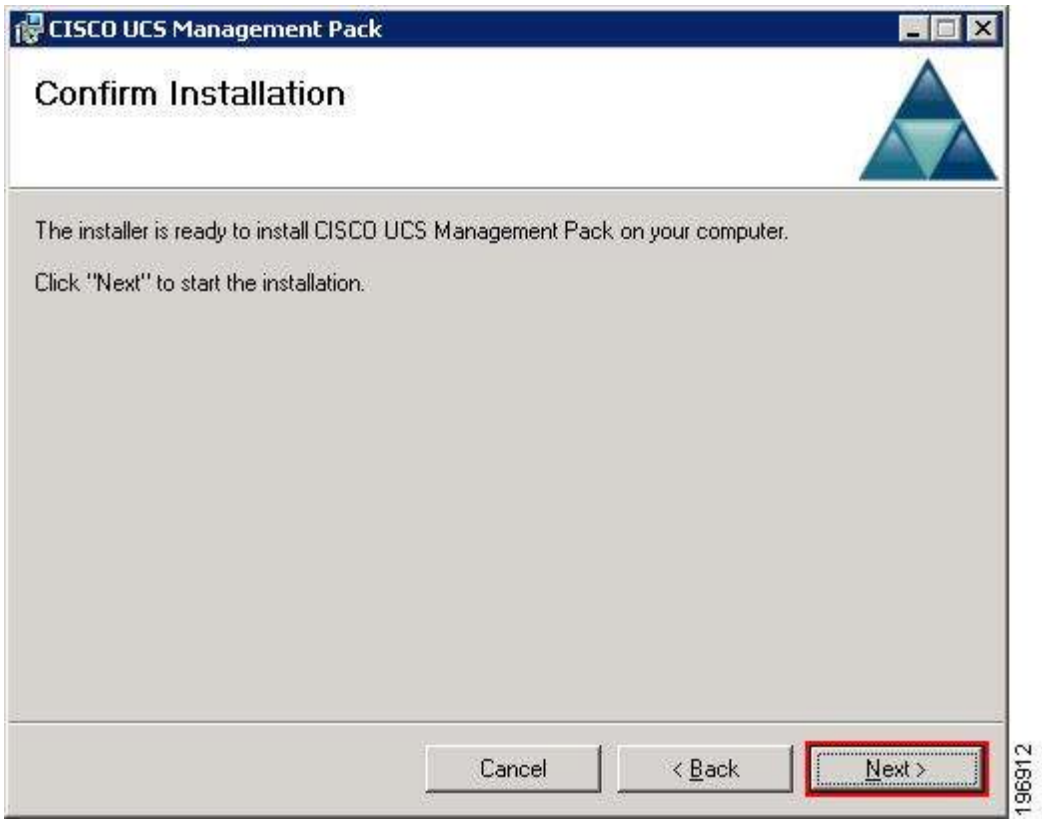
Enabling virtualization support requires that System Center Virtual Machine Manager (SCVMM) 2008 (version 2.0.3451.0) be installed, prior to the installation of the Cisco UCS Manager Management Pack. Prior to installation, the management packs specific to SCVMM 2008 must be installed in the Operations Manager console. Consult the SCVMM and SCOM R2 documentation for any installation details.

System Center Virtual Machine Manager 2008 Management Pack version 2.0.3451.0 is required for SCOM 2007 R2.

4. Enter a path to folder where the management pack is installed in the Folder field.



5. Select the Everyone or Just Me radio button to install the management pack for yourself or for anyone else who uses it and click Next.



6. Click Next to confirm the installation and then click Close.
7. Perform the following steps if during the installation an error occurred and you were asked to import an appropriate management pack independently:
   a. Click Go on the top tool bar in System Center Operations Manager and then click Administration on the drop-down menu.
   b. Right-click the Management Packs node, and then select Import Management Packs on the drop-down menu.
   c. The Import Management Packs wizard appears.
   d. Click Add, and then select Add from Disk.
   e. Click No in Online Catalog Connection.
   f. Navigate to the folder selected during installation process in the Select Management Packs to Import dialog box.
   g. Click Open, and then click Install.
   h. Click Close when the management pack is imported.

Assigning an IP Address to the Management Port

To assign an IP address to the management port, follow these steps:

1. Click Go on the top tool bar in the SCOM and then select Authoring from the drop-down menu.
2. Expand the Management Pack Templates node.
3. Select Cisco UCS Management Port and then click the Add Monitoring Wizard tab under the top tool bar.

a. The Add Monitoring Wizard appears and Cisco UCS Management Port is selected in the Select the Monitoring Type area.

4. Use the wizard to add a management port IP address and port number:
   a. Click Next.
   b. Enter an IP address and port number in the URL field and click Next.
   c. Enter a name in the Name field.
   d. When you enter a name, it appears in the Create Destination Management Pack field. Alternatively, you can select the Use Existing Management Pack or Create New checkbox to create a management pack or browse for a preexisting management pack.
   e. (Optional) Enter a description in the Description field and click Next.
   f. (Optional) Select the Virtualization checkbox, if you want to monitor any virtual machines. Click Next.
   g. Use the Summary page to make sure that you have the proper configuration. Click Create.

An IP address is now assigned to the management port.

Creating an Account for Administrators

1. To create an account for administrators, follow these steps:
2. Click Go on the top tool bar in the SCOM, and then select Administration from the drop-down menu.
3. Right-click Accounts, and then select Create Run as Accounts from the drop-down menu.

   The Create Run as Accounts wizard appears.

Note: By using the Run as Accounts option, you create an account for an administrator to log in to the Cisco UCS system from SCOM to retrieve required information. The administrator account details must be available in the Cisco UCS system to authenticate the user.

4. Use the wizard to create an account:
   a. Read the introduction, and then click Next.
   b. Select Simple Authentication from the Run as Account Type drop-down list.
   c. Enter a display name in the Display Name field.
   d. (Optional) Enter a description in the Description field, and then click Next.
   e. Enter a user name in the User Name field.
   f. Enter a password in the Password field, and then reenter the same password in the Confirm Password field.
   g. Select the Less Secure radio button and click Create.

An account for the administrator is now created.

Adding an Account to a Profile

To add an account to a profile, follow these steps:

1. Click Go on the top tool bar in the SCOM and then select Administration from the drop-down menu.
2. Click Profiles.
3. Right-click the appropriate account and then select Properties from the drop-down menu.

   The Run as Profile wizard appears.

4. Use the wizard to create an account:
   a. Click Run as Accounts.

b. Click the Add icon.
c. Select an account from the Run as Account drop-down list.
d. Click either the All Targeted Objects or the A Selected Class radio button, and then click OK.

The account is now added to the profile.

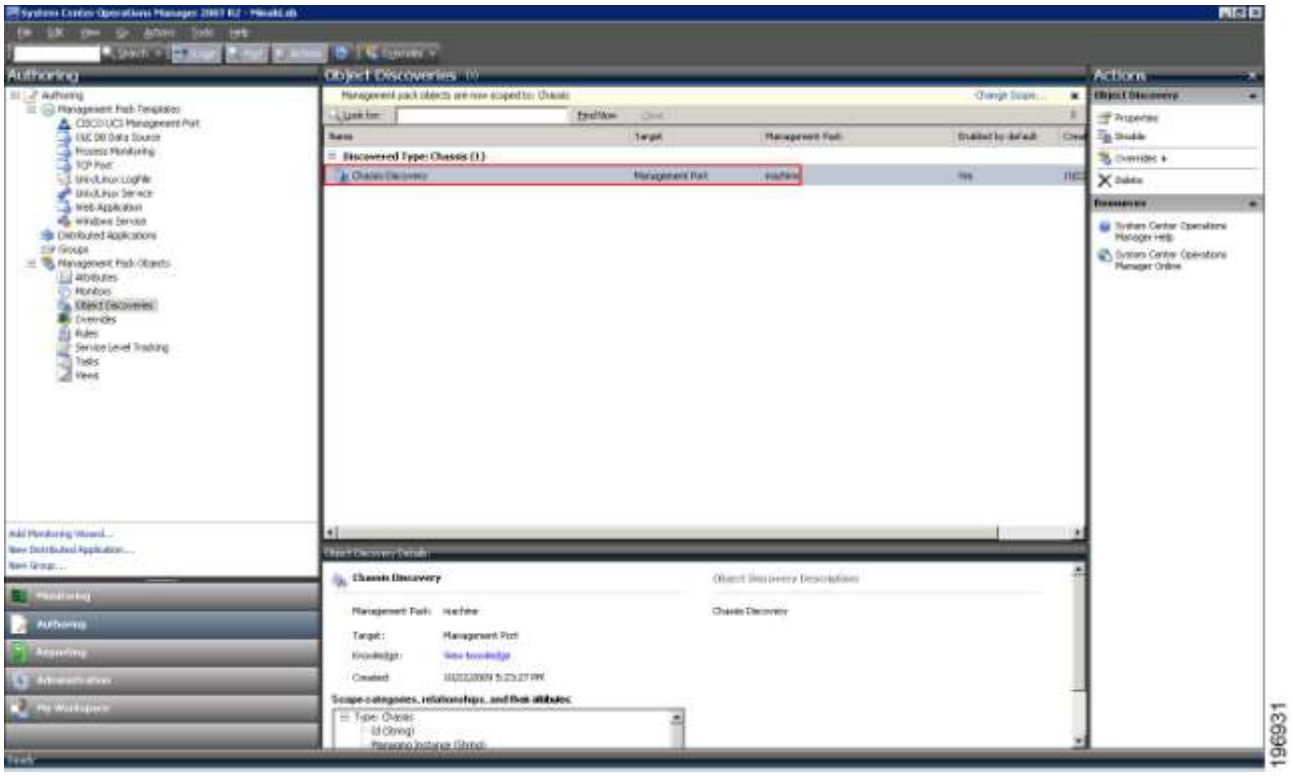
Adjusting the Discovery Interval

To adjust the discovery interval, follow these steps:

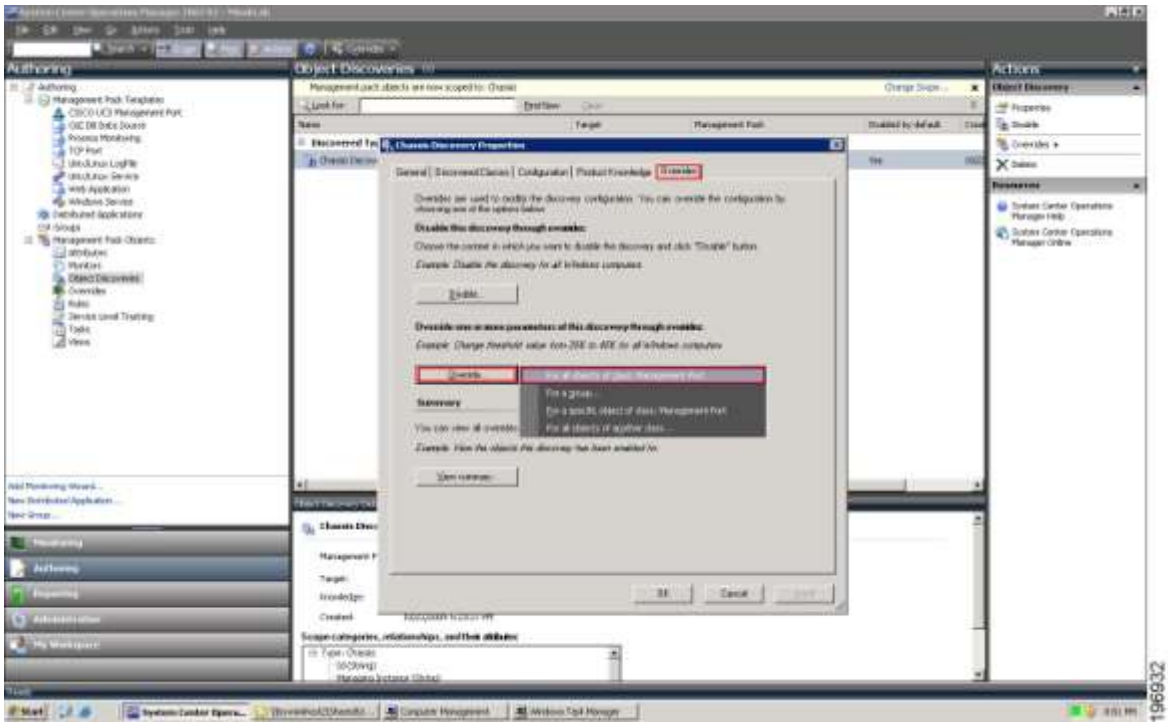
1. Click Go on the top tool bar in the SCOM, and then select Authoring from the drop-down menu.
2. Click the Objects Discoveries node, and then click Scope.
3. Click Clear All, and then select the View all Targets radio button.
4. Enter Chassis in the Look For field.
5. Select the Chassis checkbox and click OK.

Note: The Management Pack column value has to match the name entered while processing the management pack template.

6. Double-click the Chassis Discovery row.



7. Click the Overrides tab and click Override.
8. Select For all Objects of Class: Management Port from the drop-down menu.



9. Select the IntervalSeconds checkbox.
10. Change the value in the Override Value column to another value, and click OK.
11. Click OK again.

The discovery interval is now adjusted.

Note: You must perform these steps for all classes of objects, such as Management Port, Chassis, Server, Organization, and Associated Service Profile. To change the intervals for Rules and Monitors perform the steps, but start from the node Rules or Monitors.

Opalis Integration Server

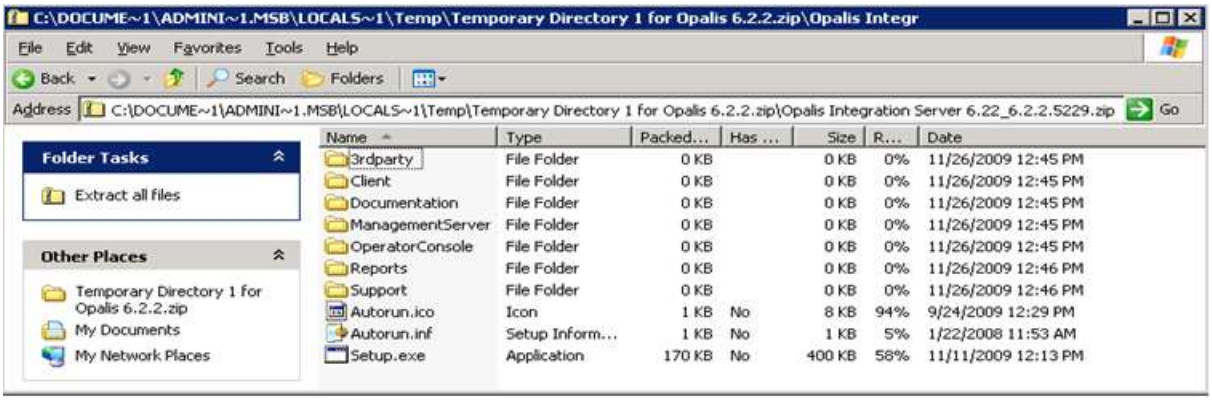
This section provides a step-by-step guide for installing Opalis Integration Server. Opalis is an optional component that provides runbook automation. NetApp integration is provided via OnCommand plug-in for Microsoft environments. Note that these instructions assume a new installation of Opalis Integration Server 6.3. Since Opalis 6.3 is a patch on top of 6.2.2, the instructions below will walk through installing 6.2.2 and will apply the 6.3 patch on top of the base 6.2.2 install. See Opalis documentation for other install scenarios.

Installing Opalis 6.2.2 SP1

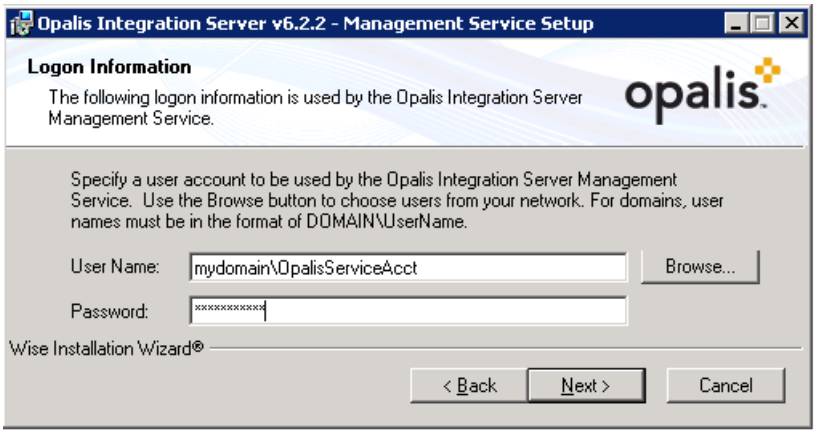
Before you begin create a service account for Opalis. It is recommended that this be a dedicated domain account with a nonexpiring password. Add this account to the local administrators group before installing Opalis. Also, this account will need access to the SQL Server created in the SQL Server section so you will need to add this account to the SQL Server security group (“Operations Manager SQL Server Admins”) created in that section.

1. Run opalis_full.exe or other source media to begin installation process.

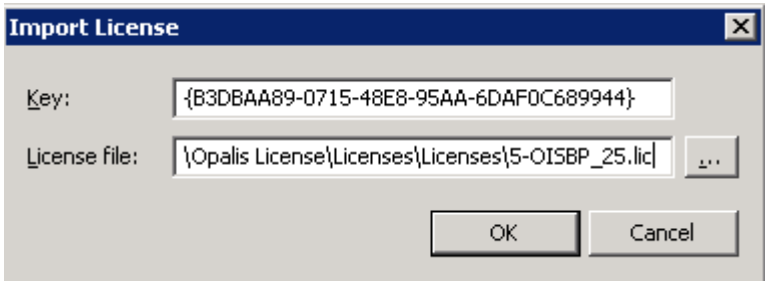
2. Agree to license terms and provide an extract location.
3. Before installing the 6.3 patch, you must install Opalis 6.2.2. Open the Opalis 6.2.2.zip folder and within that folder, open the Opalis Integration Server 6.22_6.2.2.5229.zip folder.



4. Extract this zip file to a local directory.
5. Right-click Install Opalis Integration Server and then click Run as administrator.
6. Select Install Opalis Integration Server, click “Step 1. Install Management Server.”
7. Click Next on the first screen. Accept the license and click Next.
8. Enter user information and click Next. Accept the default installation folder and click Next.
9. Enter the service account. As noted previously, it is recommended that this be a domain account with a non-expiring password.



10. Click Next to begin the installation.
11. Click Finish when the installation is complete.
12. Click Step 2: Configure the Database.
13. Accept the default database type, SQL Server. Click Next.
14. Enter the database details created in the SQL Server installation section of this document. Click Next.
15. Select Create New Database and accept the default database name. Click Finish.
16. Run Step 3: Import a license and click Import.
17. Open your .lic file for the Opalis base pack (5-OISBP_25.lic) and enter your license key.



18. Repeat this process for any additional license files.

Installing Opalis 6.3 Patch

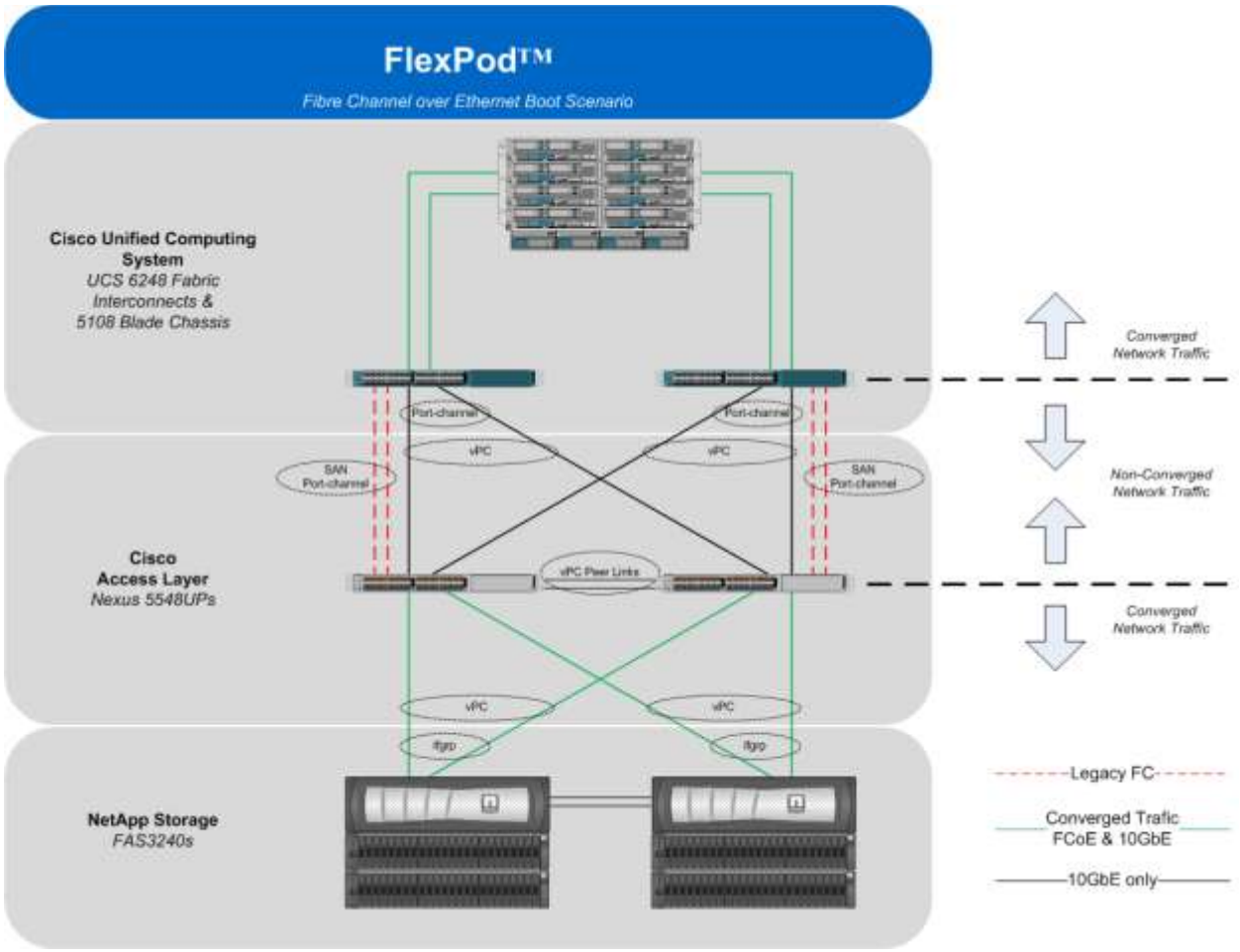
1. Open the Management Server installation folder. By default, this is located in System Drive: Program Files\Opalis Software\Opalis Integration Server\Management Service. Browse to the Components\Objects folder.
2. Copy the OpalisIntegrationServer_FoundationObjects.msi file provided in the Opalis 6.3 zip file to the System Drive:\Program Files (x86)\Opalis Software\Opalis Integration Server\Management Service\Components\Objects directory. Replace the existing file.
3. Run the OpalisIntegrationServer_ManagementService_630_PATCH.msp installer. Do not change any of the default values.
4. Deploy your Opalis Clients via the deployment manager.
5. After you deploy the clients from the Deployment Manager, copy the OpalisIntegrationServer_Client_630_PATCH.msp file included in the 6.3 release to each client.
6. Run the OpalisIntegrationServer_Client_630_PATCH.msp installer. Do not change any of the default values.

Appendix

Alternate Cisco Nexus 5548 Deployment Procedure: Part 2 for FCoE

These steps provide details for completing the configuration of the Nexus infrastructure for the FlexPod environment.

Figure 3 Nexus Infrastructure for the FlexPod Environment



Create VSANs, Assign FC Ports, Turn on FC Ports

These steps provide details for configuring VSANs, assigning FC ports and enabling FC ports.

Note: This procedure sets up FCoE connections between the Nexus 5548s and the NetApp Storage Systems. If you want to use FCoE connections between the Nexus 5548s and the NetApp Storage Systems using the NetApp Unified Target Adapter (UTA). Use the Alternate Cisco Nexus 5548 Deployment Procedure: Part 2 in the Appendix.

Cisco Nexus 5548 A

1. From the global configuration mode, type `vlan <Fabric A FCoE VLAN ID>.`
2. Type `name FCoE_Fabric_A.`
3. Type `fcoe vsan <VSAN A ID>.`

4. Type `exit`.
5. Type `interface po11`.
6. Type `switchport trunk allowed vlan add <Fabric A FCoE VLAN ID>`.
7. Type `exit`.
8. Type `interface vfc11`.
9. Type bind `interface po11`.
10. Type no shutdown.
11. Type `exit`.
12. Type `interface po12`.
13. Type `switchport trunk allowed vlan add <Fabric A FCoE VLAN ID>`.
14. Type `exit`.
15. Type `interface vfc12`.
16. Type bind `interface po12`.
17. Type no shutdown.
18. Type `exit`.
19. Type `interface san-port-channel 1`.
20. Type `channel mode active`.
21. Type `exit`.
22. Type `channel mode active`.
23. Type `vsan database`.
24. Type `vsan <VSAN A ID> name Fabric_A`.
25. Type `vsan <VSAN A ID> interface fc1/31-32`.
26. Type `vsan <VSAN A ID> interface san-port-channel 1`.
27. Type `vsan <VSAN A ID> interface vfc11`.
28. Type `vsan <VSAN A ID> interface vfc12`.
29. Type `exit`.
30. Type `interface fc1/31-32`.
31. Type `channel-group 1 force`.
32. Type `no shutdown`.
33. Type `exit`.
34. Type `show int san-port-channel 1` to confirm connectivity.
35. Type `interface fc1/31`.
36. Type `switchport description <UCSM A:fc1/31>`.
37. Type `exit`.
38. Type `interface fc1/32`.
39. Type `switchport description <UCSM A:fc1/32>`.
40. Type `exit`.

Cisco Nexus 5548 B

1. From the global configuration mode, type `vlan <Fabric B FCoE VLAN ID>`.
2. Type `name FCoE_Fabric_B`.
3. Type `fcoe vsan <VSAN B ID>`.
4. Type `exit`.
5. Type `interface po11`.
6. Type `switchport trunk allowed vlan add <Fabric B FCoE VLAN ID>`.
7. Type `exit`.
8. Type `interface vfc11`.
9. Type bind `interface po11`.
10. Type no shutdown.
11. Type `exit`.
12. Type `interface po12`.
13. Type `switchport trunk allowed vlan add <Fabric B FCoE VLAN ID>`.
14. Type `exit`.
15. Type `interface vfc12`.
16. Type bind `interface po12`.
17. Type no shutdown.
18. Type `exit`.
19. Type `interface san-port-channel 2`.
20. Type `channel mode active`.
21. Type `exit`.
22. Type `vsan database`.
23. Type `vsan <VSAN B ID> name Fabric_B`.
24. Type `vsan <VSAN B ID> interface fc1/31-32`.
25. Type `vsan <VSAN B ID> interface san-port-channel 2`.
26. Type `vsan <VSAN A ID> interface vfc11`.
27. Type `vsan <VSAN A ID> interface vfc12`.
28. Type `exit`.
29. Type `interface fc1/31-32`.
30. Type `channel-group 2 force`.
31. Type `no shutdown`.
32. Type `exit`.
33. Type `show int san-port-channel 2` to confirm connectivity
34. Type `interface fc1/31`.
35. Type `switchport description <UCSM B:fc1/31>`.
36. Type `exit`.

37. Type `interface fc1/32`.
38. Type `switchport description <UCSM B:fc1/32>`.
39. Type `exit`.

Create Device Aliases and Create Zones

These steps provide details for configuring device aliases and zones for the primary boot path. Instructions are given for all target ports, however, the redundant path is enabled following operating system installation..

Cisco Nexus 5548 A

1. From the global configuration mode, type `device-alias database`.
2. Type `device-alias name VM-Host-Infra-01_A pwwn <Fabric-A WWPN>`.
3. Type `device-alias name VM-Host-Infra-02_A pwwn <Fabric-A WWPN>`.
4. Type `device-alias name controller_A_2a pwwn <Controller A 2a WWPN>`.
5. Type `device-alias name controller_B_2a pwwn <Controller B 2a WWPN>`.

Get this information from the table in section Gather Necessary Information.

6. After all of the necessary device-alias are created, type `exit`.
7. Type `device-alias commit`.
8. Create the zone for each service profile.
   a. Type `zone name VM-Host-Infra-01_A vsan <Fabric A VSAN ID>`.
   b. Type `member device-alias VM-Host-Infra-01_A`.
   c. Type `member device-alias controller_A_2a`.
   d. Type `exit`.
9. After the zone for the primary path of the first Cisco UCS service profiles has been created, create a zoneset to organize and manage them.
10. Create the zoneset and add the necessary members.
    a. Type `zoneset name flexpod vsan <Fabric A VSAN ID>`.
    b. Type `member VM-Host-Infra-01_A`.
    c. Type `exit`.
11. Activate the zoneset.
    a. Type `zoneset activate name flexpod vsan < Fabric A VSAN ID>`.
    b. Type `exit`.
12. Type `copy run start`.

Cisco Nexus 5548 B

1. From the global configuration mode, type `device-alias database`.
2. Type `device-alias name VM-Host-Infra-01_B pwwn <Fabric-B WWPN>`.
3. Type `device-alias name VM-Host-Infra-02_B pwwn <Fabric-B WWPN>`.
4. Type `device-alias name controller_A_2b pwwn <Controller A 0d WWPN>`.

5. Type `device-alias name controller_B_2b pwwn <Controller B 0d WWPN>`.

Get this information from the tables in the section Gather Necessary Information.

6. After all of the necessary device-alias are created, type `exit`.
7. Type `device-alias commit`.
8. Create the zones for each service profile.
   a. Type `zone name VM-Host-Infra-02_B vsan <Fabric B VSAN ID>`.
   b. Type `member device-alias VM-Host-Infra-02_B`.
   c. Type `member device-alias controller_B_0d`.
6. Type `exit`.
9. After all of the zones for the Cisco UCS service profiles have been created, create a zoneset to organize and manage them.
10. Create the zoneset and add the necessary members.
    a. Type `zoneset name flexpod vsan <Fabric B VSAN ID>`.
    b. Type `member VM-Host-Infra-02_B`.
    c. Type `exit`.
11. Activate the zoneset.
    a. Type `zoneset activate name flexpod vsan <Fabric B VSAN ID>`.
    b. Type `exit`.
    20. Type `copy run start`.
12. Return to the section NetApp FAS3240A Deployment Procedure: Part 2.

Alternate Create Zones for Redundant Paths for FCoE

These steps provide details for configuring zones for the secondary boot path for each service profile.

Cisco Nexus 5548 A

1. From the global configuration mode, create the zones for the redundant path for each service profile.
   a. Type `zone name VM-Host-Infra-01_A vsan <Fabric A VSAN ID>`.
      1. Type `member device-alias controller_B_2a`.
      2. Type `exit`.
      3. Type `zone name VM-Host-Infra-02_A vsan <Fabric A VSAN ID>`.
      4. Type `member device-alias VM-Host-Infra-02_A`.
      5. Type `member device-alias controller_B_2a`.
      6. Type `member device-alias controller_A_2a`.
      7. Type `exit`.
2. Modify the zoneset and add the necessary members.
   a. Type `zoneset name flexpod vsan <Fabric A VSAN ID>`.
3. Type `member VM-Host-Infra-02`.
4. Type `exit`.
5. Activate the zoneset.
   a. Type `zoneset activate name flexpod vsan <Fabric A VSAN ID>`.

6. Type `exit`.
7. Type `copy run start`.

Cisco Nexus 5548 B

1. From the global configuration mode, create the zones for the redundant path for each service profile.
   a. Type `zone name VM-Host-Infra-01_B vsan <Fabric B VSAN ID>.`
   b. Type `member device-alias VM-Host-Infra-01_B .`
   c. Type `member device-alias controller_A_2b.`
   d. Type `member device-alias controller_B_2b.`
   e. Type `exit.`
   f. Type `zone name VM-Host-Infra-02_B vsan <Fabric B VSAN ID>.`
   g. Type `member device-alias controller_A_2b.`
   h. Type `exit.`
2. Modify the zoneset and add the necessary members.
   a. Type `zoneset name flexpod vsan <Fabric B VSAN ID>.`
   b. Type `member VM-Host-Infra-01_B.`
   c. Type `exit.`
3. Activate the zoneset.
   a. Type `zoneset activate name flexpod vsan <Fabric B VSAN ID>.`
   b. Type `exit.`
4. Type `copy run start.`

Note: Return to Clone the Windows Server 2008 R2 SP1 Installation section.

Cisco Nexus Configurations

Nexus A (sample running config)

```
ice5548-1# show run
!Command: show running-config
!Time: Thu Jan 26 22:39:15 2012
version 5.0(3)N2(2a)
feature fcoe
feature npiv
feature fport-channel-trunk
no feature telnet
no telnet server enable
cfs eth distribute
feature lacp
feature vpc
feature lldp
username admin password 5 $1$vhyEnoq8$fEeCFXDyQDTPDBltqDhU0.  role network-admin
ip domain-lookup
hostname ice5548-1
system jumbomtu 9000
logging event link-status default
```

```
class-map type qos class-fcoe
class-map type queuing class-fcoe
  match qos-group 1
class-map type queuing class-all-flood
  match qos-group 2
class-map type queuing class-ip-multicast
  match qos-group 2
class-map type network-qos class-fcoe
  match qos-group 1
class-map type network-qos class-all-flood
  match qos-group 2
class-map type network-qos class-ip-multicast
  match qos-group 2
policy-map type network-qos jumbo
  class type network-qos class-fcoe
    pause no-drop
    mtu 2158
  class type network-qos class-default
    mtu 9000
    multicast-optimize
system qos
  service-policy type network-qos jumbo
slot 1
  port 29-32 type fc
snmp-server user admin network-admin auth md5 0x2e8af112d36e9af1466f4e4db0ce36a3
 priv 0x2e8af112d36e9af1466f4e4db0ce36a3 localizedkey
snmp-server enable traps entity fru
ntp server 10.61.185.11 use-vrf management
vrf context management
  ip route 0.0.0.0/0 10.61.185.1
vlan 1
vlan 2
  name Native-VLAN
vlan 186
  name MGMT-VLAN
vlan 3101
  name CSV-VLAN
vlan 3102
  name iSCSI-VLAN-A
vlan 3103
  name Live-Migration-VLAN
vlan 3104
  name App-Cluster-Comm-VLAN
vlan 3105
  name VM-Data-VLAN
vlan 3106
  name iSCSI-VLAN-B
spanning-tree port type edge bpduguard default
spanning-tree port type edge bpdufilter default
spanning-tree port type network default
vpc domain 23
  role priority 10
  peer-keepalive destination 10.61.185.70 source 10.61.185.69
```

```
vsan database
  vsan 101 name "Fabric_A"
device-alias database
  device-alias name ice3270-1a_0c pwwn 50:0a:09:83:8d:7d:92:bc
  device-alias name ice3270-1b_0c pwwn 50:0a:09:83:9d:7d:92:bc
  device-alias name ice3270-1a_0c1_A pwwn 20:00:00:25:b5:00:0a:0f
  device-alias name ice3270-1b_0d1_A pwwn 20:00:00:25:b5:00:0a:1f
device-alias commit
fcdomain fcid database
  vsan 101 wwn 24:01:54:7f:ee:23:52:40 fcid 0x550000 dynamic
  vsan 101 wwn 50:0a:09:83:8d:7d:92:bc fcid 0x550001 dynamic
!           [ice3270-1a_0c]
  vsan 101 wwn 50:0a:09:83:9d:7d:92:bc fcid 0x550002 dynamic
!           [ice3270-1b_0c]
  vsan 101 wwn 20:00:00:25:b5:00:0a:0f fcid 0x550003 dynamic
!           [ice3270-1a_0c1_A]
  vsan 101 wwn 20:00:00:25:b5:00:0a:1f fcid 0x550004 dynamic
!           [ice3270-1b_0d1_A]

interface san-port-channel 1
  channel mode active

interface port-channel10
  description vPC peer-link
  switchport mode trunk
  vpc peer-link
  switchport trunk native vlan 2
  switchport trunk allowed vlan 186,3101-3106
  spanning-tree port type network

interface port-channel11
  description ice3270-1a
  switchport mode trunk
  vpc 11
  switchport trunk native vlan 186
  switchport trunk allowed vlan 186,3101-3102,3106
  spanning-tree port type edge trunk

interface port-channel12
  description ice3270-1b
  switchport mode trunk
  vpc 12
  switchport trunk native vlan 186
  switchport trunk allowed vlan 186,3101-3102,3106
  spanning-tree port type edge trunk

interface port-channel13
  description iceucsm-2a
  switchport mode trunk
  vpc 13
  switchport trunk native vlan 2
  switchport trunk allowed vlan 186,3101-3106
  spanning-tree port type edge trunk
```

```
interface port-channel14
  description iceucsm-2b
  switchport mode trunk
  vpc 14
  switchport trunk native vlan 2
  switchport trunk allowed vlan 186,3101-3106
  spanning-tree port type edge trunk

interface port-channel20
  description icecore
  switchport mode trunk
  vpc 20
  switchport trunk native vlan 2
  switchport trunk allowed vlan 186
  spanning-tree port type network
vsan database
  vsan 101 interface san-port-channel 1
  vsan 101 interface fc1/29
  vsan 101 interface fc1/30

interface fc1/29
  no shutdown

interface fc1/30
  no shutdown

interface fc1/31
  channel-group 1 force
  no shutdown

interface fc1/32
  channel-group 1 force
  no shutdown

interface Ethernet1/1
  description ice3270-1a:e2a
  switchport mode trunk
  switchport trunk native vlan 186
  switchport trunk allowed vlan 186,3101-3102,3106
  channel-group 11 mode active

interface Ethernet1/2
  description ice3270-1b:e2a
  switchport mode trunk
  switchport trunk native vlan 186
  switchport trunk allowed vlan 186,3101-3102,3106
  channel-group 12 mode active

interface Ethernet1/3
  description iceucsm-2a:Eth1/19
  switchport mode trunk
  switchport trunk native vlan 2
```

```
  switchport trunk allowed vlan 186,3101-3106
  channel-group 13 mode active

interface Ethernet1/4
  description iceucsm-2b:Eth1/19
  switchport mode trunk
  switchport trunk native vlan 2
  switchport trunk allowed vlan 186,3101-3106
  channel-group 14 mode active

interface Ethernet1/5
  description ice5548-2:Eth1/5
  switchport mode trunk
  switchport trunk native vlan 2
  switchport trunk allowed vlan 186,3101-3106
  channel-group 10 mode active

interface Ethernet1/6
  description ice5548-2:Eth1/6
  switchport mode trunk
  switchport trunk native vlan 2
  switchport trunk allowed vlan 186,3101-3106
  channel-group 10 mode active

interface Ethernet1/7

interface Ethernet1/8

interface Ethernet1/9

interface Ethernet1/10

interface Ethernet1/11

interface Ethernet1/12

interface Ethernet1/13

interface Ethernet1/14

interface Ethernet1/15

interface Ethernet1/16

interface Ethernet1/17

interface Ethernet1/18

interface Ethernet1/19

interface Ethernet1/20
  description icecore:Eth1/21
  switchport mode trunk
```

```
  switchport trunk native vlan 2
  switchport trunk allowed vlan 186
  channel-group 20 mode active

interface Ethernet1/21

interface Ethernet1/22

interface Ethernet1/23

interface Ethernet1/24

interface Ethernet1/25

interface Ethernet1/26

interface Ethernet1/27

interface Ethernet1/28

interface mgmt0
  ip address 10.61.185.69/24
line console
line vty
boot kickstart bootflash:/n5000-uk9-kickstart.5.0.3.N2.2a.bin
boot system bootflash:/n5000-uk9.5.0.3.N2.2a.bin
interface fc1/31
interface fc1/32
interface fc1/29
interface fc1/30
interface fc1/31
interface fc1/32
!Full Zone Database Section for vsan 101
zone name ice3270-1a_0c1_A vsan 101
    member pwwn 20:00:00:25:b5:00:0a:0f
!           [ice3270-1a_0c1_A]
    member pwwn 50:0a:09:83:8d:7d:92:bc
!           [ice3270-1a_0c]
    member pwwn 50:0a:09:83:9d:7d:92:bc
!           [ice3270-1b_0c]

zone name ice3270-1b_0d1_A vsan 101
    member pwwn 20:00:00:25:b5:00:0a:1f
!           [ice3270-1b_0d1_A]
    member pwwn 50:0a:09:83:8d:7d:92:bc
!           [ice3270-1a_0c]
    member pwwn 50:0a:09:83:9d:7d:92:bc
!           [ice3270-1b_0c]

zoneset name flexpod vsan 101
    member ice3270-1a_0c1_A
    member ice3270-1b_0d1_A
```

zoneset activate name flexpod vsan 101

Nexus B (sample running config)

```
ice5548-2# show run

!Command: show running-config
!Time: Thu Jan 26 22:43:40 2012

version 5.0(3)N2(2a)
feature fcoe
feature npiv
feature fport-channel-trunk
no feature telnet
no telnet server enable
cfs eth distribute
feature lacp
feature vpc
feature lldp
username admin password 5 $1$QwOvH6l4$uemTjjt9Bz9c2SSA1DPOX.  role network-admin
ip domain-lookup
hostname ice5548-2
system jumbomtu 9000
logging event link-status default
class-map type qos class-fcoe
class-map type queuing class-fcoe
  match qos-group 1
class-map type queuing class-all-flood
  match qos-group 2
class-map type queuing class-ip-multicast
  match qos-group 2
class-map type network-qos class-fcoe
  match qos-group 1
class-map type network-qos class-all-flood
  match qos-group 2
class-map type network-qos class-ip-multicast
  match qos-group 2
policy-map type network-qos jumbo
  class type network-qos class-fcoe
    pause no-drop
    mtu 2158
  class type network-qos class-default
    mtu 9000
    multicast-optimize
system qos
  service-policy type network-qos jumbo
slot 1
  port 29-32 type fc
snmp-server user admin network-admin auth md5 0xe481d1d2fee4aaa498237df1852270e8 priv
0xe481d1d2fee4aaa498237df1852270e8 localizedkey
snmp-server enable traps entity fru
ntp server 10.61.185.11 use-vrf management
vrf context management
  ip route 0.0.0.0/0 10.61.185.1
vlan 1
vlan 2
```

```
  name Native-VLAN
vlan 186
  name MGMT-VLAN
vlan 3101
  name CSV-VLAN
vlan 3102
  name iSCSI-VLAN-A
vlan 3103
  name Live-Migration-VLAN
vlan 3104
  name App-Cluster-Comm-VLAN
vlan 3105
  name VM-Data-VLAN
vlan 3106
  name iSCSI-VLAN-B
spanning-tree port type edge bpduguard default
spanning-tree port type edge bpdufilter default
spanning-tree port type network default
vpc domain 23
  role priority 20
  peer-keepalive destination 10.61.185.69 source 10.61.185.70
vsan database
  vsan 102 name "Fabric_B"
device-alias database
  device-alias name ice3270-1a_0d pwwn 50:0a:09:84:8d:7d:92:bc
  device-alias name ice3270-1b_0d pwwn 50:0a:09:84:9d:7d:92:bc
  device-alias name ice3270-1a_0c1_B pwwn 20:00:00:25:b5:00:0b:0f
  device-alias name ice3270-1b_0d1_B pwwn 20:00:00:25:b5:00:0b:1f

device-alias commit

fcdomain fcid database
  vsan 102 wwn 24:02:54:7f:ee:23:8b:00 fcid 0x3f0000 dynamic
  vsan 102 wwn 50:0a:09:84:9d:7d:92:bc fcid 0x3f0001 dynamic
!           [ice3270-1b_0d]
  vsan 102 wwn 50:0a:09:84:8d:7d:92:bc fcid 0x3f0002 dynamic
!           [ice3270-1a_0d]
  vsan 102 wwn 20:00:00:25:b5:00:0b:0f fcid 0x3f0003 dynamic
!           [ice3270-1a_0c1_B]
  vsan 102 wwn 20:00:00:25:b5:00:0b:1f fcid 0x3f0004 dynamic
!           [ice3270-1b_0d1_B]


interface san-port-channel 2
  channel mode active

interface port-channel10
  description vPC peer-link
  switchport mode trunk
  vpc peer-link
  switchport trunk native vlan 2
  switchport trunk allowed vlan 186,3101-3106
  spanning-tree port type network
```

```
interface port-channel11
  description ice3270-1a
  switchport mode trunk
  vpc 11
  switchport trunk native vlan 186
  switchport trunk allowed vlan 186,3101-3102,3106
  spanning-tree port type edge trunk

interface port-channel12
  description ice3270-1b
  switchport mode trunk
  vpc 12
  switchport trunk native vlan 186
  switchport trunk allowed vlan 186,3101-3102,3106
  spanning-tree port type edge trunk

interface port-channel13
  description iceucsm-2a
  switchport mode trunk
  vpc 13
  switchport trunk native vlan 2
  switchport trunk allowed vlan 186,3101-3106
  spanning-tree port type edge trunk

interface port-channel14
  description iceucsm-2b
  switchport mode trunk
  vpc 14
  switchport trunk native vlan 2
  switchport trunk allowed vlan 186,3101-3106
  spanning-tree port type edge trunk

interface port-channel20
  description icecore
  switchport mode trunk
  vpc 20
  switchport trunk native vlan 2
  switchport trunk allowed vlan 186
  spanning-tree port type network
vsan database
  vsan 102 interface san-port-channel 2
  vsan 102 interface fc1/29
  vsan 102 interface fc1/30

interface fc1/29
  no shutdown

interface fc1/30
  no shutdown

interface fc1/31
  channel-group 2 force
```

```
  no shutdown

interface fc1/32
  channel-group 2 force
  no shutdown

interface Ethernet1/1
  description ice3270-1a:e2b
  switchport mode trunk
  switchport trunk native vlan 186
  switchport trunk allowed vlan 186,3101-3102,3106
  channel-group 11 mode active

interface Ethernet1/2
  description ice3270-1b:e2b
  switchport mode trunk
  switchport trunk native vlan 186
  switchport trunk allowed vlan 186,3101-3102,3106
  channel-group 12 mode active

interface Ethernet1/3
  description iceucsm-2a:Eth1/20
  switchport mode trunk
  switchport trunk native vlan 2
  switchport trunk allowed vlan 186,3101-3106
  channel-group 13 mode active

interface Ethernet1/4
  description iceucsm-2b:Eth1/20
  switchport mode trunk
  switchport trunk native vlan 2
  switchport trunk allowed vlan 186,3101-3106
  channel-group 14 mode active

interface Ethernet1/5
  description ice5548-1:Eth1/5
  switchport mode trunk
  switchport trunk native vlan 2
  switchport trunk allowed vlan 186,3101-3106
  channel-group 10 mode active

interface Ethernet1/6
  description ice5548-1:Eth1/6
  switchport mode trunk
  switchport trunk native vlan 2
  switchport trunk allowed vlan 186,3101-3106
  channel-group 10 mode active

interface Ethernet1/7

interface Ethernet1/8

interface Ethernet1/9
```

```
interface Ethernet1/10

interface Ethernet1/11

interface Ethernet1/12

interface Ethernet1/13

interface Ethernet1/14

interface Ethernet1/15

interface Ethernet1/16

interface Ethernet1/17

interface Ethernet1/18

interface Ethernet1/19

interface Ethernet1/20
  description icecore:Eth1/22
  switchport mode trunk
  switchport trunk native vlan 2
  switchport trunk allowed vlan 186
  channel-group 20 mode active

interface Ethernet1/21

interface Ethernet1/22

interface Ethernet1/23

interface Ethernet1/24

interface Ethernet1/25

interface Ethernet1/26

interface Ethernet1/27

interface Ethernet1/28

interface mgmt0
  ip address 10.61.185.70/24
line console
line vty
boot kickstart bootflash:/n5000-uk9-kickstart.5.0.3.N2.2a.bin
boot system bootflash:/n5000-uk9.5.0.3.N2.2a.bin
interface fc1/31
interface fc1/32
interface fc1/29
```


```
interface fc1/30
interface fc1/31
interface fc1/32
!Full Zone Database Section for vsan 102
zone name ice3270-1a_0c1_B vsan 102
    member pwwn 20:00:00:25:b5:00:0b:0f
!           [ice3270-1a_0c1_B]
    member pwwn 50:0a:09:84:8d:7d:92:bc
!           [ice3270-1a_0d]
    member pwwn 50:0a:09:84:9d:7d:92:bc
!           [ice3270-1b_0d]

zone name ice3270-1b_0d1_B vsan 102
    member pwwn 20:00:00:25:b5:00:0b:1f
!           [ice3270-1b_0d1_B]
    member pwwn 50:0a:09:84:8d:7d:92:bc
!           [ice3270-1a_0d]
    member pwwn 50:0a:09:84:9d:7d:92:bc
!           [ice3270-1b_0d]

zoneset name flexpod vsan 102
    member ice3270-1a_0c1_B
    member ice3270-1b_0d1_B
```

References

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