

# Cisco Virtualization Solution for EMC VSPEX with VMware vSphere 5.1 for 250 Virtual Machines

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# **EMC**<sup>2</sup>

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# Cisco Virtualization Solution for EMC VSPEX with VMware vSphere 5.1 for 250 Virtual Machines

# **Executive Summary**

Cisco solution for the EMC VSPEX is a pre-validated and modular architecture built with proven best-of-breed technologies to create and complete an end-to-end virtualization solution. The end-to-end solutions enable you to make an informed decision while choosing the hypervisor, compute, storage and networking layers. VSPEX eliminates the server virtualization planning and configuration burdens. The VSPEX infrastructures accelerate your IT Transformation by enabling faster deployments, greater flexibility of choice, efficiency, and lower risk. This Cisco Validated Design document focuses on the VMware architecture for 250 virtual machines with Cisco solution for the EMC VSPEX.

# Introduction

Virtualization is a key and critical strategic deployment model for reducing the Total Cost of Ownership (TCO) and achieving better utilization of the platform components like hardware, software, network and storage. However, choosing an appropriate platform for virtualization can be challenging. Virtualization platforms should be flexible, reliable, and cost effective to facilitate the deployment of various enterprise applications. In a virtualization platform to utilize compute, network, and storage resources effectively, the ability to slice and dice the underlying platform is essential to size to the application requirements. The Cisco solution for the EMC VSPEX provides a very simplistic yet fully integrated and validated infrastructure to deploy VMs in various sizes to suit various application needs.

# **Target Audience**

The reader of this document is expected to have the necessary training and background to install and configure VMware vSphere 5.1, EMC VNX5500, Cisco Nexus 5548UP switch, and Cisco Unified Computing (UCS) B200 M3 Blade Servers. External references are provided wherever applicable and it is recommended that the reader be familiar with these documents.

Readers are also expected to be familiar with the infrastructure and database security policies of the customer installation.



# **Purpose of this Guide**

This document describes the steps required to deploy and configure the Cisco solution for the EMC VSPEX for VMware architecture. The document provides the end-to-end solution for the VMware vSphere 5.1 for 250 Virtual Machine Architecture.

The readers of this document are expected to have sufficient knowledge to install and configure the products used, configuration details that are important to the deployment models mentioned above.

# **Business Needs**

The VSPEX solutions are built with proven best-of-breed technologies to create complete virtualization solutions that enable you to make an informed decision in the hypervisor, server, and networking layers. The VSPEX infrastructures accelerate your IT transformation by enabling faster deployments, greater flexibility of choice, efficiency, and lower risk.

Business applications are moving into the consolidated compute, network, and storage environment. The Cisco solution for the EMC VSPEX using VMware reduces the complexity of configuring every component of a traditional deployment model. The complexity of integration management is reduced while maintaining the application design and implementation options. Administration is unified, while process separation can be adequately controlled and monitored. The following are the business needs for the Cisco solution for EMC VSPEX VMware architectures:

- Provide an end-to-end virtualization solution to utilize the capabilities of the unified infrastructure components.
- Provide a Cisco VSPEX for VMware ITaaS solution for efficiently virtualizing 250 virtual machines for varied customer use cases.
- Show implementation progression of VMware vCenter 5.1 design and the results.
- Provide a reliable, flexible and scalable reference design.

# **Solution Overview**

The Cisco solution for EMC VSPEX using VMware vSphere 5.1 provides an end-to-end architecture with Cisco, EMC, VMware, and Microsoft technologies that demonstrate support for up to 250 generic virtual machines and provide high availability and server redundancy.

The following are the components used for the design and deployment:

- Cisco B-series Unified Computing System servers
- Cisco UCS 5108 Chassis
- Cisco UCS 2204XP Fabric Extenders
- Cisco UCS 6248UP Fabric Interconnects
- Cisco Nexus 5548UP Switches
- Cisco VMFEX virtual Distributed Switch across multiple VMware ESXi hypervisors
- Cisco virtual Port Channels for network load balancing and high availability
- EMC VNX5500 storage array
- VMware vCenter 5
- Microsoft SQL database

- VMware DRS
- VMware HA

The solution is designed to host scalable, and mixed application workloads. The scope of this CVD is limited to the Cisco solution for EMC VSPEX VMware solutions for 250 virtual machines only.

# **Technology Overview**

# **Cisco Unified Computing System**

The Cisco Unified Computing System is a next-generation data center platform that unites compute, network, and storage access. The platform, optimized for virtual environments, is designed using open industry-standard technologies and aims to reduce total cost of ownership (TCO) and increase business agility. The system integrates a low-latency; lossless 10 Gigabit Ethernet unified network fabric with enterprise-class, x86-architecture servers. It is an integrated, scalable, multi chassis platform in which all resources participate in a unified management domain.

The main components of Cisco Unified Computing System are:

- Computing—The system is based on an entirely new class of computing system that incorporates blade servers based on Intel Xeon E5-2600/4600 and E7-2800 Series Processors.
- **Network**—The system is integrated onto a low-latency, lossless, 10-Gbps unified network fabric. This network foundation consolidates LANs, SANs, and high-performance computing networks which are separate networks today. The unified fabric lowers costs by reducing the number of network adapters, switches, and cables, and by decreasing the power and cooling requirements.
- Virtualization—The system unleashes the full potential of virtualization by enhancing the scalability, performance, and operational control of virtual environments. Cisco security, policy enforcement, and diagnostic features are now extended into virtualized environments to better support changing business and IT requirements.
- **Storage access**—The system provides consolidated access to both SAN storage and Network Attached Storage (NAS) over the unified fabric. By unifying the storage access the Cisco Unified Computing System can access storage over Ethernet, Fibre Channel, Fibre Channel over Ethernet (FCoE), and iSCSI. This provides customers with choice for storage access and investment protection. In addition, the server administrators can pre-assign storage-access policies for system connectivity to storage resources, simplifying storage connectivity, and management for increased productivity.
- **Management**—The system uniquely integrates all system components which enable the entire solution to be managed as a single entity by the Cisco UCS Manager. The Cisco UCS Manager has an intuitive graphical user interface (GUI), a command-line interface (CLI), and a robust application programming interface (API) to manage all system configuration and operations.

The Cisco Unified Computing System is designed to deliver:

- A reduced Total Cost of Ownership and increased business agility.
- Increased IT staff productivity through just-in-time provisioning and mobility support.
- A cohesive, integrated system which unifies the technology in the data center. The system is managed, serviced and tested as a whole.
- Scalability through a design for hundreds of discrete servers and thousands of virtual machines and the capability to scale I/O bandwidth to match demand.

• Industry standards supported by a partner ecosystem of industry leaders.

## **Cisco UCS Manager**

Cisco UCS Manager provides unified, embedded management of all software and hardware components of the Cisco Unified Computing System through an intuitive GUI, a command line interface (CLI), or an XML API. The Cisco UCS Manager provides unified management domain with centralized management capabilities and controls multiple chassis and thousands of virtual machines.

# **Cisco UCS Fabric Interconnect**

The Cisco<sup>®</sup> UCS 6200 Series Fabric Interconnect is a core part of the Cisco Unified Computing System, providing both network connectivity and management capabilities for the system. The Cisco UCS 6200 Series offers line-rate, low-latency, lossless 10 Gigabit Ethernet, Fibre Channel over Ethernet (FCoE) and Fibre Channel functions.

The Cisco UCS 6200 Series provides the management and communication backbone for the Cisco UCS B-Series Blade Servers and Cisco UCS 5100 Series Blade Server Chassis. All chassis, and therefore all blades, attached to the Cisco UCS 6200 Series Fabric Interconnects become part of a single, highly available management domain. In addition, by supporting unified fabric, the Cisco UCS 6200 Series provides both the LAN and SAN connectivity for all blades within its domain.

From a networking perspective, the Cisco UCS 6200 Series uses a cut-through architecture, supporting deterministic, low-latency, line-rate 10 Gigabit Ethernet on all ports, 1Tb switching capacity, 160 Gbps bandwidth per chassis, independent of packet size and enabled services. The product family supports Cisco low-latency, lossless 10 Gigabit Ethernet unified network fabric capabilities, which increase the reliability, efficiency, and scalability of Ethernet networks. The Fabric Interconnect supports multiple traffic classes over a lossless Ethernet fabric from a blade server through an interconnect. Significant TCO savings come from an FCoE-optimized server design in which network interface cards (NICs), host bus adapters (HBAs), cables, and switches can be consolidated.

#### **Cisco UCS 6248UP Fabric Interconnect**

The Cisco UCS 6248UP 48-Port Fabric Interconnect is a one-rack-unit (1RU) 10 Gigabit Ethernet, FCoE and Fiber Channel switch offering up to 960-Gbps throughput and up to 48 ports. The switch has 32 1/10-Gbps fixed Ethernet, FCoE and FC ports and one expansion slot.

#### Figure 1





# **Cisco UCS Fabric Extenders**

The Cisco UCS 2200 Series Fabric Extenders multiplex and forward all traffic from blade servers in a chassis to a parent Cisco UCS fabric interconnect over from 10-Gbps unified fabric links. All traffic, even traffic between blades on the same chassis or virtual machines on the same blade, is forwarded to the parent interconnect, where network profiles are managed efficiently and effectively by the fabric interconnect. At the core of the Cisco UCS fabric extender are application-specific integrated circuit (ASIC) processors developed by Cisco that multiplex all traffic.

#### **Cisco UCS 2204XP Fabric Extender**

The Cisco UCS 2204XP Fabric Extender has four 10 Gigabit Ethernet, FCoE-capable, SFP+ ports that connect the blade chassis to the fabric interconnect. Each Cisco UCS 2204XP has sixteen 10 Gigabit Ethernet ports connected through the midplane to each half-width slot in the chassis. Typically configured in pairs for redundancy, two fabric extenders provide up to 80 Gbps of I/O to the chassis.





# **Cisco UCS Blade Chassis**

The Cisco UCS 5100 Series Blade Server Chassis is a crucial building block of the Cisco Unified Computing System, delivering a scalable and flexible blade server chassis.

The Cisco UCS 5108 Blade Server Chassis, is six rack units (6RU) high and can mount in an industry-standard 19-inch rack. A single chassis can house up to eight half-width Cisco UCS B-Series Blade Servers and can accommodate both half-width and full-width blade form factors.

Four single-phase, hot-swappable power supplies are accessible from the front of the chassis. These power supplies are 92 percent efficient and can be configured to support non-redundant, N+ 1 redundant and grid-redundant configurations. The rear of the chassis contains eight hot-swappable fans, four power connectors (one per power supply), and two I/O bays for Cisco UCS 2204XP Fabric Extenders.

A passive mid-plane provides up to 40 Gbps of I/O bandwidth per server slot and up to 80 Gbps of I/O bandwidth for two slots. The chassis is capable of supporting future 40 Gigabit Ethernet standards. The Cisco UCS Blade Server Chassis is shown in Figure 3.



Figure 3 Cisco Blade Server Chassis (front and back view)

# **Cisco UCS Blade Servers**

Delivering performance, versatility and density without compromise, the Cisco UCS B200 M3 Blade Server addresses the broadest set of workloads, from IT and Web Infrastructure through distributed database.

Building on the success of the Cisco UCS B200 M2 blade servers, the enterprise-class Cisco UCS B200 M3 server, further extends the capabilities of Cisco's Unified Computing System portfolio in a half blade form factor. The Cisco UCS B200 M3 server harnesses the power and efficiency of the Intel Xeon

E5-2600 processor product family, up to 768 GB of RAM, 2 drives or SSDs and up to 2 x 20 GbE to deliver exceptional levels of performance, memory expandability and I/O throughput for nearly all applications. In addition, the Cisco UCS B200 M3 blade server offers a modern design that removes the need for redundant switching components in every chassis in favor of a simplified top of rack design, allowing more space for server resources, providing a density, power and performance advantage over previous generation servers. The Cisco UCS B200M3 Server is shown in Figure 4.





## **Cisco Nexus 5548UP Switch**

The Cisco Nexus 5548UP is a 1RU 1 Gigabit and 10 Gigabit Ethernet switch offering up to 960 gigabits per second throughput and scaling up to 48 ports. It offers 32 1/10 Gigabit Ethernet fixed enhanced Small Form-Factor Pluggable (SFP+) Ethernet/FCoE or 1/2/4/8-Gbps native FC unified ports and three expansion slots. These slots have a combination of Ethernet/FCoE and native FC ports. The Cisco Nexus 5548UP switch is shown in Figure 5.

#### Figure 5 Cisco Nexus 5548UP switch



## **Cisco I/O Adapters**

Cisco UCS Blade Servers support various Converged Network Adapter (CNA) options. Cisco UCS Virtual Interface Card (VIC) 1240 is used in this EMC VSPEX solution.

The Cisco UCS Virtual Interface Card 1240 is a 4-port 10 Gigabit Ethernet, Fibre Channel over Ethernet (FCoE)-capable modular LAN on motherboard (mLOM) designed exclusively for the M3 generation of Cisco UCS B-Series Blade Servers. When used in combination with an optional Port Expander, the Cisco UCS VIC 1240 capabilities can be expanded to eight ports of 10 Gigabit Ethernet.

The Cisco UCS VIC 1240 enables a policy-based, stateless, agile server infrastructure that can present up to 256 PCIe standards-compliant interfaces to the host that can be dynamically configured as either network interface cards (NICs) or host bus adapters (HBAs). In addition, the Cisco UCS VIC 1240 supports Cisco Data Center Virtual Machine Fabric Extender (VM-FEX) technology, which extends the Cisco UCS fabric interconnect ports to virtual machines, simplifying server virtualization deployment.



## Cisco VM-FEX Technology

The Virtual Interface Card provides hardware based implementation of the Cisco VM-FEX technology. The Cisco VM-FEX technology eliminates the standard virtual switch within the hypervisor by providing individual virtual machine virtual ports on the physical network switch. Virtual machine I/O is sent directly to the upstream physical network switch, in this case, the Cisco UCS 6200 Series Fabric Interconnect, which takes full responsibility for virtual machine switching and policy enforcement.

In a VMware environment, the VIC presents itself as three distinct device types to the hypervisor OS as:

- A fibre channel interface
- A standard Ethernet interface
- A special dynamic Ethernet interface

The Fibre Channel and Ethernet interfaces are consumed by the standard VMware vmkernel components and provide standard capabilities. The dynamic Ethernet interfaces are not visible to the vmkernel layers and are preserved as raw PCIe devices.

Using the Cisco vDS VMware plug-in and Cisco VM-FEX technology, the VIC provides a solution that is capable of discovering the dynamic Ethernet interfaces and registering all of them as uplink interfaces for internal consumption of the vDS. The vDS component on each host discovers the number of uplink interfaces that it has and presents a switch to the virtual machines running on a host as shown in the Figure 7. All traffic from an interface on a virtual machine is sent to the corresponding port of the vDS switch. The traffic is mapped immediately to a unique dynamic Ethernet interface presented by the VIC. This vDS implementation guarantees the 1:1 relationship with a virtual machine interface and an uplink port. The dynamic Ethernet interface selected, is a precise proxy for the virtual machine's interface.

The dynamic Ethernet interface presented by the VIC has a corresponding virtual port on the upstream fabric interconnect.



#### Figure 7 VM Interfaces Showing their Virtual Ports on the Physical Switch

UCS Fabric interconnect

Cisco UCS Manager running on the Cisco UCS Fabric Interconnect works in conjunction with the VMware vCenter software to coordinate the creation and movement of virtual machines. Port profiles are used to describe the virtual machine interface attributes such as VLAN, port security, rate limiting, and QoS marking. Port profiles are managed and configured by network administrators using Cisco UCS Manager. To facilitate integration with the VMware vCenter, Cisco UCS Manager pushes the catalog of port profiles into VMware vCenter, where they are represented as distinct port groups. This integration allows the virtual machine administrators to simply select from a menu of port profiles as they create virtual machines. When a virtual machine is created or moved to a different host, it communicates its port group to the Virtual Interface Card. The VIC gets the port profile corresponding to the requested profile from the Cisco UCS Manager and the virtual port on the fabric interconnect switch is configured according to the attributes defined in the port profile.

The Cisco VM-FEX technology addresses the common concerns of server virtualization and virtual networking by providing the following benefits:

- Unified virtual and physical networking—The Cisco VM-FEX technology consolidates the virtual network and physical network into a single switching point that has a single management point. Using the Cisco VM-FEX technology, number of network management points can be reduced drastically.
- **Consistent performance and feature availability**—All the network traffic is controlled at the physical switch, which ensures consistent management of both the virtual and physical network traffic. Each virtual machine interface is coupled with a unique interface on the physical switch, which allows precise decisions to be made related to the scheduling of and operations on traffic flow from and to a virtual machine.

• **Reduced broadcast domains**—The virtual machine's identity and positioning information is known to the physical switch, so the network configuration can be precise and specific to the port in question.

#### Modes of Operations for VM-FEX technology

Cisco VM-FEX technology supports virtual machine interfaces that run in the following modes:

• Emulated mode

The hypervisor emulates a NIC (also referred to as a back-end emulated device) to replicate the hardware it virtualizes for the guest virtual machine. The emulated device presents descriptors, for read and write, and interrupts to the guest virtual machine just as a real hardware NIC device would. One such NIC device that VMware ESXi emulates is the vmxnet3 device. The guest OS in turn instantiates a device driver for the emulated NIC. All the resources of the emulated devices' host interface are mapped to the address space of the guest OS.

PCIe Pass-Through or VMDirectPath mode

Virtual Interface Card uses PCIe standards-compliant IOMMU technology from Intel and VMware's VMDirectPath technology to implement PCIe Pass-Through across the hypervisor layer and eliminate the associated I/O overhead. The Pass-Through mode can be requested in the port profile associated with the interface using the "high-performance" attribute.

# **UCS Differentiators**

Cisco's Unified Compute System is revolutionizing the way servers are managed in data-center. Following are the unique differentiators of UCS and UCS-Manager.

- 1. Embedded management—In UCS, the servers are managed by the embedded firmware in the Fabric Interconnects, eliminating need for any external physical or virtual devices to manage the servers. Also, a pair of FIs can manage up to 40 chassis, each containing 8 blade servers. This gives enormous scaling on the management plane.
- 2. Unified fabric—In UCS, from blade server chassis or rack server fabric-extender to FI, there is a single Ethernet cable used for LAN, SAN and management traffic. This converged I/O results in reduced cables, SFPs and adapters reducing capital and operational expenses of overall solution.
- **3. Auto Discovery**—By simply inserting the blade server in the chassis or connecting rack server to the fabric extender, discovery and inventory of compute resource occurs automatically without any management intervention. The combination of unified fabric and auto-discovery enables the wire-once architecture of UCS, where compute capability of UCS can be extended easily while keeping the existing external connectivity to LAN, SAN and management networks.
- 4. Policy based resource classification—Once a compute resource is discovered by UCSM, it can be automatically classified to a given resource pool based on policies defined. This capability is useful in multi-tenant cloud computing. This CVD showcases the policy based resource classification of UCSM.
- 5. Combined Rack and Blade server management—UCSM can manage B-series blade servers and C-series rack server under the same UCS domain. This feature, along with stateless computing makes compute resources truly hardware form factor agnostic. In this CVD, we are showcasing combinations of B and C series servers to demonstrate stateless and form-factor independent computing work load.

- 6. Model based management architecture—UCSM architecture and management database is model based and data driven. An open, standard based XML API is provided to operate on the management model. This enables easy and scalable integration of UCSM with other management system, such as VMware vCloud director, Microsoft System Center, and Citrix Cloud Platform.
- 7. Policies, Pools, Templates—The management approach in UCSM is based on defining policies, pools and templates, instead of cluttered configuration, which enables a simple, loosely coupled, data driven approach in managing compute, network and storage resources.
- 8. Loose referential integrity—In UCSM, a service profile, port profile or policies can refer to other policies or logical resources with loose referential integrity. A referred policy cannot exist at the time of authoring the referring policy or a referred policy can be deleted even though other policies are referring to it. This provides different subject matter experts to work independently from each-other. This provides great flexibility where different experts from different domains, such as network, storage, security, server and virtualization work together to accomplish a complex task.
- **9. Policy resolution**—In UCSM, a tree structure of organizational unit hierarchy can be created that mimics the real life tenants and/or organization relationships. Various policies, pools and templates can be defined at different levels of organization hierarchy. A policy referring to another policy by name is resolved in the organization hierarchy with closest policy match. If no policy with specific name is found in the hierarchy of the root organization, then special policy named "default" is searched. This policy resolution practice enables automation friendly management APIs and provides great flexibility to owners of different organizations.
- **10.** Service profiles and stateless computing—A service profile is a logical representation of a server, carrying its various identities and policies. This logical server can be assigned to any physical compute resource as far as it meets the resource requirements. Stateless computing enables procurement of a server within minutes, which used to take days in legacy server management systems.
- **11. Built-in multi-tenancy support**—The combination of policies, pools and templates, loose referential integrity, policy resolution in organization hierarchy and a service profiles based approach to compute resources makes UCSM inherently friendly to multi-tenant environment typically observed in private and public clouds.
- 12. Extended Memory—The extended memory architecture of UCS servers allows up to 760 GB RAM per server allowing huge VM to physical server ratio required in many deployments, or allowing large memory operations required by certain architectures like Big-Data.
- 13. Virtualization aware network—VM-FEX technology makes access layer of network aware about host virtualization. This prevents domain pollution of compute and network domains with virtualization when virtual network is managed by port-profiles defined by the network administrators' team. VM-FEX also off loads hypervisor CPU by performing switching in the hardware, thus allowing hypervisor CPU to do more virtualization related tasks. VM-FEX technology is well integrated with VMware vCenter, Linux KVM and Hyper-V SR-IOV to simplify cloud management.
- **14. Simplified QoS**—Even though Fibre Channel and Ethernet are converged in UCS fabric, built-in support for QoS and lossless Ethernet makes it seamless. Network Quality of Service (QoS) is simplified in UCSM by representing all system classes in one GUI panel.

# VMware vSphere 5.1

VMware vSphere 5.1 is a next-generation virtualization solution from VMware which builds upon ESXi 4 and provides greater levels of scalability, security, and availability to virtualized environments. vSphere 5.1 offers improvements in performance and utilization of CPU, memory, and I/O. It also offers

users the option to assign up to thirty two virtual CPU to a virtual machine—giving system administrators more flexibility in their virtual server farms as processor-intensive workloads continue to increase.

The vSphere 5.1 provides the VMware vCenter Server that allows system administrators to manage their ESXi hosts and virtual machines on a centralized management platform. With the Cisco Fabric Interconnects Switch integrated into the vCenter Server, deploying and administering virtual machines is similar to deploying and administering physical servers. Network administrators can continue to own the responsibility for configuring and monitoring network resources for virtualized servers as they did with physical servers. System administrators can continue to "plug-in" their virtual machines into the network ports that have Layer 2 configurations, port access and security policies, monitoring features, and so on, that have been pre-defined by the network administrators; in the same way they need to plug in their physical servers to a previously-configured access switch. In this virtualized environment, the network port configuration/policies move with the virtual machines when the virtual machines are migrated to different server hardware.

# **EMC Storage Technologies and Benefits**

The EMC VNX<sup>TM</sup> family is optimized for virtual applications delivering industry-leading innovation and enterprise capabilities for file, block, and object storage in a scalable, easy-to-use solution. This next-generation storage platform combines powerful and flexible hardware with advanced efficiency, management, and protection software to meet the demanding needs of today's enterprises.

VNX series is designed to meet the high-performance, high-scalability requirements of midsize and large enterprises. The EMC VNX storage arrays are multi-protocol platform that can support the iSCSI, NFS, Fibre Channel, and CIFS protocols depending on the customer's specific needs. This solution was validated using NFS for data storage of Virtual Machines and Fibre Channel for hypervisor SAN boot.

VNX series storage arrays have the following customer benefits:

- Next-generation unified storage, optimized for virtualized applications
- Capacity optimization features including compression, deduplication, thin provisioning, and application-centric copies
- High availability, designed to deliver five 9s availability
- Multiprotocol support for file and block
- Simplified management with EMC Unisphere<sup>™</sup> for a single management interface for all network-attached storage (NAS), storage area network (SAN), and replication needs

# **Software Suites**

The following are the available EMC software suites:

- Remote Protection Suite—Protects data against localized failures, outages, and disasters.
- Application Protection Suite—Automates application copies and proves compliance.
- Security and Compliance Suite—Keeps data safe from changes, deletions, and malicious activity.

# **Software Packs**

Total Value Pack—Includes all protection software suites, and the Security and Compliance Suite. This is the available EMC protection software pack.

## **EMC** Avamar

EMC's Avamar® data deduplication technology seamlessly integrates into virtual environments, providing rapid backup and restoration capabilities. Avamar's deduplication results in vastly less data traversing the network, and greatly reduces the amount of data being backed up and stored; resulting in storage, bandwidth and operational savings.

The following are the two most common recovery requests used in backup and recovery:

- File-level recovery—Object-level recoveries account for the vast majority of user support requests. Common actions requiring file-level recovery are—individual users deleting files, applications requiring recoveries, and batch process-related erasures.
- System recovery—Although complete system recovery requests are less frequent in number than those for file-level recovery, this bare metal restore capability is vital to the enterprise. Some of the common root causes for full system recovery requests are viral infestation, registry corruption, or unidentifiable unrecoverable issues.

The Avamar System State protection functionality adds backup and recovery capabilities in both of these scenarios.

# **Architectural Overview**

This Cisco Validated Design discusses the deployment model of the VMware solution for 250 virtual machines.

Table 1 lists the hardware components required in the solution:

Components	Hardware required
Servers	Ten Cisco B200 M3 servers
Adapters	Ten Cisco VICs: one Cisco VIC 1240 adapter per server
Chassis	Two Cisco UCS 5108 Blade Server Chassis
Fabric extenders	Four 2204XP Fabric Extender: two fabric extenders per chassis
Fabric interconnects	Two Cisco UCS 6248UP Fabric Interconnects
Network switches	Two Cisco Nexus 5548UP Switches
Storage	One EMC VNX5500 Storage Array

#### Table 1 Hardware requirements

Table 2 lists the various firmware and software components which occupies different tiers of the Cisco solution for EMC VSPEX VMware architectures under test.

Vendor	Name	Version	Description
Cisco	Cisco UCS B200 M3	2.1(1) - CIMC	Cisco UCS B200 M3
	servers	B200M3.2.0.4a.0.0809 0121557 – BIOS	blade server firmware
Cisco	Cisco VIC 1240	2.1(1)	Cisco Virtual Interface Card (adapter) firmware
Cisco	Cisco UCS 2204XP Fabric Extender	2.1(1)	Cisco UCS fabric extender firmware
Cisco	Cisco UCS 6248UP Fabric Interconnect	5.0(3)N2(2.11)	Cisco UCS fabric interconnect firmware
Cisco	Cisco UCSM	2.1(1)	Cisco UCS Manager (UCSM) software
Cisco	Cisco Nexus 5548UP Switches	5.1(3)N1(1a)	Cisco Nexus 5000 series switches running NX-OS
EMC	EMC VNX5500	05.31.000.5.704	EMC VNX storage array firmware
EMC	EMC Avamar	6.0.0-592	EMC data backup software
EMC	Data Domain OS	5.1.0.9-282511	EMC data domain operating system
VMware	ESXi 5.1	5.1 build 799733	VMware Hypervisor
VMware	vCenter Server	5.1 build 799731	VMware management
Microsoft	Microsoft Windows Server 2008 R2	2008 R2 SP1	Operating system to host vCenter server
Microsoft	Microsoft SQL server	2008 R2	Database server SQL R2 Enterprise edition for vCenter

Table 2 Firmware and software components of VMware architectures
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Table 3 outlines the B200 M3 server configuration details (per server basis) across all the VMware architectures.

#### Table 3Server configuration details

Component	Capacity
Memory (RAM)	64 GB (8X8 MB DIMM)
Processor	2 x Intel® Xenon ® E5-2650 CPUs, 2 GHz, 8 cores, 16 threads

This architecture assumes that there is an existing infrastructure/ management network available in which a virtual machine hosting vCenter server and Windows Active Directory/ DNS server are present. Figure 8 shows a high level Cisco solution for EMC VSPEX VMware architecture for 250 virtual machines.





The following are the high level design points of the architecture:

- Only Ethernet is used as network layer 2 media to access Cisco UCS 6248UP from the Cisco UCS B200 M3 blade servers.
- Infrastructure network is on a separate 1GE network.
- Network redundancy is built in by providing two switches, two storage controllers and redundant connectivity for data, storage and infrastructure networking.

This design does not recommend or require any specific layout of infrastructure network. The vCenter server, SQL server, and AD/ DNS virtual machines are hosted on the infrastructure network. However, design does require accessibility of certain VLANs from the infrastructure network to reach the servers.

ESXi 5.1 is used as hypervisor operating system on each server and is installed on fibre channel SAN. The defined load is 25 virtual machines per server.

# **Memory Configuration Guidelines**

This section provides guidelines for allocating memory to the virtual machines. The guidelines outlined here take into account vSphere memory overhead and the virtual machine memory settings.

#### ESX/ESXi Memory Management Concepts

vSphere virtualizes guest physical memory by adding an extra level of address translation. Shadow page tables make it possible to provide this additional translation with little or no overhead. Managing memory in the hypervisor enables the following:

• Memory sharing across virtual machines that have similar data (that is, same guest operating systems).

- Memory over commitment, which means allocating more memory to virtual machines than is physically available on the ESX/ESXi host.
- A memory balloon technique whereby virtual machines that do not need all the memory they were allocated give memory to virtual machines that require additional allocated memory.

For more information about vSphere memory management concepts, see the VMware vSphere Resource Management Guide at:

http://www.vmware.com/files/pdf/perf-vsphere-memory\_management.pdf

### Virtual Machine Memory Concepts

Figure 9 shows the use of memory settings parameters in the virtual machine.

Figure 9 Virtual Machine Memory Settings



The vSphere memory settings for a virtual machine include the following parameters:

- Configured memory—Memory size of virtual machine assigned at creation.
- **Touched memory**—Memory actually used by the virtual machine. vSphere allocates only guest operating system memory on demand.
- **Swappable**—Virtual machine memory can be reclaimed by the balloon driver or by vSphere swapping. Ballooning occurs before vSphere swapping. If this memory is in use by the virtual machine (that is, touched and in use), the balloon driver causes the guest operating system to swap.

# **Allocating Memory to Virtual Machines**

Memory sizing for a virtual machine in VSPEX architectures is based on many factors. With the number of application services and use cases available determining a suitable configuration for an environment requires creating a baseline configuration, testing, and making adjustments, as discussed later in this paper. Table 4 outlines the resources used by a single virtual machine:

Characteristics	Value
Virtual processor per virtual machine (vCPU)	1
RAM per virtual machine	2 GB
Available storage capacity per virtual machine	100 GB
I/O operations per second (IOPS) per VM	25

#### Table 4Resources for a single virtual machine

Characteristics	Value
I/O pattern	Random
I/O read/write ratio	2:1

#### Table 4Resources for a single virtual machine

Following are the recommended best practices:

- Account for memory overhead—Virtual machines require memory beyond the amount allocated, and this memory overhead is per-virtual machine. Memory overhead includes space reserved for virtual machine devices, depending on applications and internal data structures. The amount of overhead required depends on the number of vCPUs, configured memory, and whether the guest operating system is 32-bit or 64-bit. As an example, a running virtual machine with one virtual CPU and two GB of memory may consume about 100 MB of memory overhead, where a virtual machine with two virtual CPUs and 32 GB of memory may consume approximately 500 MB of memory overhead. This memory overhead is in addition to the memory allocated to the virtual machine and must be available on the ESXi host.
- "Right-size" memory allocations—Over-allocating memory to virtual machines can waste memory unnecessarily, but it can also increase the amount of memory overhead required to run the virtual machine, thus reducing the overall memory available for other virtual machines. Fine-tuning the memory for a virtual machine is done easily and quickly by adjusting the virtual machine properties. In most cases, hot-adding of memory is supported and can provide instant access to the additional memory if needed.
- Intelligently overcommit—Memory management features in vSphere allow for over commitment of physical resources without severely impacting performance. Many workloads can participate in this type of resource sharing while continuing to provide the responsiveness users require of the application. When looking to scale beyond the underlying physical resources, consider the following:
  - Establish a baseline before over committing. Note the performance characteristics of the application before and after. Some applications are consistent in how they utilize resources and may not perform as expected when vSphere memory management techniques take control. Others, such as Web servers, have periods where resources can be reclaimed and are perfect candidates for higher levels of consolidation.
  - Use the default balloon driver settings. The balloon driver is installed as part of the VMware Tools suite and is used by ESX/ESXi if physical memory comes under contention. Performance tests show that the balloon driver allows ESX/ESXi to reclaim memory, if required, with little to no impact to performance. Disabling the balloon driver forces ESX/ESXi to use host-swapping to make up for the lack of available physical memory which adversely affects performance.
  - Set a memory reservation for virtual machines that require dedicated resources. Virtual
    machines running Search or SQL services consume more memory resources than other
    application and Web front-end virtual machines. In these cases, memory reservations can
    guarantee that the services have the resources they require while still allowing high
    consolidation of other virtual machines.

As with over committing CPU resources, proactive monitoring is a requirement. Table 5 lists counters that can be monitored to avoid performance issues resulting from overcommitted memory.

EXitop Metrics	Description	Implication
SWAP /MB: r/s, w/s	The rate at which machine memory is swapped in and out of disk.	High rates of swapping affect guest performance. If free memory is low, consider moving virtual machines to other hosts. If free memory is OK, check resource limits on the virtual machines.
MCTLSZ	The amount of guest physical memory reclaimed by the balloon driver.	If the guest working set is smaller than guest physical memory after ballooning, no performance degradation is observed. However, investigate the cause for ballooning. It could be due to low host memory or a memory limit on the virtual machine.

#### Table 5 ESXitop memory counters

# **Storage Guidelines**

VSPEX architecture for VMware 250 VMs scale, uses NFS to access storage arrays. This simplifies the design and implementation for the small to medium level businesses. vSphere provides many features that take advantage of EMC storage technologies such as VNX VAAI plug-in for NFS storage and storage replication. Features such as VMware vMotion, VMware HA, and VMware Distributed Resource Scheduler (DRS) use these storage technologies to provide high availability, resource balancing, and uninterrupted workload migration.

## **Virtual Server Configuration**

Figure 10 shows that the VMware storage virtualization can be categorized into three layers of storage technology:

- The Storage array is the bottom layer, consisting of physical disks presented as logical disks (storage array volumes or LUNs) to the layer above, with the vSphere virtual environment.
- Storage array LUNs that are formatted as NFS datastores provide storage for virtual disks.
- Virtual disks that are presented to the virtual machine and guest operating system as NFS attached disks can be partitioned and used in the file systems.



#### VMware Storage Virtualization Stack

#### **Storage Protocol Capabilities**

VMware vSphere provides vSphere and storage administrators with the flexibility to use the storage protocol that meets the requirements of the business. This can be a single protocol datacenter wide, such as iSCSI, or multiple protocols for tiered scenarios such as using Fibre Channel for high-throughput storage pools and NFS for high-capacity storage pools.

For VSPEX solution on vSphere NFS is a recommended option because of its simplicity in deployment.

For more information, see the VMware white paper Comparison of Storage Protocol Performance in VMware vSphere 5.1:

http://www.vmware.com/files/pdf/perf\_vsphere\_storage\_protocols.pdf

## **Storage Best Practices**

Following are the vSphere storage best practices:

- Host multi-pathing—Having a redundant set of paths to the storage area network is critical to ٠ protecting the availability of your environment. In this solution, the redundancy is comes from the "Fabric Failover" feature of the dynamic vNICs of Cisco UCS for NFS storage access.
- ٠ Partition alignment—Partition misalignment can lead to severe performance degradation due to I/O operations having to cross track boundaries. Partition alignment is important both at the NFS level as well as within the guest operating system. Use the vSphere Client when creating NFS datastores to be sure they are created aligned. When formatting volumes within the guest, Windows 2008 aligns NTFS partitions on a 1024KB offset by default.
- Use shared storage—In a vSphere environment, many of the features that provide the flexibility in ٠ management and operational agility come from the use of shared storage. Features such as VMware HA, DRS, and vMotion take advantage of the ability to migrate workloads from one host to another host while reducing or eliminating the downtime required to do so.

- Calculate your total virtual machine size requirements—Each virtual machine requires more space than that used by its virtual disks. Consider a virtual machine with a 20GB OS virtual disk and 16GB of memory allocated. This virtual machine will require 20GB for the virtual disk, 16GB for the virtual machine swap file (size of allocated memory), and 100MB for log files (total virtual disk size + configured memory + 100MB) or 36.1GB total.
- Understand I/O Requirements—Under-provisioned storage can significantly slow responsiveness
  and performance for applications. In a multi-tier application, you can expect each tier of application
  to have different I/O requirements. As a general recommendation, pay close attention to the amount
  of virtual machine disk files hosted on a single NFS volume. Over-subscription of the I/O resources
  can go unnoticed at first and slowly begin to degrade performance if not monitored proactively.

# **VSPEX VMware Memory Virtualization**

VMware vSphere 5.1 has a number of advanced features that help to maximize performance and overall resources utilization. This section describes the performance benefits of some of these features for the VSPEX deployment.

## **Memory Compression**

Memory over-commitment occurs when more memory is allocated to virtual machines than is physically present in a VMware ESXi host. Using sophisticated techniques, such as ballooning and transparent page sharing, ESXi is able to handle memory over-commitment without any performance degradation. However, if more memory than that is present on the server is being actively used, ESXi might resort to swapping out portions of a VM's memory.

For more details about Vsphere memory management concepts, see the VMware Vsphere Resource Management Guide at:

http://www.VMware.com/files/pdf/mem\_mgmt\_perf\_Vsphere5.pdf

# Virtual Networking

The Cisco VMFEX collapses virtual and physical networking into a single infrastructure. The Cisco VM-FEX technology allows data center administrators to provision, configure, manage, monitor, and diagnose virtual machine network traffic and bare metal network traffic within a unified UCS infrastructure.

The VM-FEX technology extends Cisco data-center networking technology to the virtual machine with the following capabilities:

- Each virtual machine includes a dedicated interface on the virtual Distributed Switch (vDS).
- All virtual machine traffic is sent directly to the dedicated interface on the vDS.
- The native VMware virtual switch in the hypervisor is replaced by the vDS.
- Live migration and vMotion are also supported with the Cisco VM-FEX.

#### **Benefits**

• Simplified operations—Seamless virtual networking infrastructure through UCS Manager

- Improved network security—Contains VLAN proliferation
- Optimized network utilization-Reduces broadcast domains

 Reduced network complexity—Separation of network and server administrator's domain by providing port-profiles by name

### Virtual Networking Best Practices

Following are the vSphere networking best practices:

- Separate virtual machine and infrastructure traffic—Keep virtual machine and VMkernel or service console traffic separate. This can be accomplished physically using separate virtual switches that uplink to separate physical NICs, or virtually using VLAN segmentation.
- Enable PortFast on ESX/ESXi host uplinks—Failover events can cause spanning tree protocol recalculations that can set switch ports into a forwarding or blocked state to prevent a network loop. This process can cause temporary network disconnects. To prevent this situation, set the switch ports connected to ESX/ESXi hosts to PortFast, which immediately sets the port back to the forwarding state and prevents link state changes on ESX/ESXi hosts from affecting the STP topology. Loops are not possible in virtual switches.
- Converged Network and Storage I/O with 10Gbps Ethernet—Consolidating storage and network traffic can provide simplified cabling and management over maintaining separate switching infrastructures.
- Fabric Failover—Always use fabric failover feature of Cisco UCS VIC adapters for high-availability of network access.

This solution suggests 32 dynamic VNICs per ESXi host based on following assumptions and calculation:

- One vNIC per virtual machine
- With 25 VMs per hypervisor, 25 dynamic vNICs is needed
- Three vm-kernel interfaces per hypervisor:
  - One for management
  - One for vMotion
  - One for NFS storage access
- Four additional dynamic vNICs for high-availability. High availability is required when:
  - One of the hypervisor is shutdown or in maintenance mode.
  - The VMs on the hypervisor is moved to other hypervisors.

Three dynamic vNICs are required per hypervisor, but we have provisioned one extra for head room.

## vSphere VMware Performance

With every release of vSphere the overhead of running an application on the vSphere virtualized platform is reduced by the new performance improving features. Typical virtualization overhead for applications is less than 10%. Many of these features not only improve performance of the virtualized application itself, but also allow for higher consolidation ratios. Understanding these features and taking advantage of them in your environment helps guarantee the highest level of success in your virtualized deployment. Table 6 provides details on vSphere VMware performance.

ESXitop Metric	Description	Implication
NUMA Support	ESX/ESXi uses a NUMA load-balancer to assign a home node to a virtual machine. Because memory for the virtual machine is allocated from the home node, memory access is local and provides the best performance possible. Even applications that do not directly support NUMA benefit from this feature.	See The CPU Scheduler in VMware ESXi 5.1: http://www.vmware.co m/pdf/Perf_Best_Practi ces_vSphere5.1.pdf
Transparent page sharing	Virtual machines running similar operating systems and applications typically have identical sets of memory content. Page sharing allows the hypervisor to reclaim the redundant copies and keep only one copy, which frees up the total host memory consumption. If most of your application virtual machines run the same operating system and application binaries then total memory usage can be reduced to increase consolidation ratios.	See Understanding Memory Resource Management in VMware ESXi 5.1: http://www.vmware.co m/files/pdf/perf-vspher e-memory_management .pdf
Memory ballooning	By using a balloon driver loaded in the guest operating system, the hypervisor can reclaim host physical memory if memory resources are under contention. This is done with little to no impact to the performance of the application.	See Understanding Memory Resource Management in VMware ESXi 5.1: http://www.vmware.co m/files/pdf/perf-vspher e-memory_management .pdf

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#### Table 6 vSPhere VMware performance

ESXitop Metric	Description	Implication
Memory compression	Before a virtual machine resorts to host swapping, due to memory over commitment the pages elected to be swapped attempt to be compressed. If the pages can be compressed and stored in a compression cache, located in main memory, the next access to the page causes a page decompression as opposed to a disk swap out operation, which can be an order of magnitude faster.	See Understanding Memory Resource Management in VMware ESXi 5.1: http://www.vmware.co m/files/pdf/perf-vspher e-memory_management .pdf
Large memory page support	An application that can benefit from large pages on native systems, such as MS SQL, can potentially achieve a similar performance improvement on a virtual machine backed with large memory pages. Enabling large pages increases the memory page size from 4KB to 2MB.	See Performance Best Practices for VMware vSphere 5.1: http://www.vmware.co m/pdf/Perf_Best_Practi ces_vSphere5.1.pdf and see Performance and Scalability of Microsoft SQL Server on VMware vSphere 4: http://www.vmware.co m/files/pdf/perf_vspher e_sql_scalability.pdf

#### Table 6 vSPhere VMware performance

# **Physical and Virtual CPUs**

VMware uses the terms virtual CPU (vCPU) and physical CPU to distinguish between the processors within the virtual machine and the underlying physical x86/x64-based processor cores. Virtual machines with more than one virtual CPU are also called SMP (symmetric multiprocessing) virtual machines. The virtual machine monitor (VMM), or hypervisor, is responsible for CPU virtualization. When a virtual machine starts running, control transfers to the VMM, which virtualizes the guest OS instructions.

# **Virtual SMP**

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VMware Virtual Symmetric Multiprocessing (Virtual SMP) enhances virtual machine performance by enabling a single virtual machine to use multiple physical processor cores simultaneously. vSphere supports the use of up to thirty two virtual CPUs per virtual machine. The biggest advantage of an SMP system is the ability to use multiple processors to execute multiple tasks concurrently, thereby increasing throughput (for example, the number of transactions per second). Only workloads that support parallelization (including multiple processes or multiple threads that can run in parallel) can really benefit from SMP.

The virtual processors from SMP-enabled virtual machines are co-scheduled. That is, if physical processor cores are available, the virtual processors are mapped one-to-one onto physical processors and are then run simultaneously. In other words, if one vCPU in the virtual machine is running, a second vCPU is co-scheduled so that they execute nearly synchronously. Consider the following points when using multiple vCPUs:

- Simplistically, if multiple, idle physical CPUs are not available when the virtual machine wants to run, the virtual machine remains in a special wait state. The time a virtual machine spends in this wait state is called ready time.
- Even idle processors perform a limited amount of work in an operating system. In addition to this minimal amount, the ESXi host manages these "idle" processors, resulting in some additional work by the hypervisor. These low-utilization vCPUs compete with other vCPUs for system resources.

In VMware ESXi 5 and ESXi, the CPU scheduler underwent several improvements to provide better performance and scalability; for more information, see the *CPU Scheduler in VMware ESXi 5.1*:

http://www.vmware.com/pdf/Perf\_Best\_Practices\_vSphere5.1.pdf. For example, in VMware ESXi 5, the relaxed co-scheduling algorithm was refined so that scheduling constraints due to co-scheduling requirements are further reduced. These improvements resulted in better linear scalability and performance of the SMP virtual machines.

#### **Overcommitment**

VMware conducted tests on virtual CPU overcommitment with SAP and SQL, showing that the performance degradation inside the virtual machines is linearly reciprocal to the overcommitment. Because the performance degradation is "graceful," any virtual CPU overcommitment can be effectively managed by using VMware DRS and VMware vSphere® vMotion® to move virtual machines to other ESX/ESXi hosts to obtain more processing power. By intelligently implementing CPU overcommitment, consolidation ratios of applications Web front-end and application servers can be driven higher while maintaining acceptable performance. If it is chosen that a virtual machine not participate in overcommitment, setting a CPU reservation provides a guaranteed CPU allocation for the virtual machine. This practice is generally not recommended because the reserved resources are not available to other virtual machines and flexibility is often required to manage changing workloads. However, SLAs and multi-tenancy may require a guaranteed amount of compute resources to be available. In these cases, reservations make sure that these requirements are met.

When choosing to overcommit CPU resources, monitor vSphere and applications to be sure responsiveness is maintained at an acceptable level. Table 7 lists counters that can be monitored to help achieve higher drive consolidation while maintaining the system performance.

ESXitop Metric	Description	Implication
%RDY	Percentage of time a vCPU in a run queue is waiting for the CPU scheduler to let it run on a physical CPU.	A high %RDY time (use 20% as a starting point) may indicate the virtual machine is under resource contention. Monitor this—if application speed is OK, a higher threshold may be tolerated.
%MLMTD	Percentage of time a vCPU was ready to run but was deliberately not scheduled due to CPU limits.	A high %MLMTD time may indicate a CPU limit is holding the VM in a ready to run state. If the application is running slow consider increasing or removing the CPU limit.
%CSTP	Percentage of time a vCPU spent in read, co-descheduled state. Only meaningful for SMP virtual machines.	A high %CSTP time usually means that vCPUs are not being used in a balanced fashion. Evaluate the necessity for multiple vCPUs.

#### Table 7List of Counters

## Hyper-threading

Hyper-threading technology (recent versions of which are called symmetric multithreading, or SMT) enables a single physical processor core to behave like two logical processors, essentially allowing two independent threads to run simultaneously. Unlike having twice as many processor cores which can roughly double performance, hyper-threading can provide anywhere from a slight to a significant increase in system performance by keeping the processor pipeline busier.

## **Non-Uniform Memory Access (NUMA)**

Non-Uniform Memory Access (NUMA) compatible systems contain multiple nodes that consist of a set of processors and memory. The access to memory in the same node is local, while access to the other node is remote. Remote access can take longer because it involves a multihop operation. In NUMA-aware applications, there is an attempt to keep threads local to improve performance.

The VMware ESX/ESXi provides load-balancing on NUMA systems. To achieve the best performance, it is recommended that the NUMA be enabled on compatible systems. On a NUMA-enabled ESX/ESXi host, virtual machines are assigned a home node from which the virtual machine's memory is allocated. Because it is rare for a virtual machine to migrate away from the home node, memory access is mostly kept local.

In applications that scale out well it is beneficial to size the virtual machines with the NUMA node size in mind. For example, in a system with two hexa-core processors and 64GB of memory, sizing the virtual machine to six virtual CPUs and 32GB or less, means that the virtual machine does not have to span multiple nodes.

# **VSPEX VMware Storage Virtualization**

Disk provisioning on the EMC VNX series requires administrators to choose disks for each of the storage pools.

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# **Storage Layout**

The architecture diagram in this section shows the physical disk layout. Disk provisioning on the VNX5500 storage array is simplified through the use of wizards, so that administrators do not choose which disks belong to a given storage pool. The wizard may choose any available disk of the proper type, regardless of where the disk physically resides in the array.

Figure 11 shows storage architecture for 250 virtual machines on VNX5500.



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#### Figure 11 Storage Architecture for 250 VMs on EMC VNX5500

The reference architecture uses the following configuration:

• One hundred fourty-five 300 GB SAS disks are allocated to a block-based storage pool.



Note: System drives are specifically excluded from the pool, and not used for additional storage.

- Six 300GB SAS disks are configured as hot spares.
- Three 300GB SAS disks are configured for ESXi 5.1 hypervisor SAN Boot.
- Optionally you can configure up to 20 flash drives in the array FAST Cache. These drives are not considered to be a required part of the solution, and additional licensing may be required in order to use the FAST Suite.
- EMC recommends that at least one hot spare disk is allocated for each 30 disks of a given type.
- At least two NFS shares are allocated to the vSphere cluster from each storage pool to serve as datastores for the virtual servers.

The VNX family storage array is designed for five 9s availability by using redundant components throughout the array. All of the array components are capable of continued operation in case of hardware failure. The RAID disk configuration on the array provides protection against data loss due to individual disk failures, and the available hot spare drives can be dynamically allocated to replace a failing disk.

# **Storage Virtualization**

NFS is a cluster file system that provides UDP based stateless storage protocol to access storage across multiple hosts over the network. Each virtual machine is encapsulated in a small set of files and NFS datastore mount points are used for the operating system partitioning and data partitioning.

It is preferable to deploy virtual machine files on shared storage to take advantage of VMware VMotion, VMware High Availability<sup>TM</sup> (HA), and VMware Distributed Resource Scheduler<sup>TM</sup> (DRS). This is considered a best practice for mission-critical deployments, which are often installed on third-party, shared storage management solutions.

# Architecture for 250 VMware Virtual Machines

Figure 12 shows the logical layout of 50 VMware virtual machines. The following are the key aspects of this solution:

- Ten Cisco B200 M3 servers are used, with an average load of 25 VMs per server.
- ESXi 5 is booted from SAN disk. FCoE is used from servers up to fabric interconnect, and then native FC from fabric interconnect to storage array
- Virtual port-channels on storage side networking provide high-availability and load balancing.
- Cisco VMFEX distributed Virtual Switch provides port-profiles based virtual networking solution.
- Fabric failover capability of VMFEX dynamic vNICs provides network high availability.
- SAN boot and Cisco UCS Manager service profile provides complete stateless computing architecture. A B200 M3 server can be replaced with a very little down time window.



#### Figure 12 Cisco Solution VMware Architecture for 250 VMs

# **Stateless Computing**

Cisco UCS Manager (UCSM) provides the concept of Service Profile for server running on a physical hardware. Service profile is a logical entity, which can be associated to the physical server. Among other things, service profile includes various identities of the server or server components, such as:

- BIOS UUID
- MAC address of virtual NIC of the server
- Node WWN (WWNN) for Fibre Channel SAN access
- Port WWN (WWPN) of the virtual HBA of the server
- IQN ID, if iSCSI protocol is used for storage access
- Management IP address for the KVM access

All these identities can be assigned to any physical server managed by the Cisco UCS Manager. All other configuration of the service profile is based on templates, pools and policies, providing immense flexibility to the administrator. This includes firmware and BIOS versions required by the server. These concepts enable Cisco UCS Manager to provide stateless computing across entire Cisco UCS Manager managed compute hardware. If remote storage is used to boot operating system of the server (such as SAN boot, PXE boot, iSCSI boot etc), then a given service profile can be associated to any physical server hardware and downtime for migrating such server can be reduced to few minutes. Solution presented in this CVD makes use of identity pools and SAN storage to simplify the server procurement and provide stateless computing capability.

# **Sizing Guidelines**

In any discussion about virtual infrastructures, it is important to first define a reference workload. Not all servers perform the same tasks, and it is impractical to build a reference that takes into account every possible combination of workload characteristics.

## **Defining the Reference Workload**

To simplify the discussion, we have defined a representative customer reference workload. By comparing your actual customer usage to this reference workload, you can extrapolate which reference architecture to choose.

For the VSPEX solutions, the reference workload was defined as a single virtual machine. This virtual machine has the following characteristics:

Characteristic	Value
Virtual machine operating system	Microsoft Windows Server 2008 R2 SP1
Virtual processor per virtual machine (vCPU)	1
RAM per virtual machine	2 GB
Available storage capacity per virtual machine	100 GB
I/O operations per second (IOPS) per VM	25
I/O pattern	Random
I/O read/write ratio	2:1

#### Table 8 Virtual Machine Characteristics

This specification for a virtual machine is not intended to represent any specific application. Rather, it represents a single common point of reference to measure other virtual machines.

# Applying the Reference Workload

When considering an existing server which will move into a virtual infrastructure, you have the opportunity to gain efficiency by right-sizing the virtual hardware resources assigned to that system.

The reference architectures create a pool of resources sufficient to host a target number of reference virtual machines as described above. It is entirely possible that customer virtual machines may not exactly match the specifications above. In that case, you can say that a single specific customer virtual machine is the equivalent of some number of reference virtual machines, and assume that number of virtual machines have been used in the pool. You can continue to provision virtual machines from the pool of resources until it is exhausted. Consider these examples:

#### Example 1 Custom Built Application

A small custom-built application server needs to move into this virtual infrastructure. The physical hardware supporting the application is not being fully utilized at present. A careful analysis of the existing application reveals that the application can use one

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processor, and needs 3 GB of memory to run normally. The IO workload ranges between 4 IOPS at idle time to 15 IOPS when busy. The entire application is only using about 30 GB on local hard drive storage.

Based on these numbers, following resources are needed from the resource pool:

- CPU resources for 1 VM

- Memory resources for 2 VMs
- Storage capacity for 1 VM

- IOPS for 1 VM

In this example, a single virtual machine uses the resources of two of the reference VMs. Once this VM is deployed, the solution's new capability would be 248 VMs.

#### Example 2 Point of Sale System

The database server for a customer's point-of-sale system needs to move into this virtual infrastructure. It is currently running on a physical system with four CPUs and 16 GB of memory. It uses 200 GB storage and generates 200 IOPS during an average busy cycle. The following resources that are needed from the resource pool to virtualize this application:

- CPUs of 4 reference VMs
- Memory of 8 reference VMs
- Storage of 2 reference VMs
- IOPS of 8 reference VMs

In this case the one virtual machine uses the resources of eight reference virtual machines. Once this VM is deployed, the solution's new capability would be 242 VMs.

#### Example 3 Web Server

The customer's web server needs to move into this virtual infrastructure. It is currently running on a physical system with two CPUs and 8GB of memory. It uses 25 GB of storage and generates 50 IOPS during an average busy cycle.

The following resources that are needed from the resource pool to virtualize this application:

- CPUs of 2 reference VMs
- Memory of 4 reference VMs
- Storage of 1 reference VMs
- IOPS of 2 reference VMs

In this case the virtual machine would use the resources of four reference virtual machines. Once this VM is deployed, the solution's new capability would be 246 VMs.

#### Example 4 Decision Support Database

The database server for a customer's decision support system needs to move into this virtual infrastructure. It is currently running on a physical system with 10 CPUs and 48 GB of memory. It uses 5 TB of storage and generates 700 IOPS during an average busy cycle. The following resources that are needed from the resource pool to virtualize this application:

- CPUs of ten reference VMs
- Memory of 24 reference VMs
- Storage of 52 reference VMs
- IOPS of 28 reference VMs

In this case the one virtual machine uses the resources of fifty-two reference virtual machines. Once this VM is deployed, the solution's new capability would be 198 VMs.

#### Summary of Example

The four examples show the flexibility of the resource pool model. In all the four cases the workloads simply reduce the number of available resources in the pool. If all four examples were implemented on the same virtual infrastructure, with an initial capacity of 250 virtual machines they can all be implemented, leaving the capacity of one hundred eighty six reference virtual machines in the resource pool.

In more advanced cases, there may be tradeoffs between memory and I/O or other relationships where increasing the amount of one resource, decreases the need for another. In these cases, the interactions between resource allocations become highly complex, and are out of the scope of this document. However, when a change in the resource balance is observed, and the new level of requirements is known; these virtual machines can be added to the infrastructure using the method described in the above examples.

# **VSPEX** Configuration Guidelines

This sections provides the procedure to deploy the Cisco solution for EMC VSPEX VMware architecture.

Follow these steps to configure the Cisco solution for EMC VSPEX VMware architectures:

- 1. Pre-deployment tasks.
- 2. Physical setup.
- **3**. Cable connectivity.
- 4. Configure Cisco Nexus switches.
- 5. Configure Cisco Unified Computing System using Cisco UCS Manager.
- 6. Prepare and configure storage array.
- 7. Install VMware ESXi servers and vCenter infrastructure.
- 8. Install and configure Microsoft SQL server database.
- 9. Install and configure VMware vCenter server.
- 10. Install and configure Cisco Nexus VM-FEX.
- **11**. Test the installation.

These steps are described in detail in the following sections.

# **Pre-deployment Tasks**

Pre-deployment tasks include procedures that do not directly relate to environment installation and configuration, but whose results will be needed at the time of installation. Examples of pre-deployment tasks are collection of hostnames, IP addresses, VLAN IDs, license keys, installation media, and so on. These tasks should be performed before the customer visit to decrease the time required onsite.

- Gather documents—Gather the related documents listed in the Preface. These are used throughout the text of this document to provide detail on setup procedures and deployment best practices for the various components of the solution.
- Gather tools—Gather the required and optional tools for the deployment. Use Table 9 to confirm that all equipment, software, and appropriate licenses are available before the deployment process.
- Gather data—Collect the customer-specific configuration data for networking, naming, and required accounts. Enter this information into the Customer Configuration Data Sheet, page 172 for reference during the deployment process.
| Requirement | Description   | Reference   |  |  |
|-------------|---|---|--|--|
| Hardware    | Cisco UCS B200 M3 servers to host virtual machines  | EMC-Cisco Reference<br>Architecture: VSPEX                          |  |  |
|             | Cisco UCS 5108 Blade Server<br>Chassis  | Server Virtualization<br>with VMware vSphere<br>5.1 for 250 Virtual |  |  |
|             | Cisco UCS 2204XP Fabric<br>Extender   | Machines.   |  |  |
|             | Cisco UCS 6248UP Fabric<br>Interconnect   |   |  |  |
|             | VMware vSphere <sup>™</sup> 5 server to<br>host virtual infrastructure<br>servers   | -   |  |  |
|             | <b>Note</b> This requirement may be covered in the existing infrastructure  |   |  |  |
|             | Cisco Nexus switches: Two<br>Cisco Nexus 5548UP Switches<br>for high availability   | -   |  |  |
|             | EMC VNX storage: EMC<br>VNX5500 Multiprotocol storage<br>array with the required disk<br>layout as per architecture<br>requirements |   |  |  |
| Software    | VMware ESXi <sup>™</sup> 5.1 installation media   | See the corresponding<br>product documentation                      |  |  |
|             | VMware vCenter Server 5.1 installation media  |   |  |  |
|             | EMC VSI for VMware vSphere:<br>Unified Storage Management –<br>Product Guide  |   |  |  |
|             | EMC VSI for VMware vSphere:<br>Storage Viewer—Product Guide   |   |  |  |
|             | Microsoft Windows Server 2008<br>R2 SP1 installation media<br>(suggested OS for VMware<br>vCenter)                                  |   |  |  |
|             | Microsoft SQL Server 2008 R2<br>SP1 Note: This requirement may<br>be covered in the existing<br>infrastructure                      | +   |  |  |

### Table 9 Customer Specific Configuration Data

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Requirement	Descri	Reference			
Licenses	VMwa	re vCenter 5.1 license key	Consult your		
	VMwa	re ESXi 5.1 license keys	corresponding vendor obtain license keys		
	Micros key	soft SQL Server license	obtain neense keys		
	Note	This requirement may be covered in the existing infrastructure			

Table 9 Customer Specific Configuration I	Data
---	------

# **Customer Configuration Data**

To reduce the onsite time, information such as IP addresses and hostnames should be assembled as part of the planning process.

The section Customer Configuration Data Sheet, page 172 provides tabulated record of relevant information (to be filled at the customer's end). This form can be expanded or contracted as required, and information may be added, modified, and recorded as the deployment progresses.

Additionally, complete the VNX Series Configuration Worksheet, available on the EMC online support website, to provide the most comprehensive array-specific information.

# **Physical setup**

Physical setup includes the following tasks:

- 1. Mount all the hardware.
- 2. Connect power cords and management connectivity to all hardware.
- 3. Perform the initial setup steps for all hardware involved.

# **Preparing Cisco UCS Components**

For information on mounting the hardware, see the *Cisco UCS B-Series Hardware Installation Guide*. Care must be taken about efficient cooling and proper airflow while mounting any equipment in the data center. Similarly, you need to pay attention to power requirements of chassis, servers and fabric interconnects.

Cisco UCS 5108 chassis, including its embedded blade servers and fabric extenders do not require management connectivity as they are managed by the fabric interconnects. Fabric interconnects are deployed in pair for high availability. Both the fabric interconnects require 100 Mbps peer connectivity for synchronizing the management plane between them. In addition, both the FIs require 1Gbps out-of-band management connectivity.

Cisco UCS Manager software runs on the Cisco UCS Fabric Interconnects. The Cisco UCS 6000 Series Fabric Interconnects expand the UCS networking portfolio and offer higher capacity, higher port density, and lower power consumption. These interconnects provide the management and communication backbone for the Cisco UCS B-Series Blades and Cisco UCS Blade Server Chassis. All chassis and the blade servers attached to the interconnects are part of a single, highly available management domain. By supporting unified fabric, the Cisco UCS 6000 Series provides the flexibility to support LAN and SAN

connectivity for all blade servers within its domain right at the configuration time. Typically deployed in redundant pairs, the Cisco UCS Fabric Interconnect provides uniform access to both network and storage, facilitating a fully virtualized environment.

Initial setup steps of Cisco UCS 6248UP Fabric Interconnects and the Cisco UCS Manager are similar to those of the Nexus 5548UP switches:

- 1. Connect the RJ-45 connector of the console cable to the primary fabric interconnect console port.
- **2.** Configure the terminal emulator program on the host to match the following default port characteristics: 9600 baud, 8 data bits, 1 stop bit, and no parity.
- **3.** Choose the CLI based initial setup configuration and provide basic information about the fabric interconnect cluster.
- 4. Connect two fabric interconnects using two 100 Mbps Ethernet cables to create management plane cluster.
- 5. Repeat steps 1, 2 and 3 for the second fabric interconnect. The initial setup for the second fabric interconnect is relatively easier, as it forms a UCS management plane cluster with the pre-configured fabric interconnect, and assumes the role of secondary fabric interconnect.

Cisco UCS 5108 Chassis, Cisco UCS 2204XP Fabric Extenders and UCS B200 M3 blade servers would be part of the Cisco UCS Manager (UCSM) management domain, so no special configuration is required for them.

# **Preparing Cisco Nexus Switches**

Cisco Nexus 5548UP switches are 1RU top of the rack 10Gbps Ethernet and Fibre Channel switches. For information on how to deploy these switches, see *Nexus 5548UP Product Documentation*.

For initial configuration of these switches, follow these steps:

- 1. Connect the RJ-45 connector of the console cable to the Cisco Nexus 5548UP Switch console port.
- **2.** Configure the terminal emulator program on the host to match the following default port characteristics: 9600 baud, 8 data bits, 1 stop bit, and no parity.
- **3.** Type Setup at the switch prompt and follow the menu driven to configure the IP address on the management port and allow ssh to enable remote configuration of the switch.
- 4. Using the RJ-45 cable, connect to the upstream switch/router (or to the infrastructure network switch for managing remotely).

### Preparing EMC VNX5500

For information on mounting the storage array EMC VNX5500 and initial configuration, see the EMC product documentation. Proper connectivity of storage controllers and DAEs are crucial for high availability of the storage.

## **Topology Diagram for 250 Virtual Machines**

Following diagrams show connectivity details cable connectivity of solution covered in this document. At high level, cable connectivity can be divided in two parts:

- 10 Gbps Ethernet cables connectivity
- 8 Gbps Fibre Channel cables connectivity

As it is apparent from the following figure, there are five major cabling sections for the Ethernet connectivity:

- Chassis / fabric interconnect connectivity
- Fabric interconnect / Nexus 5548UP connectivity
- Inter-switch links
- Storage connectivity
- Infrastructure connectivity

Figure 13 Topology Diagram for 250 VMs



Table 10, Table 11 and Figure 14 provides the detailed cable connectivity for the EMC VSPEX 250 virtual machines configuration. Table 10 lists all the device port links from the Cisco Nexus 5548UP Switch perspective. Table 11 lists all the device port links from the Cisco UCS 6248UP Fabric Interconnects.

Table 10	Cabling Details For 250 Vms From Cisco Nexus 5548up Switch Perspective
----------	--

Cable ID	Switch Interface	VLAN	Mode	Speed (Gbps)	Port Channel	Remote Device port
A,C	Eth1/7	All	Trunk	10(D)	1	VPC peer link
B,D	Eth1/8	All	Trunk	10(D)	1	VPC peer link
E,G	Eth1/18	All	Trunk	10(D)	18	Fabric Interconnect (A)
F,H	Eth1/19	All	Trunk	10(D)	19	Fabric Interconnect (B)

Cable ID	Switch Interface	VLAN	Mode	Speed (Gbps)	Port Channel	Remote Device port	
I,J	Eth1/24	40	Access	10(D)	24	VNX5500 - SP A	
K,L	Eth1/25	40	Access	10(D)	25	VNX5500 - SP B	
(not shown)	Eth1/15	1	Trunk	10(D)	-	Uplink to infrastructure network	
(not shown)	Eth1/17	1	Trunk	10(D)	-	Uplink to infrastructure network	

Table 10 Cabling Details For 250 Vms From Cisco Nexus 5548up Switch Perspective





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Cable ID	Fabric Interconnect Interface	VLAN	Mode	Speed (Gbps)	Port Channel	Remote Device port
A,I	Eth1/1	-	Server	10(D)	-	Chassis 1
B,J	Eth1/2	-	Server	10(D)	-	Chassis 1
C,K	Eth1/3	-	Server	1(D)	-	Chassis 1
D,L	Eth1/4	-	Server	1(D)	-	Chassis 1
E,M	Eth1/5	-	Server	1(D)	-	Chassis 2
F,N	Eth1/6	-	Server	10(D)	-	Chassis 2
G,O	Eth1/7	-	Server	10(D)	-	Chassis 2
H,P	Eth1/8	-	Server	10(D)	-	Chassis 2
Q,S	Eth1/18	All	Uplink	10(D)	1	Nexus 5548UP (A)
R,T	Eth1/19	All	Uplink	10(D)	2	Nexus 5548UP (B)
(not shown)	Mgmt0	1	Access	10(D)	-	Uplink to Infrastructure network

Table 11 Cabling details for 250 VMs from Cisco Fabric Interconnect 6248UP perspective

After connecting all the cables as per Table 10 and Table 11, you can configure the switch and the fabric interconnect.

Following are the important points to note:

- There are four 10GE links between UCS 2204XP Fabric Extender and 6248UP Fabric Interconnect.
- A given fabric extender connects to only one fabric interconnect. For example, all links from left fabric extender connect to FI-A and all links from right fabric extender connect to FI-B.
- There are no direct 10GE links between two FIs.
- Each FI connect to both Nexus 5548UP switches. Nexus 5548UP switches have peer 10 GE links, and both switches connect to both storage controllers.

### Fibre Channel connectivity

This solution uses Fibre Channel over Ethernet (FCoE) protocol from UCS B200 M3 servers to UCS fabric interconnects. This reduces number of cables required between fabric interconnect and UCS blade server chassis by half. Native fibre channel cables are required from FIs to Nexus 5548UP switches and from there to storage devices. Use following guideline to connect the fibre channel links:

- The Cisco UCS 6248UP Fabric Interconnects A and B run in fibre channel NPV mode, and so, Cisco UCS FI-A is connected to Cisco Nexus 5548UP A only. Similarly, Cisco UCS FI-B is connected to Cisco Nexus 5548UP B switch only.
- Both the Cisco Nexus 5548UP switches is connected to the EMC VNX Storage Controllers A and B for redundancy.

Connect all the cables as shown in Figure 14 you will be ready to configure Cisco UCS Manager and switches.

### **Configuring Cisco Nexus Switches**

This section explains switch configuration needed for the Cisco solution for EMC VSPEX VMware architectures. For information on configuring password, and management connectivity, see the Cisco Nexus 5000 Series Configuration Guide.

### **Configure Global VLANs and VSANs**

Figure 15 shows how to configure VLAN on a switch.

Figure 15 Creating VLAN

```
UCS-N5k-FabA# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
UCS-N5k-FabA(config)# vlan 40
UCS-N5k-FabA(config-vlan)# name Storage
UCS-N5k-FabA(config-vlan)# exit
UCS-N5k-FabA(config)# exit
UCS-N5k-FabA#__
```

Following VLANs in Table 12 need to be configured on both switches A and B in addition to your application specific VLANs:

VLAN Name	Description			
Storage	VLAN to access storage array from the servers over NFS			
vMotion	VLAN for virtual machine vMotion			
Infra	Management VLAN for vSphere servers to reach vCenter management plane			
VM-Data	VLAN for the virtual machine (application) traffic (can be multiple VLANs)			

Table 12 Configured VLANS on Switch A and B

For actual VLAN IDs of your deployment, see Customer Configuration Data Sheet, page 172. We have used one VSAN in this solution. Table 13 gives the VSAN name and the description.

Table 13 Configured Vsan To Access Storage Array

VSAN Name	Description
Storage	VSAN to access storage array from the servers over fibre channel

For actual VSAN ID of your deployment, see Customer Configuration Data Sheet, page 172. Figure 16 and Figure 17 show the creation of VSAN and assigning VSAN to the fibre channel interface.

Figure	16	Creating	VSAN
UCS-N5k-Fabl# configure termin		line End	
Enter configuration commands, UCS-N5k-FabA(config)# vsan dat	abase	line. End	with CNIL/2.
UCS-N5k-FabA(config-vsan-db)# UCS-N5k-FabA(config-vsan-db)#	vsan 10		
UCS-N5k-FabA(config-vsan-db)# UCS-N5k-FabA(config-vsan-db)#	vsan 10	interface f	c 1/31
UCS-N5k-Fabl(config-vsan-db)# UCS-N5k-Fabl(config-vsan-db)# UCS-N5k-Fabl#		interface f	C 1/32
UCS-NSK-FabA#			

After creating the VSAN. VSAN membership is assigned, and the peer interfaces on the links need to be configured properly, a healthy fibre channel port is shown in Figure 17.

Figure 17	Assigned VSAN Membership
-----------	--------------------------

UCS-N5k-Fak vsan 1 inte			membersh	ip					
fc1/27		fc	1/28						
vsan 10 interfaces: fc1/29 fc1/30 fc1/31 fc1/32									
vsan 4079(6	evfp_is≀	olated_	vsan) in	terfaces					
vsan 4094(:	isolate	d_vsan)	interfa	ces:					
UCS-N5k-Fak	od# sho:	w inter	face fc1,	/29-32 b	rief				
Interface	Vsan		Admin Trunk Mode	Status		SFP	- F	Oper Speed (Gbps)	Port Channel
fc1/29	10	F	on	up		swl	F		
fc1/30	10	F	on	up		swl	F		
fc1/31		F	on	up		swl	F		
· ·	10	F	on	up		swl	F		
UCS-N5k-Fak	oA#								

It is also crucial to enable NPIV feature on the Cisco Nexus 5548UP switches. Figure 18 show how to enable NPIV feature on Nexus 5548UP switches.



UCS-N5k-Fabl# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
UCS-N5k-Fabl(config)# feature npiv
UCS-N5k-Fabl(config)#

### **Configuring Virtual Port Channel (VPC)**

Virtual port-channel effectively enables two physical switches to behave like a single virtual switch, and port-channel can be formed across the two physical switches. Following are the steps to enable vPC:

- 1. Enable LACP feature on both switches.
- 2. Enable vPC feature on both switches.
- 3. Configure a unique vPC domain ID, identical on both switches.
- 4. Configure mutual management IP addresses on both the switches and configure peer-gateway as shown in Figure 19.

1

### Figure 19 Configuring Peer-Gateway



1

id

CS-N5k-Fabl#

5. Configure port-channel on the inter-switch links. Configuration for these ports is shown in Figure 20. Ensure that "vpc peer-link" is configured on this port-channel.

### Figure 20 Configured VPC Peer-link on Port-Channel



- 6. Add ports with LACP protocol on the port-channel using "channel-group 1 mode active" command under the interface sub-command.
- 7. Verify vPC status using **show vPC** command. Successful vPC configuration is shown in Figure 21.

### UCS-N5k-Fabl# show vpc Legend: (\*) - local vPC is down, forwarding via vPC peer-link vPC domain id 101 Peer status : peer adjacency formed ok vPC keep-alive status : peer is alive Configuration consistency status: success Per-vlan consistency status : success Type-2 consistency status primary, operational secondary Number of vPCs configured Peer Gateway : Enabled Dual-active excluded VLANs : Enabled vPC Peer-link status Status Active vlans Port

1,40-41,45

Figure 21 Window Showing Successful vPC Configuration

### **Configuring Port-Channels Connected to Cisco UCS Fabric Interconnects**

Interfaces connected to the fabric interconnects need to be in the trunk mode. Storage, vMotion, infra, and application VLANs are allowed on this port. From the switch side, interfaces connected to Cisco UCS FI-A and Cisco UCS FI-B are in a vPC, and from the FI side the links connected to Cisco Nexus 5548UP A and B switches are in LACP port-channels. Ensure that you give a right description for each port and port-channel on the switch for better diagnosis in case of any problem. Figure 22 shows the configuration commands.

Figure 22 Port-channel Configuration



### **Configuring Storage Connectivity**

From each switch one link connects to each storage processor on the VNX5500 storage array. A virtual port-channel is created for the two links connected to a single storage processor, but connected to two different switches. In this example configuration, links connected to the storage processor A (SP-A) of VNX5500 storage array are connected to Ethernet port 1/26 on both the switches and links connected to the storage processor B (SP-B) are connected to Ethernet port 1/25 on both the switches. A virtual port-channel (id 26) is created for the Ethernet port 1/26 on both the switches and another virtual port-channel (id 25) is created for the Ethernet port 1/25 on both the switches.



The ports are in the access mode since only storage VLAN is required on these ports.

Figure 23 shows the configuration on the port-channels and interfaces.

Figure 23

Configuration of Port-channel and Interfaces



### **Configuring Ports Connected To Infrastructure Network**

Port connected to infrastructure network need to be in trunk mode, and they require at least infrastructure VLAN, N1k control and packet VLANs at the minimum. You may require enabling more VLANs as required by your application domain. For example, Windows virtual machines may need to access to active directory / DNS servers deployed in the infrastructure network. You may also want to enable port-channels and virtual port-channels for high availability of infrastructure network.

### **Verify VLAN and Port-channel Configuration**

At this point of time, all ports and port-channels are configured with necessary VLANs, switchport mode and vPC configuration. Validate this configuration using the "show vlan", "show port-channel summary" and "show vpc" commands as shown in Figure 24.

Note

The ports will be "up" only after the peer devices are configured properly, so you should revisit this subsection after configuring the EMC VNX5500 storage array and Cisco UCS fabric interconnects.

/LAN Name		Status	Ports
40 Storage 41 vMotion 45 VM-DATA VLAN Name 		active active active Status	Po1, Po18, Po19, Po25, Po26 Po1, Po18, Po19 Po1, Po18, Po19 Ports
Primary Secondary		Ports	
Frimary Secondary	туре 		

Figure 24 Validating Created Port-Channels with VLANs

"show vlan" command can be restricted to a given VLAN or set of VLANs as shown in Figure 24. Ensure that on both switches, all required VLANs are in "active" status and right set of ports and port-channels are part of the necessary VLANs.

Port-channel configuration can be verified using "show port-channel summary" command. Figure 25 shows the expected output of this command.

### Figure 25 Verifying Port-Channel Configuration

<pre>UCS-N5k-Fabl# show port-channel summary Flags: D - Down P - Up in port-channel (members) I - Individual H - Hot-standby (LACP only) s - Suspended r - Module-removed S - Switched R - Routed U - Up (port-channel)</pre>										
Grou	ıp Port- Channel	Туре	Protocol	Member Port:	3					
1 18 19 25 26	Po1(SU) Po18(SU) Po19(SU) Po25(SD) Po26(SU)	Eth Eth Eth Eth Eth Eth	LACP LACP LACP LACP LACP LACP	Eth1/1(P) Eth1/18(P) Eth1/19(P) Eth1/25(P) Eth1/26(P)	Eth1/2(P)					

In this example, port-channel 1 is the vPC peer-link port-channel, port-channels 25 and 26 are connected to the storage arrays and port-channels 18 and 19 are connected to the Cisco UCS FI A and B. Make sure that the state of the member ports of each port-channel is "P" (Up in port-channel).



The port may not show "up" if the peer ports are not configured properly.

Common reasons for port-channel port being down are:

- Port-channel protocol mis-match across the peers (LACP v/s none)
- Inconsistencies across two vPC peer switches. Use "show vpc consistency-parameters {global | interface {port-channel | port} <id>} command to diagnose such inconsistencies.

vPC status can be verified using "show vpc" command. Example output is shown in Figure 26.

		Fig	uie 20	vernying vrc 3ta	11.05
UCS-	N5k-FabA# show	vpc			
Lege	nd:				
	(*	) – loca	al vPC is do	wn, forwarding via vl	PC peer-link
vPC	domain id		: 101		
Peer	status		: peer	adjacency formed o	k
vPC	keep-alive sta	itus	: peer	: is alive	
Conf	iguration cons	istency	status: suco	cess	
Per-	vlan consisten	icy stati	is : suco	cess	
Type	-2 consistency	status	: suce	cess	
vPC	role		: prim	mary, operational sec	condary
Numb	er of vPCs con	figured	: 4		
Peer	Gateway		: Enal	oled	
Dual	-active exclud	led VLANs	3 : -		
Grac	eful Consisten	cy Check	: Enal	oled	
VPC	Peer-link stat	us			
id	Port Status	Active			
1	Po1 up	1,40-41			
vPC	status				
id	Port	Status	Consistency		Active vlans
18	 Po18	(up)	success	success	1,40-41
19	Po19	up		success	1,40-41
25	Po25	up		success	40
26	Po26	up	success		40
		Ľ			
UCS-	N5k-FabA#				
		-		DG	

Figure 26 Verifying VPC Status

Ensure that the vPC peer status is "peer adjacency formed ok" and all the port-channels, including the peer-link port-channel status are "up".

### **Configuring QoS**

The Cisco solution for the EMC VSPEX VMware architectures require MTU to be set at 9216 (jumbo frames) for efficient storage and vMotion traffic. MTU configuration on Cisco Nexus 5000 fall under global QoS configuration. You may need to configure additional QoS parameters as needed by the applications. For more information on the QoS configuration, see *Cisco Nexus 5000 Series Configuration Guide*.

To configure jumbo MTU on the Cisco Nexus 5000 series switches, follow these steps on both switch A and B:

- 1. Create a policy map named "jumbo-mtu".
- 2. As we are not creating any specific QoS classification, set 9216 MTU on the default class.
- **3.** Configure the system level service policy to the "jumbo-mtu" under the global "system qos" sub-command.

Figure 27 shows the exact Cisco Nexus CLI for the steps mentioned above.



Figure 27 shows the NXOS interface range CLI to configure multiple interfaces at the same time.

### Configuring Cisco Unified Computing System Using Cisco UCS Manager

We would use web interface of Cisco UCS Manager (UCSM) to configure Cisco Unified Computing System. Cisco Unified Computing System configuration is broadly divided in two parts:

- Global and uplink configuration—Global configuration includes global VLAN and VSAN configuration, uplink Ethernet and Fibre Channel configuration, and server side chassis and blade server related configuration.
- Service profile configuration—Service profile configuration includes definition of various identifier pools, service profile template and instance definitions, and service profile association.

To launch Cisco UCS Manager, access https://<UCSM-Virtual-IP>/. By default, Cisco UCS Manager uses self-signed certificate, and so, browser would give untrusted SSL certificate warning. Ignore the warning and allow the initial Web UI page to load. Click Launch UCSM. A Java applet gets automatically downloaded and the Cisco UCS Manager login page appears. Enter the administrator's username/ password. Provide the right credential and let the Java based Cisco UCS Manager client application run.

### **Configuring VLANs**

To create and configure VLANs, follow these steps:

1. In the Cisco UCS Manager window, select the LAN tab in the left pane, and right-click the VLANs under LAN Cloud as shown in Figure 28. Click Create VLANs.

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Fault Summary	G 🔵 🖬 New	- 🕑 Options	😧 🚯 🖾 Pe	nding Activities	0 Exit			ahaha cisco
2 6 8 5	>> 🗏 LAN 🕨 🤇	🗍 LAN Cloud 🕨 🗮	VLANs					I VLANs
Equipment Servers LAN SAN VM Admin	VLANs							
Filter: All	🔍 Filter 👄 Ex	port 😸 Print						
	Name	ID	Туре	Transport	Native	VLAN Sharing	Primary VLAN Name	C.
	VLAN defa	. 1	Lan	Ether	yes	None		<b>^</b>
						Sav	e Changes ) ( Rese	t Values
A Logged in as admin@10.29.180.5						Syst	em Time: 2012-08-07T	12:08

Figure 28 Creating VLANs

2. Enter the name of the VLAN (name cannot be changed later), VLAN ID and keep the sharing type to be default "None". Click **Ok**.

Figure 29 VLAN Details

🚖 Create VLANs	×
Create VLANs	0
VLAN Name/Prefix: USphereMgmt O Common/Global O Fabric A O Fabric B O Both Fabrics Configured Differently	
You are creating global VLANs that map to the same VLAN IDs in all available fabrics. Enter the range of VLAN IDs.(e.g. "2009-2019", "29,35,40-45", "23", "23,34-45") VLAN IDs: 1	
Sharing Type:  None Primary Isolated	
Check Overlap OK C	ancel

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- 3. A popup window shows the success notification when the VLAN creation is complete.
- 4. Repeat steps 1 to 3 for all the VLANs required. For list of VLANs, see Configuring Cisco Nexus Switches, page 43. Figure 30 shows successful creation of all necessary VLANs.

🛕 Cisco Unified Computing System Manager - V2	250-	UCS							×
Fault Summary		🎯 🍈 🛄 New 🚽 🎴 Optio	ns <table-cell> 🔞 🕕</table-cell>	Pending Activities	0 Exit				(15) (15)
2 2 8 5		>> 📑 LAN + 🙆 LAN Cloud	VLANs						I VLAN
Equipment Servers LAN SAN VM Admin		VLAPS A Filter ⇒ Export ⊗ Print	:						
Filter: Al	U	Name	ID	Туре	Transport	Native	VLAN Sharing	Primary VLAN Name	T.
t e		VLAN Storage (40)	40	Lan	Ether	no	None		
⊡-≡ LAN		VLAN VM-DATA (45)	45	Lan	Ether	no	None		
🛱 🔘 LAN Cloud	11	VLAN default (1)	1	Lan	Ether	yes	None		
🕀 🏧 Fabric A		VLAN vMotion (41)	41	Lan	Ether	no	None		
Gos System Class		VLAN vSphereMgmt (1)	1	Lan	Ether	yes	None		
VLAN Storage (40) VLAN Storage (40) VLAN Vor-DATA (45) VLAN Vor-DATA (45) VLAN Vor-DATA (45) VLAN Vor-DATA (41) VLAN Vor-DATA (41) VLAN Vor-DATA (45) VLAN VOR		Cetails     General Events     Actions     4	Prope	rties 11	117			•	T T
		1					Sav	e Changes Reset V	alues
A Logged in as admin@10.29.180.5							Syst	em Time: 2012-08-07T12	19

### Figure 30 Window Showing all the Created VLANs

### **Configuring VSANs**

1. In the Cisco UCS Manager window, select the SAN tab in the left pane, and right-click the VSANs under SAN Cloud as shown in the Figure 31. Click Create VSAN.

Figure 31

### Creating VSANs



2. Enter the name of the VSAN (name cannot be changed later), enable default zoning, enter the VSAN id and the corresponding FCoE VLAN id. FCoE VLAN id can not be shared with any other VLANs defined from the Ethernet LAN domain.

Figure 32	VSAN Details
Create VSAN	×
Create VSAN	Ø
Name:         BootVsan           Default Zoning:         Disabled         Enabled           © Common/Global         Fabric A         Fabric B         Both	Fabrics Configured Differently
You are creating a global VSAN that maps to the same VSAN ID in all available fabrics. Enter the VSAN ID that maps to this VSAN. VSAN ID: 10	A VLAN can be used to carry FCoE traffic and can be mapped to this VSAN. Enter the VLAN ID that maps to this VSAN. FCoE VLAN: 10

3. A popup window shows the success notification when the VSAN creation is complete.

### **Configure Fibre Channel Uplink Ports**

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Fibre Channel ports on the Cisco UCS FIs are classified as uplink ports by default, but they are under VSAN by default. Click the **SAN** tab in the UCSM window and select the uplink FC interface connected to the Cisco Nexus 5548UP switches. From the drop-down text box for VSAN, select Boot Vsan created in step 2 of Configuring VSANs as shown in Figure 33. Click **Save Changes**. Repeat this for all the uplink FC interfaces on both the Cisco UCS FIs.

Fault Summary		🤤 🛑 🖽 New 🖌 🌛 Options	🛛 🕜 🕕 🖾 Pending Act	tivities 0 Exit								
3 41 7 17		>> 🗮 SAN + 🙆 SAN Cloud +	🚍 SAN > 💪 SAN Cloud > 🚥 Fabric A > 📲 Uplink FC Interfaces > 📲 FC Interface 2/1 🚽									
Equipment Servers LAN SAN /M Admin		General Faults Events										
Filter: Al		Actions	Properties									
• •	=	Enable Interface	ID: 1 Fabric ID: A	Slot ID: 2								
		Disable Interface	User Label:									
🖨 🟉 SAN Cloud			Port Type: Physical	al Network Type: San								
Fabric A				Role: Network								
FC Port Channels			Transport Type: Fc									
Holiok EC Toterfaces			Locale: Externa									
FC Interface 2/1			VSAN: Fabric de	dual/vsan BootVsan (10) 💌								
FC Interface 2/3												
FC Interface 2/4												
FC Interface 2/5												
FC Interface 2/6												
VSANs												
	-			Save Changes	Res							
		L			<u> </u>							
A Logged in as admin@10.29.180.5	T			System Time: 2012-	08-13							

Figure 33 Mapping FC Uplink Ports to Created VSAN

### **Configuring Ethernet Uplink Port-Channels**

Virtual port-channels (vPC) on the Nexus 5548UP switches terminate on the UCS FIs as regular LACP port-channels. Follow these steps to configure uplink port-channels. Note that Ethernet ports on the UCS FIs are classified as "Unconfigured" by default, and need to be classified as uplink or server ports.

 In the Cisco UCS Manager window, click the SAN tab. Expand Fabric A under LAN Cloud on the left pane of the Cisco UCS Manager window. Right-click on Port Channels. Click Create Port Channel to create port-channels on FI-A as shown in Figure 34.

Fault Summary	G 💿 🖬 New	🔹 🚽 🛃 Options 🛛 😢	●   ▲ Pending Activities	0 Exit		ahah cisco
0 4 8 5	>> ≡ LAN ► ( Port Channels	-	abric A 🕨 👄 Port Channels			⊕ Port Channels
VLANS Fabric B QOS System Class Create Por LAN Pin Groups S Threshold Policies VLANS Appliances Internal Fabric A S Threshold Policies S Policies Policies Policies Policies	ts Manager	ilter 👄 Export 🛞 Pr Fabric ID	int If Type	If Role	Transport	
LAN Cloud     D S Threshold Policies	-				Save Changes	Reset Values
A Logged in as admin@10.29.180.5					System Time: 2012-	08-07T12:02

Figure 34 Creating Port-Channel

 Enter port-channel ID in the ID field and enter the port-channel name in the Name field (optional). Port-channel ID has local significance, so it can be different from the vPC or port-channel ID configured on the Cisco Nexus 5548UP switches. Click Next.



Figure 35 Port-Channel Details

3. Select the ports that must be added as ports in the port-channel and click Finish.

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### Figure 36 Adding Ports to the Port-Channel X A Create Port Channel Computing System Manager Unified Add Ports 0 Create Port Channel 1. VSet Port Channel Name 2. VAdd Ports Ports in the port channe ₽ ₽ Slot ID Port MAC Slot ID Port MAC 18 00:0D:EC:F7:04:19 00:0D:EC:F... 12 19 00:0D:EC:F7:04:1A 13 00:0D:EC:F... >>14 00:0D:EC:F... 15 00:0D:EC:F... << 00:0D:EC:F... 16 17 00:0D:EC:E... 20 00:0D:EC:F... < Prev Next > Finish Cancel

- 4. A popup window showing success notification will appear when the port-channel is created.
- Port-channels are disabled by default in Cisco UCS Manager. To enable it, select the created port-channel and click Enable Port Channel link under Actions on the right pane of the Cisco UCS Manager window as shown in Figure 37.





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- 6. A popup window appears to confirm enabling of port-channels. Click Yes in the popup window.
- 7. Make sure that the Overall status is showing "UP" for all the port-channels.

🛕 Cisco Unified Computing System Manager - V	250-UCS	
Fault Summary	Image: Second	
Equipment Servers LAN SAN VM Admin		
Filter: All	Status       Overal Status: <ul> <li>Up</li> <li>Additional Info:</li> <li>Rectoring</li> <li>Enable Port Channel</li> <li>Rectoring</li> <li>Rectoring</li></ul>	

Figure 38 Overall Status of all the Port-Channels

8. Repeat the steps 1 to 7 for "Fabric B" to create port-channel on FI-B.

### **Chassis and Server Discovery**

After configuring uplink connectivity and global VLANs and VSANs, we need to configure server side connectivity for chassis and server discovery steps.

When the initial configuration in Cisco UCS Manager is completed through the serial console, the cluster state of the Cisco UCS Manager remains as "HA Not Ready" as shown in Figure 39. This is because there is no shared storage between two fabric interconnects due to lack of blade server chassis configuration on the UCS domain. Upon configuring two chassis in this solution, the HA state of the Cisco UCS Manager would transition to "HA Ready".

Figure 39 Cluster State of Cisco UCS Manager



As this solution requires 25 VMs per server, we need 32 dynamic VNICs, two static VNICs and two more VHBAs per server, we need four links between Cisco UCS Fabric Interconnects and Cisco UCS Fabric Extenders. The default chassis discovery policy supports one link between chassis and FI, so, we need to change the chassis discovery policy to "4 Link".

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To change chassis discovery policy, click the **Equipment** tab in the Cisco UCS Manager window, expand the Equipment tree root, and select the **Policies** tab on the right pane of the Cisco UCS Manager window as shown in Figure 40. Select the option "4 Link" from the "Action" drop down list in the "Chassis Discovery Policy" and click **Save Changes**.

📥 Cisco Unified Computing System Manager - V2	50-UCS	-				
Fault Summary	Ġ 🍏 🖪 New -	🛛 🔛 Options 🛛 😗 🕕 💧 Mending A	ctivities   🧿 Exit			alialia cisco
	>> 👸 Equipment					Equipment
Equipment Servers LAN SAN VM Admin	/ Thermal	Main Topology View	1	Example Anterconnects Television Frances Television Francesco Fran	S Policies	Servers
Filter: All		utoconfig Policies Server Inheritance Pol	1 1111	-	Iž	A Pauls
	Chassis Disco Link Grouping P Rack Server I	Action: 4 Link Preference: 0 None 0 Port Channel Discovery Policy 0 Immediate 0 User Acknowledged			Save Changes	E Reset Values
Logged in as admin@10.29.180.5		C Retrieving	data		System Time: 2012-0	)8-07T11:44 .:

Figure 40 Changing Chassis Discovery Policy Settings

### **Marking Server Ports**

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After changing chassis discovery policy, next step is to classify interfaces connected to fabric extender as server ports on the fabric interconnect. Follow these steps for the same:

1. In the Cisco UCS Manager window, click the **Equipment** tab, expand "Fabric Interconnect A", expand "Fixed Module", and then expand "Unconfigured Ethernet Ports". Select the port that needs to be configured as the server port. On the right pane of the Cisco UCS Manager window, click the **Configure as Server Port** link as shown in Figure 41.



Figure 41 Selecting Port to Configure as Server Port

- 2. Click Yes in the confirmation popup window.
- **3.** A success notification popup window appears when the port gets marked as a server port. Make sure that the "Overall Status" of the port shows "Up" as shown in Figure 42.



Figure 42

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**Overall Status of the Configured Port** 

4. Repeat steps 1 to 3 for all the ports on FI-A and FI-B. Totally 16 ports will be marked as server ports.

When all the server ports are configured, Cisco UCS Manager will auto-discover the chassis connected to the Cisco UCS Fabric Interconnects. Chassis objects will show up under the **Equipment** tab in Cisco UCS Manager, and upon successful deep discovery of chassis, the "Overall Status" of the chassis will change to "Operable" as shown in Figure 43. Also ensure that the two IOMs (Fabric Extenders) are listed under each chassis by expanding the individual chassis.



When the chassis is discovered, deep discovery of the embedded Cisco UCS B200 M3 Blade Servers would also get started. You can see the progress of the Blade Server discovery FSM. To see the discovery status, expand Chassis, expand Servers, select the required server and then click the **FSM** tab on right pane of the Cisco UCS Manager window as shown in Figure 44.



🛕 Cisco Unified Computing System Manager -	V250-	-UCS
Fault Summary		🕒 🏐 🗈 New 🥆 🛃 Options   🔗 🕕   📥 Pending Activities   🔟 Exit
0 4 7 4		>> 🚰 Equipment > 🗐 Chassis > 🗐 Chassis 1 (VSPEX-V2S0) > 🥪 Servers > 🛶 Server 1 General Inventory Virtual Machines Installed Firmware SEL Logs   VIF Paths   Faults   Events   FSM   Statistics   Temperatures
Equipment Servers LAN SAN VM Admin		FSM Status: Nop Retry #: 0
🛨 🗖		Current Stage Description: Description:
Chassis Chassis Chassis (VSPEX-V250) Chassis (VSPEX-V250) Chassis (VSPEX-V250) Chassis Chassis (VSPEX-V250) Chassis Chass	H	Status of Last Operation: Discover Success Named Invocation Error Code: None Remote Invocation Description:
Server 2 (VS0-ESXHorb3)     B		Progress Status: Scheduled FSM Tasks
Grassis 2 (VSPEX-V250)     Grassis		Completion FSM Flags
PSUs	-	
Logged in as admin@10.29.180.5		

When deep discovery of the server is complete, the "Status of Last Operation" will change to "Discover Success" and "Progress Status" will reach 100%. The success notification of the server discovery will also show up and "Overall Status" becomes "Unassociated" in the **General** tab of Cisco UCS Manager.

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### Figure 43

Change in the Overall Status of the Chassis



### **QoS Configuration**

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We need to configure system QoS classes and vNIC in QoS policies, which plays part in the end-to-end jumbo MTU configuration of the solution. Follow these steps to configure QoS on the Cisco UCS Manager:

 In the Cisco UCS Manager window, click the LAN tab, expand LAN Cloud and click QoS System Class. On the right panel in the Cisco UCS Manager window, check the check box to enable "Platinum" and "Gold" classes, and keep the weight at "5" for all the classes. Set the MTU of both of these classes at 9216 bytes to support jumbo MTU as shown in Figure 46. Click Apply Changes.

📥 Cisco Unified Computing System M	anager - ¥250-UCS							_ 🗆 ×
Fault Summary	G 💿 🖬 New	- 🛛 🖓 👓	tions 🛛 🕜	0 APen	ding Activities 📗 🚺 🗉	×it		aliali cisco
1 7 9 6	>> 🔳 LAN + 🙆 L	AN Cloud 🕨	👬 QoS Sy	stem Class				🙀 Qo5 System Class
Equipment Servers	General Events F	SM						
LAN SAN VM Admir	Priority	Enabled	Co5	Packet Drop	Weight	Weight (%)	MTU	Multicast Optimized
	Platinum	<b>V</b>	5	Γ	5	- 25	9216	• [
	Gold	▼	4		5	25	9216	• •
E IAN	Silver		2	V	8	▼ N/A	normal	•
E-BI Fabric A	Bronze		1		7	N/A	normal	•
E-E Fabric B	Best Effort	$\overline{\mathbf{v}}$	Any		5	- 25	normal	•
EAN Pin Groups	Fibre Channel		3		5	- 25	fc	▼ N/A

### Figure 46 Enabling Classes in Cisco UCS Manager

To configure QoS policies, in the Cisco UCS Manager window click the LAN tab, expand "Policies" and then expand "root". Right-click the QoS Policies. Click Create QoS Policy as shown in Figure 47.

Figure 47





**3.** In the name field enter the name as "vMotion" of the Create QoS Policy window, and select the priority as "Platinum" from the drop-down list. Do not modify any other parameters and click **Ok** as shown in Figure 48.

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### Figure 48

Details to Create QoS Policies

	te Qos Po te Qo	olicy oS Policy				×
Name: Egre:	vMotior ss	η 			L	
Burd	Priority: t(Bytes):	Platinum		•		
	:e(Kbps):					
Host	Control:	💿 None 🔿 Full				
			_		ОК	Cancel
				D		

**4.** Repeat step 3 for creating another QoS policy with the name "NFS" and "Gold" as the priority as shown in Figure 49.



🗼 Create Qo5 Policy	×
Create QoS Policy	0
·····	
Name: NFS	
Egress	
Priority: Gold	
Burst(Bytes): 10240	
Rate(Kbps): line-rate	
Host Control: • None • Full	
	DK Cancel

These QoS policies would be used in the port-profiles created at a later point during the solution deployment.

# **Configuring Identifier Pools**

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As described in the "Stateless Computing" section of the "Architectural Overview", Service Profile - a logical representation of the server – includes various identities. Best way to manage various identities is to configure identifier pools. We will begin with defining external management IP address pool for the servers. Most common use of external management IP address of the server is launch of KVM of the server. KVM also includes virtual CD-ROM media launch, which we would use at later point in deployment of this solution.

### **Configuring external management IP address pool**

An IP address pool named "ext-mgmt" is predefined in Cisco UCS Manager. Follow these steps to populate the pool with IP addresses for the out-of-band management of the Cisco UCS B200 M3 blade servers.

Click the Admin tab on the left pane of Cisco UCS Manager, select "Communication Management" filter from the drop-down list. Expand the Communication Management and click Management IP Pool (ext-mgmt). On the right pane of the Cisco UCS Manager window, under the "Actions" area, click Create Block of IP Addresses link as shown in Figure 50.

Figure 50 Creating Block of IP Addresses for the Pool

🛕 Cisco Unified Computing System Manager -	/250-UCS	
Cisco Unified Computing System Manager - Fault Summary 0 4 8 4 Equipment Servers LAN SAN M Admin Filter Communication Management	Image: Second	dudi- ctroo
Communication Management Communication Services Communication Services Uns management Management Interfaces	Description: Size: 0 Assigned: 0	Save Changes Reset Values
B Logged in as admin@10.29.180.5		System Time: 2012-08-08T09:43

2. In the "Create Block of IP Addresses" wizard, provide the start of the IP addresses range and specify the size of the pool. You need at least 10 IP addresses, but you may want to provide larger number for the future expansion. Also provide "Subnet Mask" and "Default Gateway" associated with the IP addresses as shown in the Figure 51. Click Ok.

Figure 51 Entering Parameters to Create Block of IP Addresses

D	30 V
D	30 💌
D	30 🛬
0	
10.29.180.1	_
	OK Cancel
(	10.29.180.1

- 3. A pop-up window appears showing successful completion of creating a block IP addresses.
- **4.** To see the out-of-band external management IP address, click the **IP Addresses** tab in the right pane to see the assigned IP addresses as shown in Figure 52.

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Fault Summary	Â	9 🔍 🗖	New 🔻	Options (	🛛 🕕 🖾 Pendir	ig Activities	Exit		alta CISC
0 4 7 4 Equipment Servers LAN SAN VM Admin Filter: Communication Management		-0	P Addre	sses I Blocks	<ul> <li>Management</li> <li>Events</li> </ul>	: IP Pool (ex	it-ngmt) 🧱 Managem	ent IP Pool (ext-	·mgmt)
	Ξ	IP Address		Subnet	Default Gateway	Assigned	Assigned To	Prev Assi	2
* =		10.29.1	80.221	255.255.255.0	10.29.180.1	no			-
Communication Management		10.29.1	80.222	255.255.255.0	10.29.180.1	no			
		10.29.1	80.223	255.255.255.0	10.29.180.1	no			E.
<ul> <li>Communication Services</li> <li>DNS Management</li> </ul>		10.29.1	80.224	255.255.255.0	10.29.180.1	no			-
Management IP Pool (ext-mgmt)		10.29.1	80.225	255.255.255.0	10.29.180.1	no			
Management Interfaces		10.29.1	80.230	255.255.255.0	10.29.180.1	no		1	
-		10.29.1		255.255.255.0	10.29.180.1		sys/chassis-1/blade-1/mgmt/ipv4-pooled-addr	sys/chass	
		10.29.1	80.219	255.255.255.0	10.29.180.1	yes	sys/chassis-1/blade-2/mgmt/ipv4-pooled-addr	sys/chass	
		MBN 10.29.1 ∢	80.209	255.255.255.0	10.29.180.1	ves III	sys/cbassis-1/blade-3/mont/inv4-nonled-addr	sysichass *	
4	-						Save Changes	Reset Valu	es
* Rugged in as admin@10.29.180.5	1			1			System Time: 201	2-08-08T09:47	

### Figure 52 List of Assigned IP Addresses

### **Configure UUID Pool**

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Follow these steps to create B200 M3 servers' BIOS UUID pool:

1. In the Cisco UCS Manager window, click the **Servers** tab, expand "Pools" and right-click on "UUID Suffix Pools" as shown in Figure 53. Click **Create UUID Suffix Pool**.

Fault Summary		itions 🛛 🕜 🕕 🖾 Pending Ad	Hotlac 6 Eve		
0 4 7 4		s 🔸 🙏 root 🔸 🎆 UUID Suffix P	pols		
Equipmen: Servers AN SAN VM Admin	UUID Suffix Pools				
	🕒 🖃 🕰 Filter 👄 Exp	port 🗞 Print			
Filter: Al	Name	Pool Name	UUID Prefix	From	То
• •		default	C2833354-12A8-11DF		
⊕ ∰ Schedules UUI Suffi ⊕ ∰ Schedules Create UUI	r Pools D Suffix Pool				Save Changes
	U			1	Curber Time 2011
A Logged in as admin@10.29.180.5					System Time: 2012

Figure 53 Creating UUID Suffix Pool

**2.** Enter the UUID pool name in the Name field and description in the description field (optional) as shown in Figure 54. Keep the prefix as "Derived" which is the default option. Click **Next**.



3. Click Add in the "Add UUID Blocks" window as shown in Figure 55.

Adding UUID Blocks

### 🛕 Create UUID Suffix Pool X **Computing System Manage** Unified Add UUID Blocks 0 Create UUID Suffix Pool 1. VDefine Name and Description **₽** Name То 2. √<u>Add UUID Blocks</u> From 🕂 Add Finish Next > < Prev Cancel

Figure 55

4. Enter the beginning of the UUID block range and the size of the UUID block as shown in Figure 56. You need at least 10 UUIDs in the pool, but you may want to keep larger size considering future expansion. Click **Ok** and click **Finish**.

I

# Create a Block of UUID Suffixes Create a Block of UUID Suffixes From: 600D-00000000001 Size: 20

### Figure 56 Entering Parameters to Create a Block of UUID Suffixes

5. A pop-up window appears showing successful completion of creating a block of UUID suffixes.

### **Configure MAC Address Pools**

For each ESXi host in the solution, we would need two vNIC cards, so we need at least 20 unique MAC addresses defined in a MAC address pool. Follow these steps to create MAC address pool.

1. In the Cisco UCS Manager window, click the LAN tab, expand "Pools" and right-click on "MAC Pools" and click **Create MAC Pool**.



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### Figure 57 Creating MAC Address Pool

2. Enter the MAC address pool name in the Name field and description in the description field (optional) as shown in Figure 58. Click Next.

Unified Computing System Manager	I	Figure 58	Entering Details fo	or Creating MA	AC Add
1. √ Set MAC Pool Name     2. □ Add MAC Addresses       Name:     V250-MACs	Unified Co	omputir	ng System	Manag	eı
2. DAdd MAC Addresses Name: V250-MACs	Create MAC Pool	Set MAC Po	ol Name	(	0
		Name: <b>¥250-M</b>	ACs		
				re	
<pre></pre>					

3. Click Add in the "Add MAC Addresses" window as shown in Figure 59.

Adding MAC Addresses

Unified Co	omput	ting Syste	em Man	agei
Create MAC Pool	Add MAC	Addresses		0
2. √ <u>Add MAC Addresses</u>	Name	From	То	<b>F</b>
		Add Pe	lete	<b>•</b>
		< Prev N	ext > Finish	Cancel

4. Enter the beginning of the MAC addresses block range and the size of the MAC addresses block as shown in Figure 60. You need at least 20 MAC addresses in the pool, but you may want to keep larger size considering future expansion. Also note that to ensure uniqueness of MAC addresses across the data center, OUI part of the MAC address must be kept 00:25:B5. Click **Ok** and click **Finish**.



Figure 59

### Entering Parameters to Create a Block of MAC Addresses

🛕 Create a Block of MAC Addresses	<b></b>
Create a Block of MAC Addresses	0
First MAC Address: 00:25:85:60:0D:00 To ensure uniqueness of MACs in the LAN fabric, you are strongly encouraged to use the following MAC prefix: 00:25:85:xx:xx:x	Size: 0 💭
	OK Cancel

5. A pop-up window appears showing successful completion of creating a block of MAC Addresses.

### **Configuring WWNN Pool**

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Each ESXi host requires a unique Fibre Channel World Wide Node Name (WWNN), so we need at least 10 unique WWNN addresses defined in a WWN address pool. Follow these steps to create WWNN address pool.

1. In the Cisco UCS Manager window, click the SAN tab, expand "Pools" and right click on "WWNN Pools" and click **Create WWNN Pool**.



Figure 61 Creating WWNN Pool

2. Enter the WWNN address pool name in the Name field and description in the description field (optional) as shown in Figure 62. Click Next.

Figure 62

A Create WWNN Pool	
Unified C	omputing System Manager
Create WWNN Pool	Define Name and Description @
2. Add WWN Blocks	
	Name: U250-Node-WWNs
	Description: Description:
	<pre></pre>

3. Click Add in the "Add WWNN Blocks" window as shown in Figure 63.

**Entering Details for Creating WWNN Address Pool** 

1

A Create WWNN Pool	_			×
Unified C	Comput	ing System	n Manage	r
Create WWNN Pool	Add WWN	Blocks		0
1. √ <u>Define Name and</u>				
2. √ <u>Add WWN Blocks</u>	Name	From	То	Ę
				•
		Add 💼 P	elete	
		< Pre	v Next > Finish	Cancel

Figure 63 Adding WWNN Blocks

4. Enter the beginning of the WWNN addresses block range and the size of the WWNN addresses block as shown in Figure 64. You need at least 10 WWNN addresses in the pool, but you may want to keep larger size considering future expansion. Also note that to ensure uniqueness of WWNN addresses across the data center, prefix of the WWNN address must be kept 20:00:00:25:b5. Click Ok and click Finish.

### Figure 64 Ente

**Entering Parameters to Create WWNN Block** 



**5.** A pop-up window appears showing successful completion of creating a WWNN pool.

### **Configuring WWPN Pool**

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Each ESXi host in this solution has two vHBAs. Each vHBA requires a unique Fibre Channel World Wide Port Name (WWPN), so we need at least 20 unique WWPN addresses defined in a WWN address pool. Follow these steps to create WWPN address pool.

1. In the Cisco UCS Manager window, click the SAN tab, expand "Pools" and right click on "WWNN Pools" and click Create WWPN Pool.



### Figure 65 Creating WWPN Pool

2. Enter the WWPN address pool name in the Name field and description in the description field (optional) as shown in Figure 66. Click Next.

	Figure 66	Entering Details	for Creating	WWPN Ad	dress Po
🛕 Create WWPN Pool	-				×
Unified C	Computi	ng Syster	n Mana	iger	
Create WWPN Pool 1. √Define Name and	Define Name and Description				0
2. Add www.Blocks					
	Name: U250-Pc	nt-WWNs			
	Description: Description:	WWPNs for ¥250 architectu	re		
		<	Prev Next >	Finish	lancel

3. Click Add in the "Add WWPN Blocks" window as shown in Figure 67.

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1



Adding WWNN Blocks

A Create WWPN Pool				×
Unified C	comput	ting System	n Manage	r
Create WWPN Pool	Add WWN	Blocks		0
<ol> <li>✓<u>Define Name and</u> Description</li> </ol>				
2. √ <u>Add WWN Blocks</u>	Name	From	То	Ę
				*
				-
		Add 👕 P	elete	
		< Pre	w Next > Finish	Cancel

4. Enter the beginning of the WWPN addresses block range and the size of the WWNPN addresses block as shown in Figure 68. You need at least 10 WWPN addresses in the pool, but you may want to keep larger size considering future expansion. Also note that to ensure uniqueness of WWPN addresses across the data center, prefix of the WWNN address must be kept 20:00:00:25:b5. Click **Ok** and click **Finish.**
#### Figure 68 Entering Parameters to Create WWPN Block



**5.** A pop-up window appears showing successful completion of creating a WWPN pool.

# **Create Service Profile Template**

After configuring all necessary pools, next step is to define Service Profile Template. Given that all ten B200 M3 Blade Servers have identical ESXi 5 hypervisor configuration, Service Profile Template is the most convenient approach. Follow these steps to configure service profile template.

1. In the Cisco UCS Manager window, click the **Servers** tab, expand "Service Profile Templates", right-click on "root" and click **Create Service Profile Template** as shown in Figure 69.



#### Figure 69 Creating Service Profile Template

**2.** In the "Create Service Profile Template" wizard, enter the name of Service Profile Template. select the type as "Updating Template", select the name of UUID pool created in previous section from the "UUID Assignment" drop down list and enter description (optional) as shown in Figure 70.

Figure 70

Unified C Create Service Profile Template 1. √ Identify Service Profile Template 2. □ Storage 3. □ Networking	Computing System Manager         Identify Service Profile Template         You must enter a name for the service profile template and specify the template type. You can also specify how a UUID will be assigned to this template and enter a description.         Name:       V250-Host-Template
A. Development     A. Development     Alternative     Additional Placement     Additional Policy     Additional Policies	The template will be created in the following organization. Its name must be unique within this organization. Where: org-root The template will be created in the following organization. Its name must be unique within this organization. Type: Initial Template Industry Outputs Integrate
	Specify how the UUID will be assigned to the server associated with the service generated by this template. UUID UUID Assignment: V250-UUIDs(20/20)  The UUID will be assigned from the selected pool. The available/total UUIDs are displayed after the pool name.
	Optionally enter a description for the profile. The description can contain information about when and where the service profile should be used.  An updating template for ESX hosts in the V2SO architecture
	< Prev Next > Finish Can

Identify Service Profile Template Window

**3.** In the "Storage" window of the wizard, click **Expert** radio button for SAN connectivity and name of the WWNN pool created in previous step for the "WWNN Assignment" drop-down list as shown in Figure 71. Click **Add** to add vHBAs.

1

e Service Profile Template	Storage Optionally specify disk policies and SAN configuration information.
Template         2. X_Storage         3. Networking         4. VAIC/VHBA Placement         5. Server Boot Order         6. Maintenance Policy         7. Server Assignment         8. Operational Policies	Select a local disk configuration policy. Local Storage: Select Local Storage Policy to use If nothing is selected, the default Local Storage configuration policy will be assigned to this service profile. Create Local Disk Configuration Policy
	How would you like to configure SAN connectivity? Simple © Expert No vHBAs A server is identified on a SAN by its World Wide Node Name (WWNN). Specify how the system should assign a WWNN to the server associated with this profile. World Wide Node Name WWNN Assignment: V250-Node-WWNIs(15/15)
	The WWNN will be assigned from the selected pool. The available/total WWNNs are displayed after the pool name.

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Figure 71 Storage Window of the Create Service Profile Template Wizard

**4.** Enter the name for the vHBA ("fc0" in this example), select WWPN pool name created in the previous step from the "WWPN Assignment" drop down menu. Keep fabric ID "A", select the VSAN for the vHBA by drop down names menu and change adapter policy to "VMware" as shown in Figure 72. Click **Ok**.

-		
Name: fc0 o se SAN Connectivity Template:	World Wide Port Name WWPN Assignment: V250-Port-WWNs(30/30)	
Create vHBA Template	Create WWPN Pool The WWPN will be assigned from the selected pool. The available/total WWPNs are displayed after the pool name.	
Fabric ID:       A       B         Select VSAN:       BootVsan       Image: Create VSAN:         Pin Group: <not set="">       Image: Create Si         Persistent Binding:       Image: Disabled       Enabled         Max Data Field Size:       2048</not>		
Operational Parameters	8	
dapter Performance Profile Adapter Policy: VMWare QoS Policy:		

Figure 72 Creating vHBA on Fabric A

**5.** Repeat step 3, and step 4 to add vHBA on fabric B as shown in Figure 73. When second vHBA is added, click **Next** in the wizard.

1

Name: fc1	World Wide Port Name
e SAN Connectivity Template:	WWPN Assignment: V250-Port-WWNs(30/30)
Create vHBA Template	Create WWPN Pool The WWPN will be assigned from the selected pool. The available/total WWPNs are displayed after the pool name.
Fabric ID: A  BootVsan Fin Group: <not set=""> Pin Group: <not set=""> Persistent Binding: Disabled Enabled Max Data Field Size: 2048</not></not>	VSAN SAN Pin Group
Operational Parameters	8
dapter Performance Profile	annel Adapter Policy cy

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Figure 73 Creating vHBA on Fabric B

6. In the "Networking" window of the wizard, choose "Create a Specific Dynamic vNIC Connection Policy" from the drop-down list for "Dynamic vNIC Connection Policy". This will provide many options to configure various parameters of the dynamic vNIC connection policy. Enter "32" as number of dynamic vNICs (this is because we would have 25 VMs per hypervisor, 3 vmknic interfaces of hypervisor, and 4 additional dynamic VNICs for high-availability, if one of the hypervisor goes into maintenance mode and its load is distributed across 9 other hypervisors), select "VMware" for the adapter policy from the drop-down list, and keep the "Protection" radio button as **Protected** (this will provide fabric fail-over capability for dynamic vNICs). Click **Expert** radio button for LAN connectivity as shown in Figure 74, and click **Add** to add a (static) vNIC.



7. Enter the vHBA name ("eth0" in this example) in the name field, select name of the MAC pool created in the previous section from the "MAC Address Assignment" drop-down list, keep fabric ID as "A" and select "VMware" as "Adapter Policy" from the drop-down list as shown in Figure 75. As the static vNICs will be used only for ESXi host's management and vCenter/ ESXi host communication through standard vSwitch on the hypervisor, you need to choose only vSphere Management (infra) VLAN for the allowed VLANs on the vNIC. Make sure that Native VLAN radio button is selected for this VLAN as shown in Figure 75. Click Ok.

I

Iame: eth0   Iame: eth0   Image: Image:   Image: Imag	ana ath0		MAC Address			
Create VAIC Template  The MAC address will be automatically assigned from the selected pool.  The MAC address will be automatically assigned from the selected pool.   VANS Select Name Native VLAN  VI. Storage VM-DATA  MTU: 1500  Pro Group: Create VLAN  MTU: 1500  Pro Group: Create LAN Pin Group  Coperational Parameters  Comparisonal Parameter  Comparisonal Parameter  Comparisonal Parameter  Comparisonal Parameter  Create Ethernet Adapter Policy: Create Policy: Comparisonal Parameter  Comparisonal Paramet	0	er	MAC Address As	signment: V250-MACs(30	/30)	•
Create VNIC Template   The MAC address will be automatically assigned from the selected pool.   abric ID:   Fabric A Fabric B Enable Failover   VLANs   Select   Name   Native VLAN   Storage   Storage   VM-DATA   Workion   Wrdetion   Treate VLAN   Tu:   To create LAN Pin Group:   Operational Parameters   Adapter Policy:   MWWare   Create Ethernet Adapter Policy			Create MA	C Roal		
abric ID: Fabric A Fabric B Enable Failover          VLANs         Select       Name         Storage       •         ·       VM-DATA         ·       ·         · </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>						
VANs   Select   Storage   VM-DATA   VM-DATA   widioion   widioion   vysphereMgmt	Create vNIC Template		The MAC addre	ss will be automatically ass	igned from the selected	d pool.
VANs   Select   Storage   VM-DATA   VM-DATA   widioion   widioion   vysphereMgmt						
VANs   Select   Storage   VM-DATA   VM-DATA   widioion   widioion   vysphereMgmt						
VLANs   Select   Storage   VM-DATA   VM-DATA   WMotion   WMotion   Vy-SphereMgmt						
VLANs   Select   Storage   VM-DATA   VM-DATA   WMotion   WMotion   Vy-SphereMgmt	abric ID: 💿 Eabric A 🔿	Eabric B	ble Failover			
Select Name Native VLAN  Storage Storage VM-DATA VM-DATA VSphereMgmt VsphereMg						
	VLANs					
	Select	Name		Native VLAN	Ē	
	Jeiect					
		-			^ ^	
Image: Second					E	
Create VLAN MTU: 1500 Pin Group: <not set=""> Create LAN Pin Group Operational Parameters  Adapter Performance Profile  Create Ethernet Adapter Policy</not>			amt			
MTU: 1500 Pin Group: <pre> Create LAN Pin Group Operational Parameters S Implement Performance Profile Create Ethernet Adapter Policy </pre>						
Pin Group: <not set="">  Create LAN Pin Group Operational Parameters  Iapter Performance Profile  Adapter Policy: VMWare  Create Ethernet Adapter Policy</not>						
Pin Group: <not set="">  Create LAN Pin Group Operational Parameters  Iapter Performance Profile  Adapter Policy: VMWare  Create Ethernet Adapter Policy</not>	🛨 Create VLAN					
Operational Parameters S						
Operational Parameters S						
Adapter Performance Profile	MTU: 1500	🔻 🕂 Cre	ate LAN Pin Group			
Adapter Policy: VMWare	MTU: 1500 Pin Group: <a href="https://www.setsup-action.org">https://www.setsup-action.org</a>		ate LAN Pin Group			
Adapter Policy: WMWare	MTU: 1500 Pin Group: <a href="https://www.sets-and-comp-10-14-14-14-14-14-14-14-14-14-14-14-14-14-&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;ate LAN Pin Group&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;td&gt;8&lt;/td&gt;&lt;td&gt;&lt;/td&gt;&lt;/tr&gt;&lt;tr&gt;&lt;td&gt;Adapter Policy: VMWare&lt;/td&gt;&lt;td&gt;MTU: 1500&lt;br&gt;Pin Group: &lt;a href=" https:="" td="" www.sets-and-comp-10-14-14-14-14-14-14-14-14-14-14-14-14-14-<=""><td></td><td>eate LAN Pin Group</td><td>_</td><td>8</td><td></td></a>		eate LAN Pin Group	_	8	
	MTU: 1500 Pin Group: <not set=""> Operational Parameter</not>	·5	ate LAN Pin Group	_	۲	
OoS Policy < Oot set > T Create OoS Policy	MTU: 1500 Pin Group: <not set=""> Operational Parameter</not>	·5	ate LAN Pin Group	_	8	
	MTU: 1500 Pin Group: <not set=""> Operational Parameter</not>	's file		rnet Adapter Policy	۲	

Figure 75 Adding vNIC on Fabric A

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8. Repeat step 6 to add vNIC on Fabric B as shown in Figure 76. Click Next.

reate vNIC					(
Name: eth1 O se LAN Connectivity Templa	te:	MAC Address A	ssignment: V250-MACs(3	0/30)	•
🕂 Create vNIC Template		_	ess will be automatically as	signed from the selec	ted pool.
Fabric ID: Fabric A	Fabric B 📃 Enal	ble Failover			
Select	Name Storage		Native VLAN	<b></b>	
	VM-DATA				
	vMotion			E	
	vSphereMç	gmt	۲		
🛨 Create VLAN					
MTU: 1500					
	🔻 🚺 Cre	ate LAN Pin Group			
MTU: 1500		ate LAN Pin Group	_	8	
MTU: 1500 Pin Group: <a href="https://www.setsup-ic.action.com">https://www.setsup-ic.action.com</a>		ate LAN Pin Group	_	8	
MTU: 1500 Pin Group: <not set=""> Operational Paramete</not>	:rs	bate LAN Pin Group	_	۲	
MTU: 1500 Pin Group: < <u>not set&gt;</u> Operational Paramete	ers ofile		met Adapter Policy	8	
MTU: 1500 Pin Group: <not set=""> Operational Paramete</not>	ofile Ware		met Adapter Policy Policy	8	

## Figure 76 Adding vNIC on Fabric B

- 9. Do not change the settings in vNIC/vHBA Placement window of the wizard. Click Next.
- 10. In the "Server Boot Order" window of the wizard, click the Create Boot Policy link.
- Enter the boot policy name in the "Name" field, check both check boxes as shown in Figure 77 and click Add CD-ROM radio button under "Local Devices" to choose it as 1st order for boot. Click Add SAN Boot radio button under "vHBAs" on the left pane of the "Create Boot Policy" window.

1

Figure 77 Create Boot Policy Window

Create Boot Policy				-	-	
Create Boot Policy						
Name: SAI Description: Reboot on Boot Order Change: V Enforce vNIC/vHBA/ISCSI Name: V WARNINGS:	N-Boot		_			
The type (primary/secondary) does nr The effective order of boot devices w If Enforce vNIC/vHBA/iSCSI Nam If it is not selected, the vNICs/vHBAs; Local Devices	ithin the same device class (LAN) e is selected and the vNIC/vHBA	/Storage/ISCSI) is determ v/ISCSI does not exist, a otherwise the vNIC/vHB	config error will be reported.	an order is used.		
Add Local Disk	Name	Order	VNIC/VHBA/ISCSI VNIC	Туре	Lun ID	WWN
Add Floppy	CD-ROM	1				
	Storage	2				
vNICs     Image: Constraint of the second seco						
			🔺 Move Up 🔍 Move Down	👕 Delete		
						OK

- **12.** Provide name of the vHBA on SAN fabric A and select it as "Primary" type. Click **Ok**.
- Add SAN Boot

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Figure 78 Adding SAN Boot

13. Click the Add SAN Boot Target link.

Figure 79

Local Devices 🔹 🚷	Boot Order					-
Add Local Disk	🔹 🖃 🕰 Filter 👄 Export	😓 Print				
Add CD-ROM	Name	Order	VNIC/VHBA/iSCSI VNIC	Туре	Lun ID	WWN
📕 Add Floppy	CD-ROM	1				
	🖮 🌆 Storage	2				
vNICs 😵	SAN primary		fcO	Primary		
Add SAN Boot     Add SAN Boot Target						
	14. Enter 0 in the '	'Boot Targe	et LUN" field and en	ter WWPN	of the SP-A	A of the

Adding SAN Boot Target

Target WWPN field. Keep the "Type" as "Primary" and click **Ok** as shown in Figure 80.

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Figure 80	Entering Details in Add SAN Boot Target Window
-----------	--

📥 Add SAN Boot Target	×
Add SAN Boot Target	0
Boot Target LUN: 0	
Boot Target WWPN: 50:06:01:64:3E:A0:52:02	
Type: 💿 Primary 🔿 Secondary	
ОК	Cancel

**15.** Repeat step 14 for secondary Boot Target on the SP-B of VNX5500. Repeat steps 12 to 14 for the secondary SAN Boot on fabric B. After configuring both primary and secondary SAN boot and boot targets the Boot Policy will look as shown in Figure 81. Click **Ok** to save the boot policy.

Figure 81 Successfully Created Boot Policy Window

resence. ss (LAN/Storage/ISCSI) is determin C/VHBA/ISCSI does not exist, a co y exist, otherwise the vNIC/vHBA/	nfig error will be reported.	an order is used.		
ss (LAN/Storage/ISCSI) is determin :C/vHBA/ISCSI does not exist, a co	nfig error will be reported.	an order is used.		
ss (LAN/Storage/ISCSI) is determin :C/vHBA/ISCSI does not exist, a co	nfig error will be reported.	an order is used.		
ss (LAN/Storage/ISCSI) is determin :C/vHBA/ISCSI does not exist, a co	nfig error will be reported.	an order is used.		
ss (LAN/Storage/ISCSI) is determin :C/vHBA/ISCSI does not exist, a co	nfig error will be reported.	an order is used.		
🛥 Export 😹 Print			_	
Order	VNIC/VHBA/ISCSI VNIC	Туре	Lun ID	WWN
1				
2				
imary	fc0	Primary		
Target primary		Primary	0	50:06:01:64:3E:A0:52:02
Target secondary		Secondary	0	50:06:01:6C:3E:A0:52:02
condary	fc1	Secondary		
Target primary		Primary	0	50:06:01:65:3E:A0:52:02
Target secondary		Secondary	0	50:06:01:6D:3E:A0:52:02
	Order 1	Order VNIC/VHBA/ISCSI VNIC 1 2 imary fc0 VTarget primary Target secondary condary fc1 VTarget primary	I Order VNIC/VHBA/ISCSI VNIC Type I I rarget primary Target secondary Condary Target primary	Order     VNIC/VHBA/iSCSI vNIC     Type     Lun ID       1     2       imary     fc0     Primary       1 Target primary     0       4 Target secondary     fc1       5econdary     6       1 Target primary     0

- In the "Server Boot Order" window, from the drop-down list of the "Boot Policy" of the "Create Service Profile Template" wizard, select "SAN-Boot" a newly created boot order. click Next.
- **17.** Keep the default setting in the "Management Policy" window of the "Create Service Profile Template" wizard and click **Next**.
- **18.** Keep the default setting "Assign Later" for "Pool Assignment" in the "Server Assignment" window of the "Create Service Profile Template" wizard and click **Next**.
- 19. Click Finish in the "Operational Policies" window of the "Create Service Profile Template" wizard.
- 20. You will see a success notification of creation of service profile template as shown in Figure 82.

Unified	Computing	Syste	m Mana	ger			
e Service Profile Template			service profile template.				
Iemplate. 2. √Storage 3. √Networking. 4. √NIC(N+BA Placement. 5. √Server Boot Order 6. Maintenance Policy. 7. Server Assignment. 8. Deperational Policies	Select a boot policy. Boot Policy: SAN-Boot Name Description	e: SAN-Boot	Create Boot Policy				
	Reboot on Boot Order Change Enforce VMIC/MBA/SCSI Name WARNINGS: The type (primary/secondary) of The effective order of boot dew If Enforce VMIC/MBA/SCSI If it is not selected, the VMICs/M Boot Order	e: yes e: yes does not indicate a boo vices within the same o I Name is selected an vHBAs/ISCSI are select	device class (LAN/Storage/ISC id the vNIC/vHBA/ISCSI does	not exist, a con	fig error will	be reported.	used.
	Reboot on Boot Order Change Enforce VAIC/MBA/SCSI Name WARNINGS: The type (primary/secondary) The effective order of boot des If Enforce VAIC/MBA/ISCSI If it is not selected, the VAICs/M Boot Order	e: yes e: yes does not indicate a boo vices within the same o I Name is selected an vHBAs/ISCSI are select i	levice class (LAN/Storage/ISO d the vNIC/vHBA/ISCSI does ted if they exist, otherwise th	not exist, a con he vNIC/vHBA/IS	fig error will iCSI with the	be reported. lowest PCIe bus scan order is	
	Reboot on Boot Order Change Enforce VAIC/VHBA/SCSI Name WARNINGS: The type (primary/secondary) to The effective order of boot dev If Enforce VAIC/VHBA/SCSI If it is not selected, the VAICs/V Boot Order	e: yes e: yes does not indicate a boo vices within the same o I Name is selected an vHBAs/ISCSI are select Print Order	device class (LAN/Storage/ISC id the vNIC/vHBA/ISCSI does	not exist, a con	fig error will	be reported.	used.
— <u>uteraturia ruităs</u>	Reboot on Boot Order Change Enforce VMIC/MBA/ISCSI Name WARNINGS: The type (primary/secondary) of The freque (primary/secondary) of The fife of the VMIC/MBA/ISCSI If it is not selected, the VMICs/M Boot Order	e: yes e: yes does not indicate a boo vices within the same o HBAs/ISCSI are select Print Order 1	levice class (LAN/Storage/ISO d the vNIC/vHBA/ISCSI does ted if they exist, otherwise th	not exist, a con he vNIC/vHBA/IS	fig error will iCSI with the	be reported. lowest PCIe bus scan order is	
— <u>Spendrumar Funkés</u>	Reboot on Boot Order Change Enforce VMIC/VHBA/ISCSI Name WARNINGS: The type (primary/secondary) of The fife (primary) secondary) of The fife (primary) secondary) of Boot Order Boot Order Boot Order Boot Order Boot Order Boot Order Boot Order Boot Order Boot Order Boot Order Scorage	e: yes e: yes does not indicate a boo vices within the same o I Name is selected an vHBAs/ISCSI are select Print Order	levice (LAN/Storage/GC d the vNIC/vHBA/ISCSI does ted if they exist, otherwise th vNIC/vHBA//SCSI vNIC	not exist, a con he vNIC/vHBA/IS Type	fig error will iCSI with the	be reported. lowest PCIe bus scan order is	
	Reboot on Boot Order Change Enforce VAIC/MBA/SCSI Name WARNINGS: The type (primary/secondary) of the effective order of boot dew If Enforce VAIC/VHBA/SCSI If it is not selected, the vAICs/M Boot Order	e: yes e: yes does not indicate a boo vices within the same of t Name is selected an vHBAs/ISCS1 are select Print Order 1 2	levice class (LAN/Storage/ISO d the vNIC/vHBA/ISCSI does ted if they exist, otherwise th	not exist, a con he vNIC/vHBA/IS Type Primary	fig error will ICSI with the	be reported. lowest PCIe bus scan order is	
- Jueronnia Ponkos	Reboot on Boot Order Change Enforce VNIC/WBA/ISCSI Name WARTINGS The type (primary/secondary) of The effective order of boot dev If Enforce VNIC/WBA/SISSI If it is not selected, the vNICs/N Boot Order	e: yes e: yes does not indicate a boo vices within the same o YHBAS/ISCSI are select Print Order 1 2 mary	levice (LAN/Storage/GC d the vNIC/vHBA/ISCSI does ted if they exist, otherwise th vNIC/vHBA//SCSI vNIC	not exist, a con re vNIC/vHBA/IS Type Primary Primary	fig error will ICSI with the Lun ID	be reported. lowest PCIe bus scan order is	
- <u>ureronnia rundo</u>	Reboot on Boot Order Change Enforce VMIC/MBA/ISCSI Name WARNINGS: The type (primary/secondary) of The free (primary/secondary) of The fire (primary/secondary) of The fire (primary/secondary) of The fire (primary) Boot Order If it is not selected, the vMICs/N Boot Order If it is not selected, the v	e: yes e: yes does not indicate a boo vices within the same o YHBAS/ISCSI are select Print Order 1 2 mary	levice (LAN/Storage/GC d the vNIC/vHBA/ISCSI does ted if they exist, otherwise th vNIC/vHBA//SCSI vNIC	not exist, a con e vNIC/VHBA/IS Type Primary Primary Secondary	fig error will ICSI with the	be reported. lowest PCIe bus scan order is WWN 50:06:01:6413E:A0:52:02	
- Juerannia Fuikăs	Reboot on Boot Order Change Enforce VNIC/WBA/ISCSI Name WARTINGS The type (primary/secondary) of The effective order of boot dev If Enforce VNIC/WBA/SISSI If it is not selected, the vNICs/N Boot Order	e: yes e: yes does not indicate a box vices within the same of I Name is selected an VHBAs/ISCSI are select Prink Order 1 2 anary condary	Jevice class (LAN/Storage/GC di the vNLC/vHBA/SGC does ted if they exist, otherwise th vNIC/vHBA/GCSI vNIC	not exist, a con re vNIC/vHBA/IS Type Primary Primary	fig error will ICSI with the Lun ID	be reported. lowest PCIe bus scan order is WWN 50:06:01:6413E:A0:52:02	
	Reboot on Boot Order Change Enforce VAIC/VHBA/ISC51 Name WARNINGS: The type (primary/secondary) If it is not selected, the vAICs/ Boot Order	e: yes e: yes does not indicate a boo vices within the sected in Name is selected an VHBAs/ISCSI are select Order 1 2 mary condary mary	Jevice class (LAN/Storage/GC di the vNLC/vHBA/SGC does ted if they exist, otherwise th vNIC/vHBA/GCSI vNIC	not exist, a con e vNIC/VHBA/IS Type Primary Primary Secondary Secondary	fig error will ICSI with the Lun ID	be reported. lowest PCIe bus scan order is WWN 50:06:01:64:3E:A0:52:02 50:06:01:6C:3E:A0:52:02	

# Create service profile instances from the template

In this section we will create ten service profile instances from the template created in the previous section. Follow these steps to create service profile instances:

1. In the Cisco UCS Manager window, select the **Servers** tab, expand "Service Profiles", right-click on the "root" and click **Create Service Profiles From Template** as shown in Figure 83.

#### 🛕 Cisco Unified Computing System Manager - V250-UCS Fault Summary 🕒 🏐 🖽 New 🚽 🌛 Options 🛛 🚱 $\otimes$ 🥪 Servers 🕨 🍮 Service Profiles 🕨 0 7 4 General Sub-Organizations Service P Equipment Servers LAN SAN VM Admin Filter: All Fault Summary $\otimes$ V Δ $\pm$ =n 7 n rofiles 😳 Actions - <u>6</u> Show Navigator Service Create Service Profile ofile 🚊 🎪 roo ÷ 🗊 Create Organization rofile (expe ÷., Create Service Profile (expert) S Policies rofile Templa Create Service Profile Template \varTheta Pools rofiles From 🛓 🧙 roc Create Server Pool ÷ Create UUID Suffix Por ÷ 1 Create Service Profiles From Template <u>به</u>. 🗄 🗄 🗿 Schedi Trate Server Pool Policy Qualificat ix Pool Create Boot Policy Create BIOS Policy ol Policy Qu Create Ethernet Adapter Policy Create Fibre Channel Adapter Policy Create Local Disk Configuration Policy Adapter Pol Create IPMI Access Profile

Figure 83 Creating Service Profiles from Template

2. In the Create Service Profile from Template window, enter the name in the "Naming Prefix" field, number of Service Profiles as "10", and select the "Service Profile Template" as "Service Profile Template V250-Host-Template" (created in the previous section) drop-down list. Click **Ok**.

### Figure 84 Entering Details for Creating Service Profile instance

🛕 Create Service Profiles	From Template	×
Create Servic	e Profiles From Template	0
	V250-ESX-Host	
Number:	10	
	Service Template V250-Host-Template	-
	ОК	Cancel

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- 3. A pop-up window appears showing successful completion of creating service profile instances.
- **4.** You will see 10 Service Profiles instantiated under "root" with the "Overall Status" showing "Unassociated" as in Figure 85. The window will show a warning message "Service profile is not associated".



# **Associate Service Profiles**

As mentioned before, Service Profile is a logical representation of a server. When a Service Profile is associated with available physical server, the server assumes the role described by the Service Profile and corresponding server is booted. we need to associate Service Profile instances created in previous section to the Cisco UCS B200 M3 Blade Servers available. Follow these steps to associate Service Profiles:

 Select the first Service Profile instance out of the ten Service profiles created in previous section, and click the Change Service Profile Association link on the right pane of the side Cisco UCS Manager window as shown Figure 86.



#### Figure 86 Changing Service Profile Association

2. Select Cisco UCS B200 M3 Blade Server 1/1 and click Ok.

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			Figure	87	Assoc	iating Ser	vice P	rofile
🔺 Ass	ociate Servio	e Profile						x
	Select an e specify a cu		pool or a p by entering	its chassis a	nd slot ID. If	r by name, or no server curre		🕜 sat
war	nt to associate	n existing server e with this servic ment: Select ex	e profile.	I, or specify the	•	on of the server y	rou	
	Select	Chassis ID	Slot	Back ID	Procs	Memory	Ę	
	0	1	1		2	131072		
	0	1	2		2	262144		
	0	1	3		2	65536		
	0	1	4		2	65536	-	
	•		III				F	
	Restrict Migr	ation:						
							ок с	ancel

3. You will get an acknowledgement on Service Profile association process as shown in Figure 88.

1

### Figure 88 Service Profile Association Process in Progress

Associate	Service Profile
•	The system is modifying Service Profile V250-E5X-Host1's association. You can monitor the operation's progress on the server's FSM tab and in the Overall Status field. Show Navigator for Service Profile V250-E5X-Host1
	ОК

**4.** After the Service Profile association is complete, the "Overall Status" of the server should show "Ok" and there should be no faults under the server as shown in Figure 89.

### Figure 89 Overall Status of the Server



This completes the UCS server configuration. We need to configure the Cisco UCS Manager/ vCenter integration in Cisco UCS Manager and Cisco VMFEX architecture after the vSphere infrastructure is setup.

# **Preparing and Configuring Storage Array**

To configure the EMC VNX5500 storage array follow these steps:

- 1. Configure end-to-end SAN boot infrastructure for ESXi hosts.
- 2. Create a data store for virtual machines operating systems and data, create performance pool and LUNs.
- 3. Configure NFS share and assign host access privileges.
- 4. Configure port-channel (aggregation) and jumboframe.

# **Configure SAN Boot Infrastructure**

This section explains how to configure end-to-end SAN Boot Infrastructure for the Cisco UCS B200 M3 Blade Servers. Most of the configuration is on the EMC VNX5500, but part of it is on Cisco Nexus 5548UP switches and Cisco UCS Manager. we have the following tasks completed already:

- 1. VSAN configuration and FC port configuration on the Cisco Nexus 5548UP switches and Cisco UCS FIs.
- 2. WWPN and WWNN assignments to the proposed ESXi servers.

Follow these steps to configure SAN Boot Infrastructure:

 In the Cisco UCS Manager window, click the SAN tab, expand "Pools", under "root" click WWPN Pools to select the WWPN pool created for the B200 M3 servers' Service Profiles. Click the Initiators tab on the right pane of the Cisco UCS Manager window as shown Figure 90. The "Assigned To" column on the right pane of the Cisco UCS Manager window provides the WWPN assignment values. This can be referred while creating the zones on the Cisco Nexus 5548UP switches.

1

Fault Summary	🌀 🏐 🖬 New - 🏹 Options 🔞 🕕	A Pending Activities	
🛛 🗸 🖉 🛆 🔺	>> 🗐 SAN + 🛞 Pools + 🛕 root + 🛞 WV		ort-WWNs 🛞 WWPN Poo
2 18 7 14			ar main and a second and a second a s
Equipment Servers LAN SAN VM Admin	General WWN Initiator Blocks Initiators	aults Events	
	A Filter 👄 Export 🌏 Print		
Filter: All	Name	Assigned	Assigned To
± 🗆	ML Initiator 20:00:00:25:85:66:DD:16	yes	org-root/is-V250-E5X-Host9/fc-fc1
∃ <mark>=</mark> SAN	Initiator 20:00:00:25:B5:66:DD:06	yes	org-root/is-V250-ESX-Host9/fc-fc0
👜 🏉 SAN Cloud	Initiator 20:00:00:25:B5:66:DD:17	yes	org-root/ls-V250-E5X-Host8/fc-fc1
🕀 🟉 Storage Cloud	Initiator 20:00:00:25:85:66:DD:07	yes	org-root/is-V250-E5X-Host8/fc-fc0
Policies	Initiator 20:00:00:25:65:66:DD:18	yes	org-root/is-V250-E5X-Host0/ic-rco
SAN Cloud	Initiator 20:00:00:25:85:66:DD:08	ves	org-root/is-V250-E5X-Host7/fc-fc0
⊕- 🕤 Threshold Policies ⊖- 🛕 root	Initiator 20:00:00:25:85:66:DD:19	yes	org-root/is-V250-E5X-Host6/ic-fc1
Fibre Channel Adapter Policies	Initiator 20:00:00:25:85:66:DD:09	yes	org-root/is-V250-E5X-Host6/ic-fc0
S Threshold Policies	Initiator 20:00:00:25:85:66:DD:0A	yes	org-root/is-V250-E5X-Host5/fc-fc1
vHBA Templates	Initiator 20:00:00:25:B5:66:DD:1A	yes	ora-root/is-V250-E5X-Host5/fc-fc0
🕀 🥂 Sub-Organizations	Initiator 20:00:00:25:85:66:DD:08	yes	org-root/is-V250-E5X-Host4/fc-fc1
🖨 💮 Pools	Initiator 20:00:00:25:85:66:DD:18		org-root/is-V250-E5X-Host4/fc-fc0
🖻 🙀 root	Initiator 20:00:00:25:85:66:DD:0C	yes	org-root/is-V250-E5X-Host3/fc-fc1
i IQN Pools	Initiator 20:00:00:25:85:66:DD:1C		org-root/is-V250-E5X-Host3/fc-fc0
WWWNN Pools	Initiator 20:00:00:25:85:66:DD:0D	yes	
De 💮 WWPN Pools		yes	org-root/is-V250-E5X-Host2/fc-fc1
WWPN Pool v250-Port-WWNs     WWPN Pool default	Initiator 20:00:00:25:85:66:DD:1D	yes	org-root/is-V250-E5X-Host2/fc-fc0
⊕ Sub-Organizations	Initiator 20:00:00:25:85:66:DD:15	yes	org-root/ls-V250-E5X-Host10/fc-fc1
Zersions     Traffic Monitoring Sessions	Initiator 20:00:00:25:85:66:DD:05	yes	org-root/ls-V250-E5X-Host10/fc-fc0
a 🖉 manic Hondoning Sessions	Initiator 20:00:00:25:85:66:DD:0F	yes	org-root/ls-V250-E5X-Host1/fc-fc1
	Initiator 20:00:00:25:85:66:DD:0E	yes	org-root/ls-V250-ESX-Host1/fc-fc0
	Initiator 20:00:00:25:B5:66:DD:14	no	
	Initiator 20:00:00:25:85:66:DD:13	no	
	Initiator 20:00:00:25:85:66:DD:12	no	
	Initiator 20:00:00:25:85:66:DD:11	no	
	Initiator 20:00:00:25:85:66:DD:10	no	
	Initiator 20:00:00:25:85:66:DD:04	no	
	Initiator 20:00:00:25:85:66:DD:03	no	
	Initiator 20:00:00:25:85:66:DD:02	no	
	Initiator 20:00:00:25:85:66:DD:01	no	
	Initiator 20:00:00:25:85:66:DD:00	no	

Figure 90 Assigned WWPN Values

**2.** Login to the Nexus 5548UP switch A and configure a zoneset for SAN fabric A. Create 10 zones, one for each ESXi host, containing WPN of SP-A and SP-B of VNX5500 and WWPN of the vHBA on fabric A of the ESXi server. WWPN list in the step 1 will be helpful to verify. Entire zoneset configuration will look as shown in Figure 91. Activate the zoneset in the storage VSAN.

Figure 91

Creating Zones for Each of the ESX Hosts

UCS-N5k-FabA# configure terminal	
Enter configuration commands, one	
UCS-N5k-FabA(config)# zoneset name	
UCS-N5k-FabA(config-zoneset)# zone	
	member pwwn 20:00:00:25:b5:66:dd:0e
	member pwwn 50:06:01:64:3e:a0:52:02
	member pwwn 50:06:01:6c:3e:a0:52:02
UCS-N5k-FabA(config-zoneset-zone)#	
UCS-N5k-Fabl(config-zoneset)# zone	
	member pwwn 20:00:00:25:b5:66:dd:1d
	member pwwn 50:06:01:64:3e:a0:52:02
	member pown 50:06:01:6c:3e:a0:52:02
UCS-N5k-FabA(config-zoneset-zone)#	
UCS-N5k-FabA(config-zoneset)# zone	
	member pown 20:00:00:25:b5:66:dd:1c
	member pwwn 50:06:01:64:3e:a0:52:02 member pwwn 50:06:01:6c:3e:a0:52:02
UCS-N5k-FabA(config-zoneset-zone)#	
UCS-N5k-Fabk(config-zoneset)# zone	
	member pwwn 20:00:00:25:b5:66:dd:1b
	member pwwn 50:06:01:64:3e:a0:52:02
	member pwwn 50:06:01:64:3e:a0:52:02
UCS-N5k-FabA(config-zoneset-zone)#	
UCS-N5k-Fabl(config-zoneset) # zone	
	member pwwn 20:00:00:25:b5:66:dd:1a
	member pwwn 50:06:01:64:3e:a0:52:02
	member pwwn 50:06:01:6c:3e:a0:52:02
UCS-N5k-FabA(config-zoneset-zone)#	
UCS-N5k-FabA(config-zoneset)# zone	
	member pwwn 20:00:00:25:b5:66:dd:09
	member pwwn 50:06:01:64:3e:a0:52:02
	member pwwn 50:06:01:6c:3e:a0:52:02
UCS-N5k-FabA(config-zoneset-zone)#	exit
UCS-N5k-Fabl(config-zoneset)# zone	name V250-ESXHost7-fc0
UCS-N5k-Fabl(config-zoneset-zone)#	member pwwn 20:00:00:25:b5:66:dd:08
UCS-N5k-Fabl(config-zoneset-zone)#	member pwwn 50:06:01:64:3e:a0:52:02
UCS-N5k-FabA(config-zoneset-zone)#	member pwwn 50:06:01:6c:3e:a0:52:02
UCS-N5k-Fabl(config-zoneset-zone)#	exit
UCS-N5k-FabA(config-zoneset)# zone	
	member pwwn 20:00:00:25:b5:66:dd:07
	member pwwn 50:06:01:64:3e:a0:52:02
	member pwwn 50:06:01:6c:3e:a0:52:02
UCS-N5k-Fabl(config-zoneset-zone)#	
UCS-N5k-FabA(config-zoneset)# zone	
	member pwwn 20:00:00:25:b5:66:dd:06
	member pwwn 50:06:01:64:3e:a0:52:02 member pwwn 50:06:01:6c:3e:a0:52:02
UCS-N5k-FabA(config-zoneset-zone)#	
UCS-N5k-FabA(config-zoneset)# zone	
	member pwwn 20:00:00:25:b5:66:dd:05
	member pwwn 50:06:01:64:3e:a0:52:02
	member pwwn 50:06:01:6c:3e:a0:52:02
UCS-N5k-FabA(config-zoneset-zone)#	
UCS-N5k-FabA(config-zoneset)# exit	
UCS-N5k-FabA(config)# zoneset acti	
Zoneset activation initiated. chec	
UCS-N5k-Fabl(config)#	

3. Validate the successful activation of zoneset by the command show zoneset brief as shown below.

Figure 92	Fia	ure	92
-----------	-----	-----	----

I

Validating the Activation of Zoneset on Fabric A

UCS-N5k-Fabl# show zoneset brief	
zoneset name V250-Fabric-A vsan 10	
zone V250-ESXHost1-fc0	Ξ
zone V250-ESXHost2-fc0	
zone V250-ESXHost3-fc0	
zone V250-ESXHost4-fc0	
zone V250-ESXHost5-fc0	
zone V250-ESXHost6-fc0	
zone V250-ESXHost7-fc0	
zone V250-ESXHost8-fc0	
zone V250-ESXHost9-fc0	
zone V250-ESXHost10-fc0	
UCS-N5k-Fabl#	Ŧ

**4.** Similarly, on the Nexus 5548UP switch B, create zoneset for fabric B and include vHBAs on fabric B on the servers. Validation of zoneset on fabric B is shown in Figure 92.

Figure 93

```
Validating the Activation of Zoneset on Fabric B
```

UCS-N5K-FabB# show zoneset brief	Ľ
zoneset name V250-Fabric-B vsan 10	
zone V250-ESXHost1-fc1	
zone V250-ESXHost2-fc1	
zone V250-ESXHost3-fc1	
zone V250-ESXHost4-fc1	
zone V250-ESXHost5-fc1	
zone V250-ESXHost6-fc1	
zone V250-ESXHost7-fc1	
zone V250-ESXHost8-fc1	
zone V250-ESXHost9-fc1	
zone V250-ESXHost10-fc1	
UCS-N5K-FabB#	-

**5.** To further validate the zoneset configuration across entire SAN fabric, SSH to UCS FI-A, issue **connect nxos** command, and run the command **show npv flogi-table**. It should list all the ten fLogi sessions, one from each vHBA on fabric A in storage VSAN as shown in Figure 94.

1

Figure 94	Validating the Created Zoneset Across SAN Fabric
-----------	--

TAC suppor Copyright The copyr: owned by o license. C the GNU Ge Lesser Ger such licer http://www http://www	us Ope ct: ht (c) 2 ights other Certa: eneral neral nse is w.open w.open	erating Sy ttp://www 2002-2012 to certa: third pan in compone 1 Public J Public L s availab msource.on	ystem (NX-OS) Software .cisco.com/tac , Cisco Systems, Inc. Al in works contained in th rties and used and distr ents of this software are license (CPL) version 2 icense (LGPL) Version 2.	is software are ibuted under e licensed under O or the GNU 1. Å copy of each	
SERVER INTERFACE E	VSAN	FCID	PORT NAME	NODE NAME	EXTERNAL INTERFAC
 vfc769	 10				
vic769 vfc823	10			20:00:00:25:b5:60:0d:0e 20:00:00:25:b5:60:0d:0d	
vfc877	10			20:00:00:25:b5:60:0d:0d	
vfc931	10			20:00:00:25:b5:60:0d:0b	
vfc1011	10			20:00:00:25:b5:60:0d:06	
vfc1065	10			20:00:00:25:b5:60:0d:07	
vfc1119	10			20:00:00:25:b5:60:0d:08	
vfc1173	10			20:00:00:25:b5:60:0d:09	
vfc1227	10			20:00:00:25:b5:60:0d:05	
vfc1281	10			20:00:00:25:b5:60:0d:0a	
Total numb V250-UCS-J		_	10.		

- **6.** Similarly, the **show flogi database** command on Nexus 5548UP switch should show 14 flogi sessions:
  - 10 from B200 M3 vHBAs
  - 2 from FI-A's FC ports
  - 2 from VNX5500 storage array's SP-A and SP-B FC ports

Similarly, verify the FLogI entries on SAN fabric B.

INTERFACE	VSAN	FCID	PORT NAME	NODE NAME
 fc1/29	10	0x5c0000	20:41:00:0d:ec:f7:04:00	20:0a:00:0d:ec:f7:04:0
fc1/29	10	0x5c0002	20:00:00:25:b5:66:dd:0e	20:00:00:25:b5:60:0d:0
fc1/29	10	0x5c0004	20:00:00:25:b5:66:dd:1c	20:00:00:25:b5:60:0d:0
fc1/29	10	0x5c0006	20:00:00:25:b5:66:dd:06	20:00:00:25:b5:60:0d:0
fc1/29	10	0x5c0007	20:00:00:25:b5:66:dd:07	20:00:00:25:b5:60:0d:0
fc1/29	10	0x5c000a	20:00:00:25:b5:66:dd:05	20:00:00:25:b5:60:0d:0
fc1/30	10	0x5c0001	20:42:00:0d:ec:f7:04:00	20:0a:00:0d:ec:f7:04:0
fc1/30	10	0x5c0003	20:00:00:25:b5:66:dd:1d	20:00:00:25:b5:60:0d:0
fc1/30	10	0x5c0005	20:00:00:25:b5:66:dd:1b	20:00:00:25:b5:60:0d:0
fc1/30	10	0x5c0008	20:00:00:25:b5:66:dd:09	20:00:00:25:b5:60:0d:0
fc1/30	10	0x5c0009	20:00:00:25:b5:66:dd:08	20:00:00:25:b5:60:0d:0
fc1/30	10	0x5c000b	20:00:00:25:b5:66:dd:1a	20:00:00:25:b5:60:0d:0
fc1/31	10	0x5c00ef	50:06:01:64:3e:a0:52:02	50:06:01:60:be:a0:52:0
fc1/32	10	Ox5c01ef	50:06:01:6c:3e:a0:52:02	50:06:01:60:be:a0:52:0

After the end-to-end FC SAN fabric connectivity is verified, log in to the EMC's VNX5500
 Unisphere. To configure SAN storage, select VNX5500 array in the Unisphere window. Click the Storage tab from the menu bar, and click Storage Configuration > Storage Pools. Click Create to

				Advanced 👰	
< > 🏦 🗐 VSPEX5500 💌	🗃 Dashboard 🛛 📗 System	Storage	Hosts 🛛 👔 Data Protec	tion 🛛 🏶 Settings 🛛 📀 S	Support
SPEX5500 > Storage > Storage Cr	onfiguration > Storage Pools				
Pools RAID Groups				Wizards	^
RAID Groups			272.00	LUN Provisioning Wizard	
T Filter for RAID	Type All			RAID Group LUN Expansion Disk Provisioning Wizard for	
ID A Drive Type RAI	ID Type User Capacity ( Free	Capacity ( <mark>% Full</mark>	Largest Contig	Storage Assignment Wizard SAN Copy Wizard File System Wizard Share Wizard CIFS Server Wizard CIFS Services Wizard	for
				CIPS Services Wizard	
) Selected Create Delete F	Properties Defragment		0 items	Tiering Manage Auto-Tiering	*
	Properties Defragment	Last Refresh	ed: 2012-07-30 18:17:22	Tiering	^
D Selected Create Delete F Details JLUNs Disks	roperties Defragment	Last Refresh		Tiering Manage Auto-Tiering	×
Details LUNS Disks	sage ALL User LUNs	Løst Refresh	ed: 2012-07-30 18:17:22	Tiering Manage Auto-Tiering Data Migration Configure SAN Copy Setting	× 15
Details LUNS Disks	sage ALL User LUNs	Last Refresh / (G Current Owner	ed: 2012-07-30 18:17:22	Tiering Manage Auto-Tiering Date Migration Configure SAN Copy Setting Update SAN Copy Connection	15 2005 *
Details LUNS Disks Filter for u	sage ALL User LUNs		ed: 2012-07-30 18:17:22	Tiering Manage Auto-Tiering Data Migration Configure SAN Copy Setting Update SAN Copy Connectio Block Storage Compressed LUN Summary	* 15 005

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# Figure 96 Creating Storage Pools in EMC VNX5500 Unisphere

create a new storage pool as shown in Figure 96.

8. Click **RAID Group** radio button for Storage Pool Type, select RAID5 from the drop-down list for the RAID Type and click **Manual** radio button in the Disks area. Click **Select...** as shown Figure 97.

MC Unisphere 💾	VSPEX5500 - Create Sto	orage Pool					
	General Advanced						
< > 🏠 🗊 VSPEX5500 💌	-Storage Pool Para	meters					
<u>VSPEX5500</u> > <u>Storage</u> > <u>Stor</u>	Storage Pool Type:	O Pool 💿 RA	ID Group				
Pools RAID Groups	Storage Pool ID:	0					¥
RAID Groups	Storage Pool Name:	RAID Group 0					
T Filter for	RAID Type:	RAID5					*
	Number of Disks:	Invalid disk s	selection				Y
ID A Drive Type	Disks						
	🔘 A <u>u</u> tomatic 🛄 Use	Power Saving B	Eligible Disks				
	💽 <u>M</u> anual	- 1	<u>S</u> elect				
	Disk	Capacity	Drive Type	Model	State	Power Savi	ng Eligible
0 Selected Create Delete							
Details           LUNs         Disks           Filter for           Name         ID							
Details LUNs Disks Filter for					Аррі	y. Canc	el Hel

Figure 97 Entering Details for Creating Storage Pool

1

9. Select 3 disks for ESXi 5 hypervisor boot storage as shown in Figure 98. Click Ok.

# Figure 98 Selecting Disks for ESXi 5 Hypervisor

Select From: All Cabinets	*					
Select Disk						
Available Disks				Selected Disks		
Disk 🔽	Capacity	Drive .		Disk	Capacity	Drive
🔗 Bus 0 Enclosure 0 Disk 3	536.808 GB	SAS	~	🔗 Bus 0 Enclosure 0 Disk I	536.808 GB	SAS
🔗 Bus 0 Enclosure 0 Disk 4	536.808 GB	SAS	::	🔗 Bus 0 Enclosure 0 Disk :	536.808 GB	SAS
🔗 Bus 0 Enclosure 0 Disk 5	5 536.808 GB	SAS		🖉 Bus 0 Enclosure 0 Disk :	536.808 GB	SAS
🔗 Bus 0 Enclosure 0 Disk 6	5 536.808 GB	SAS		•		
🔗 Bus 0 Enclosure 0 Disk 7	7 536.808 GB	SAS				
🔗 Bus 0 Enclosure 0 Disk 8	536.808 GB	SAS				
🔗 Bus 0 Enclosure 0 Disk 9	9 536.808 GB	SAS				
🔗 Bus 0 Enclosure 0 Disk .	536.808 GB	SAS				
🔗 Bus O Enclosure O Disk .	536.808 GB	SAS				
🖉 Bus A Enclosure A Disk	536 808 GB	202	Y			
< u		3	>	K ::		>

10. Click Yes in the pop-up window to initiate RAID group operation as shown in Figure 99.

Figure 99

Confirmation Window to Initiate RAID Group Operation

Storage Pool Para	meter	rs				
Storage Pool Type:	0 <u>P</u>	ool 💿 <u>R</u> A	ID Group			
Storage Pool ID:	0					
Storage Pool Name:	RAID	) Group 0				
RAID Type:	RAI	D5				2
Number of Disks:	3					3
) Automatic 🗌 Use () <u>M</u> anual	Power	r Saving B	Eligible Disks <u>S</u> elect		Total	Raw Capacity: 1610.4.
Disk		Canacity	Drive Type	Model	State	Power Saving Eligible
Bus 0 Enclosure       Bus 0 Enclosure       Bus 0 Enclosure       Bus 0 Enclosure	0 D ! 0 D !	536.808 536.808	. SAS . SAS	STE600 STE600		No No
Bus 0 Enclosure   Bus 0 Enclosure	0 D <sup>!</sup> 0 D <sup>!</sup> irm: Cr	536.808 536.808 eate Stor	. SAS . SAS	STE600 STE600	. Unb	No
Bus 0 Enclosure 6 Bus 0 Enclosure	0 D ! 0 D ! irm: Cr Initiat	536.808 536.808 eate Stor e Create	. SAS . SAS age Pool	STE600 STE600	. Unb	No No
Bus 0 Enclosure 6 Bus 0 Enclosure	0 D ! 0 D ! irm: Cr Initiat	536.808 536.808 eate Stor e Create	. SAS . SAS age Pool RAID Group op	STE600 STE600	. Unb	No No

Γ

11. You will see a success notification as shown in Figure 100 upon completion of RAID group creation.

eneral Advanced							
Storage Pool Paran	neters						
Storage Pool Type:	O <u>P</u> ool • <u>R</u>	AID Group					
Storage Pool ID:	1	1					
Storage Pool Name:	RAID Group 1						
RAID Type:	RAID5						
Number of Disks:	Invalid disk	selection					
Disks							
🔘 Automatic 📃 Use F	ower Saving	Eligible Disks					
🖲 <u>M</u> anual		<u>S</u> elect					
				1922 38			
Disk	Capacity	/ Drive Type	Model	State	Power Saving Eligible		
Disk			Model	State			
Messa	ge: Create St			State	Power Saving Eligible		

Figure 100 Success Notification of RAID Group Creation

12. From the newly created RAID group, right-click and click Create LUN as shown in Figure 101.

1

# Figure 101 Creating LUN in EMC Unisphere

EMC Unisphere				Pool LUN	❤ Se	earch
< > 🏠 🗊 vs	PEX5500 🔽	🔠 Dashboard	l 📗 System	Storag	e 👔 Host	s 🛛 👔 Data Pro
VSPEX5500 > Stor	<u>age</u> > <u>Storage</u>	<u>Configuration</u> >	Storage Pools			
Pools RAID Groups						
RAID Groups					2	7 %. 🖻 🤉
🝸 🗸 Filter for	RA	ID Type All	¥			
ID	<ul> <li>Drive Type</li> </ul>	RAID Type	User Capacity	Free Capacity	% Full	Largest Conti
😭 RAID Group 0	SAS Create LUN	RAIDS	704.117	704.117		704.117
	Delete					
	Power Savings					
	Analyzer	>				
	Properties					
1 Selected Creat	e Delete	Properties [	Defragment			1 items
				Last	Refreshed: 2012	2-07-30 18:21:26
Details			<u> </u>		2	7 🍋 📦 🕥

**13.** Create ten LUNs with 50 GB capacity each. Make sure that you click **RAID Group** radio button for "Storage Pool Type".

VSPEX5500 - Create LUN		
General Advanced		
Storage Pool Properties		
Storage Pool Type:	O Pool      RAID Group	
RAID Type:	RAID5: Distributed Parity (High Throughput)	
Storage Pool for new LUN:	0 <u>N</u> ew	
Capacity		
Available Capacity: 704.13	. ,	
Largest Contiguous Free S	pace: 704.139 GB	
LUN Properties		
User Capacity 50		
LUN ID: 0	Number of LUNs to create: 10	
LUN Name		
🔾 Name		
Starting ID	0	
Automatically assign LU	N IDs as LUN Names	
	<u>Apply</u> <u>Cancel Help</u>	
	14. You should see a LUN creation	notification as shown in Figure 103

Figure 102 Entering Details to Create LUNs



Storage	Pool Properties	
Stora 🜌	Message: Create LUN	
RAID	The create operation was initiated with these results:	~
Stora	LUN "LUN 0" was created successfully	
⊢Сар	LUN "LUN 1" was created successfully	
Ava	LUN "LUN 2" was created successfully LUN "LUN 3" was created successfully	
MVd	LUN "LUN 4" was created successfully	
Larg	LUN "LUN 5" was created successfully	
	LUN "LUN 6" was created successfully	
LUN	LUN "LUN 7" was created successfully	
	LUN "LUN 8" was created successfully	
User	LUN "LUN 9" was created successfully	$\geq$
LUN 1		~
LUN	<u>o</u> ĸ	
ON		
	ing ID	
() Autom	natically assign LUN IDs as LUN Names	
-LUN Crea	ation Progress	
- conteret	Alon Frogroup	

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15. After the storage LUNs are created, we need to add hosts to the host list. Click Hosts tab from the EMC Unisphere menu bar, click the Connectivity Status link on the right pane of the EMC Unisphere window in the Host management Area as shown in Figure 104.

Figure 104 Adding Hosts to the Host List in the EMC Unisphere Window



**16.** Select WWPN of the first ESX host and click **Edit** as shown in Figure 105. The WWPN Initiator list in Cisco UCS Manager shown in the step 1 can be used to verify.



VSPEX5500 - Connectivity Status	
	🗸 Storage Group is enabled
Host Initiators MirrorView Initiators SAN Copy Initiators	
Initiator Name 🛆	
- 20:00:00:25:85:60:0D:08:20:00:00:25:85:66:DD:1B [Unknown	n; Fibre; Host Agent not reachable or connection registered manual
2 20:00:00:25:85:60:0D:0C:20:00:00:25:85:66:DD:1C [Unknow: 2 20:00:00:25:85:60:0D:0D:20:00:00:25:85:66:DD:0D [Unknow:	n; Fibre; Host Agent not reachable or connection registered manua n; Fibre; Host Agent not reachable or connection registered manua
- 20:00:00:25:85:60:0D:0D:20:00:00:25:85:66:DD:1D [lnknown	
20:00:00:25:B5:60:0D:0E:20:00:00:25:B5:66:DD:0E 20:00:00:25:B5:60:0D:0E:20:00:00:25:B5:66:DD:0E 20:00:00:25:B5:60:0D:0E:20:00:00:25:B5:66:DD:0E	; Fibre; Host Agent not reachable or connection registered manual
- 20:00:00:25:B5:60:0D:05:20:00:025:B5:66:DD:05 (Unknown	
	>
Refresh <u>A</u> LL Refresh Detail Create	legister
	<u>O</u> K <u>Cancel</u> <u>H</u> elp

**17.** Click **New Host** radio button in the Edit Initiators window and provide ESXi hostname and IP address in the respective fields and Initiator information as shown in Figure 106.

Edit Initiators	and the second se		×
WW	/N/IQN	SP-Port ID	Registered
	00:00:25:B5:60:0D:0E:20:00:00:25:B5:6 00:00:25:B5:60:0D:0E:20:00:00:25:B5:6		No No
• New Host Host Name: V250-E IP Address: 10.29.	SXHost1		D:0E:20:00:00:25:85:66:DE
Initiator Inform		Active-Active mode(ALUA	A)-failovermode 4

# Figure 106 Entering Details for Editing Initiators



# Figure 107 Confirmation to Register Initiator with Existing Host Information



**19.** In the Host initiator window, click **Refresh All**, select the WWPN on fabric B of the same host, and click **Edit** as shown below.

lost Initiators	MirrorView Initiators SAN Copy Initiators	💎 Storage Gr
		010000
Initiator Name		Storage Grou
	1:25:85:60:0D:0A:20:00:00:25:85:66:DD:0A [Unknown; Fibre; Host Agent not reachable or connection registered manually or with Unisphere Server Ubility] 1:25:85:60:0D:0A:20:00:00:25:85:66:DD:1A [Unknown; Fibre; Host Agent not reachable or connection registered manually or with Unisphere Server Ubility]	None Assigne
		None Assigne
	1:25:85:60:0D:0B:20:00:00:25:85:66:DD:0B [Unknown; Fibre; Host Agent not reachable or connection registered manually or with Unisphere Server Utility]	None Assign
	1:25:85:60:0D:0B:20:00:00:25:85:66:DD:1B [Unknown; Fibre; Host Agent not reachable or connection registered manually or with Unisphere Server Utility]	None Assign
	I:25:85:60:0D:0C:20:00:00:25:85:66:DD:0C [Unknown; Fibre; Host Agent not reachable or connection registered manually or with Unisphere Server Utility] I:25:85:60:0D:0C:20:00:00:25:85:66:DD:1C [Unknown; Fibre; Host Agent not reachable or connection registered manually or with Unisphere Server Utility]	None Assign
		None Assign
	1:25:85:60:0D:0D:20:00:00:25:85:66:DD:0D [Unknown; Fibre; Host Agent not reachable or connection registered manually or with Unisphere Server Utility] h:25:85:60:0D:0D:20:00:00:25:85:66:DD:DD [Unknown; Fibre; Host Agent not reachable or connection registered manually or with Unisphere Server Utility]	None Assign
	153:85:60:0D:0E:20:00:00;25:85:66:DD:0F[UNIX0W];Fibre; Host Agent not reachable or connection registered manually or with Unisphere Server Unity] [35:85:60:0D:0E:20:00:00;25:85:66:DD:0F[UNIX0W];Fibre; Host Agent not reachable or connection registered manually or with Unisphere Server Unity]	None Assign
	1.2515516010D1021201001001251851651D10F[Unknown] Fibre; Host Agent hot reachable or connection registered manually or with Omsphere Server Unity] 1001251855(010)061201001001251851651D010F]	None Assign
	10125155160100161251001001251551651001001 001251551601001061251001001012515516610D10P	
	100:25:05:100:00:00:25:05:00:00:025:05:06:00-00 Functionary Fibre: Host Agent not reachable or connection registered manually or with Unisophere Server Utility]	None Assign
	ESSESSION/DD/05/S2000/00/25/BS/60/DD/05/D0/DD/05/D0/DD/05/D0/DD/05/2000/DD/05/2000/D0/25/BS/60/DD/05/2000/2000/25/BS/60/DD/05/2000/2000/25/BS/60/DD/05/2000/2000/25/BS/60/DD/05/2000/2000/2000/2000/2000/2000/20	None Assign
	(25)35:00:00/00:25:20:00:00:25:35:56:DD15[Unknown; Fibre; Host Agent not reachable or connection registered manually or with Unisphere Server Unity] (25)85:66(0)D166(2):00:00:25:85:56:DD16[Unknown; Fibre; Host Agent not reachable or connection registered manually or with Unisphere Server Unity]	None Assign
	125155100100100120100125155105105100100 [UNKNOW] FIDTE; Host Agent not reachable or connection registered manually or with Unisphere Server Unity] 125185160100106122100102518516610D116 [UnKNOW] FIDTE; Host Agent not reachable or connection registered manually or with Unisphere Server Unity]	
	issission of the second s	None Assign
	(25)35:00:00/07/22:00:00/25)35:60:00/7 (Unknown; Fibre; Host Agent not reachable or connection registered manually or with Unisphere Server Unity] (25)35:60:00/07/22:00:00:25)35:66:00:77 (Unknown; Fibre; Host Agent not reachable or connection registered manually or with Unisphere Server Unity]	None Assign
		None Assign
	1:25:85:60:0D:08:20:00:00:25:85:66:DD:08 [Unknown; Fibre; Host Agent not reachable or connection registered manually or with Unisphere Server Utility]	None Assign
	1:25:85:60:0D:08:20:00:00:25:85:66:DD:18 [Unknown; Fibre; Host Agent not reachable or connection registered manually or with Unisphere Server Utility]	None Assign
	1:25:85:60:0D:09:20:00:00:25:85:66:DD:09 [Unknown; Fibre; Host Agent not reachable or connection registered manually or with Unisphere Server Utility]	None Assign
	1:25:85:60:00:09:20:00:00:25:85:66:DD:19 [Unknown; Fibre; Host Agent not reachable or connection registered manually or with Unisphere Server Utility]	None Assign
	VSPEX5500 [10.29.150.201; Fibre; Manually registered]	~filestorage
- 🕖 V250-ES	XHost1 [10.29.180.121; Fibre; Manually registered; Host Agent not reachable or connection registered manually or with Unisphere Server Utility]	None Assign
(		
Refresh ALL	Refresh Detail Create Edit Register Deregister	

### Figure 108 Editing the Host Initiators

20. Click Existing Host... radio button as shown in Figure 109.

1

	WWN/IQN	SP-Port ID	Registered
>	20:00:00:25:85:60:0D:0E:20:00:00:25:85:6 20:00:00:25:85:60:0D:0E:20:00:00:25:85:6		No No
These HBA <u>N</u> ew Host Host Name: IP Address:	s belong to © Existing Browse I		0D:0E:20:00:00:25:B5:66:D
Initiator In	formation e: Please Select One V Failover Mode:	Legacy failovermode 0	V

# Figure 109 Browsing for the Existing Host

21. Select the first host created in step 17 and click Ok as shown in Figure 110.



	💋 Edit Initiators	-					×
I		WWN/IQN		SP-Port II	D	Registered	
	V	20:00:00:25:B5:60:0D:0E:20:00:00 20:00:00:25:B5:60:0D:0E:20:00:00				No No	
	These HBAs	belong to	-				
	O New Host Host Name:		<u>Existing</u> Browse H		Selected Host 250-ESXHost1		
	IP Address:		Browser				
	Initiator Inf	ormation					
	Initiator Type: <u>Advanced Op</u> t		lover Mode:	Active-A	ctive mode(ALUA)	)-failovermode 4	<b>v</b>
					<u>о</u> к	<u>C</u> ancel	<u>H</u> elp

**22.** Select Initiator Type and Failover Mode from the respective drop-down list as shown in Figure 111 and click **Ok**.



#### 11 Entering Initiator Information

-	💋 Edit Initiators	-					X
I		WWN/IQN		SP-Port ID		Registered	
I.	<ul> <li>Image: A set of the set of the</li></ul>	20:00:00:25:B5:60:0D:0E:20:00:00				No	
l	✓	20:00:00:25:B5:60:0D:0E:20:00:00	:25:B5:6	B-5		No	
i.							
l							
I.	These HBAs	belong to					
I.	🔘 <u>N</u> ew Host_		● Existing	Host 🔄 🥥 Sel	ected Host		
I.	Host Name:		Browse H	lost V250-E	SXHost1		
l	IP Address:						
	Initiator Inf	ormation					
I	Initiator Type	CLARiiON Open 🔽 Fail	lover Mode:	Active-Active	mode(ALUA	)-failovermode	e 4 🔽
ľ	<u>Advanced Opt</u>	ions					
					<u>о</u> к	<u>C</u> ancel	<u>H</u> elp

**23.** Click **Refresh All**. Two WWPNs of the first ESXi host should be visible from both SPs as shown in Figure 112.

				🖌 :	Storage Gro	oup is enable
ost Initiators MirrorView Initiators SAN Copy Initiators						
nitiator Name 🛆	Storage Groups	Registered	Logged In	SP - port	Туре	Attribute
- 🖗 20:00:00:25:85:60:0D:0A:20:00:00:25:85:66:DD:0A [Unknown; Fibre - 🖉 20:00:00:25:85:60:0D:0A:20:00:00:25:85:66:DD:1A [Unknown; Fibre	; Host Agent notNone Assigned					
- 20:00:00:25:85:60:0D:08:20:00:00:25:85:66:DD:08 [Unknown; Fibre						
- # 20:00:00:25:85:60:0D:08:20:00:00:25:85:66:DD:18 [Unknown; Fibre - # 20:00:00:25:85:60:0D:0C:20:00:00:25:85:66:DD:0C [Unknown; Fibre						
- 20:00:00:25:85:60:0D:0C:20:00:00:25:85:66:DD:0C [Unknown; Fibre						
20:00:00:25:85:60:0D:0D:20:00:00:25:85:66:DD:0D [Unknown; Fibre						
- 📴 20:00:00:25:85:60:0D:0D:20:00:25:85:66:DD:1D [Unknown; Fibre						
- 🚰 20:00:00:25:85:60:0D:05:20:00:00:25:85:66:DD:05 [Unknown; Fibre	Host Agent not None Assigned					
- 🥐 20:00:00:25:85:60:0D:05:20:00:00:25:85:66:DD:15 [Unknown; Fibre]						
- 🏆 20:00:00:25:85:60:0D:06:20:00:00:25:85:66:DD:06 [Unknown; Fibre,						
- 20:00:00:25:85:60:0D:06:20:00:00:25:85:66:DD:16 [Unknown; Fibre,						
- 🚰 20:00:00:25:85:60:0D:07:20:00:00:25:85:66:DD:07 [Unknown; Fibre; - 🚰 20:00:00:25:85:60:0D:07:20:00:00:25:85:66:DD:17 [Unknown; Fibre;						
- 20:00:00:25:85:60:0D:07:20:00:00:25:85:66:DD:07 [Unknown; Fibre]						
- 20:00:00:25:85:60:0D:08:20:00:00:25:85:66:DD:18 [Unknown; Fibre						
20:00:00:25:85:60:0D:09:20:00:00:25:85:66:DD:09 [Unknown; Fibre						
- 📴 20:00:00:25:85:60:0D:09:20:00:00:25:85:66:DD:19 [Unknown; Fibre						
- (p celerra_vsPcx5500 [10.29.150.201; ribre; Manually registered]	~hiestorage					
- 🔟 V250-ESXHost1 [10.29.180.121; Fibre; Manually registered; Host Agen	not reachable cNone Assigned					1
- 20:00:00:25:85:60:0D:0E:20:00:00:25:85:66:DD:0E		Yes	Yes	A-4	Fibre	
- 🖉 20:00:00:25:B5:60:0D:0E:20:00:00:25:B5:66:DD:0E		Yes	Yes	B-4	Fibre	
20:00:00:25:85:60:0D:0E:20:00:00:25:85:66:DD:0F		Yes	Yes	B-5	Fibre	
20:00:00:25:85:60:0D:0E:20:00:00:25:85:66:DD:0F		Yes	Yes	A-5	Fibre	
·						>
Refresh ALL Refresh Detail Create Edit Register	Deregister					

Figure 112 Window Showing WWPNs of ESXi Host

**24.** Repeat steps 15 to step 23 for remaining 9 servers. When all 10 servers are registered, the Host Initiators window should show all of them as in Figure 113.

Figure 113 Conr	ectivity Status of All	the TEN Servers
-----------------	------------------------	-----------------

USPEX5500 - Connectivity Status		-				
Host Initiators MirrorView Initiators SAN Cop	y Initiators					✔ Storage Group is enabled
Initiator Name 🛆	Storage Groups	Registered	Logged In	SP - port	Туре	Attributes
<ul> <li>P Celerra_VSPEX5500 [10.29.150.201; Fibre; Man</li> <li>V250-ESXHost1 [10.29.180.122; Fibre; Man</li> <li>V250-ESXHost2 [10.29.180.122; Fibre; Man</li> <li>V250-ESXHost3 [10.29.180.123; Fibre; Man</li> <li>V250-ESXHost4 [10.29.180.124; Fibre; Man</li> <li>V250-ESXHost5 [10.29.180.125; Fibre; Man</li> <li>V250-ESXHost5 [10.29.180.125; Fibre; Man</li> <li>V250-ESXHost6 [10.29.180.126; Fibre; Man</li> <li>V250-ESXHost6 [10.29.180.126; Fibre; Man</li> <li>V250-ESXHost6 [10.29.180.126; Fibre; Man</li> <li>V250-ESXHost8 [10.29.180.126; Fibre; Man</li> <li>V250-ESXHost9 [10.29.180.130; Fibre; Man</li> </ul>	u-None Assigned u-None Assigned u-None Assigned u-None Assigned u-None Assigned u-None Assigned u-None Assigned u-None Assigned					
Refresh ALL Refresh Detail Creat	<b>e</b> <u>E</u> dit	<u>R</u> egister	Deregis	ter		OK Cancel Help

I

**25.** Click the **Hosts** tab on the menu bar in the EMC Unisphere window, click **Storage Groups** as shown in Figure 114.

< > 🏠	VSPEX5500 🔽	🚟 Dashboard	System	Storage	Hosts	🐻 Data P	rotection	🗳 Settings	🛛 🕜 s
VSPEX5500 >	Hosts								
	Host List View properties of ho the storage system, s connectivity and assig Storage Groups Create and manage s	such as gned LUNs.	Ð	Virtualization View properties and virtual mach the storage syst	of VMware serv ines connected		Hypervis Failover Host Man Allocate Connect	agement LUNs for File Stora Host vity Status	nfigurat

Figure 114

Managing Storage Groups in the EMC Unisphere Window



EMC Unisphere			Pool LUN	V Searc	h	B Advanced	0
< > 👔 🗊 VSPEX5500 🗸	🔠 Dashboard	System	Storage	Hosts	👔 Data Protection	🐝 Settings	👩 Supp
<u>VSPEX5500</u> > <u>Hosts</u> > Storag	e Groups						
Storage Groups Filter for Storage Group Nwe WWN P offiestorage 60:06:01:60:	00:00:00:00:00:00:00:00:00:00:00:00:00:	0:00:00:00:04	<b>2</b> Y	4. 🖻 0	Wizards Storage Assignment I Hypervisor Informatio Failover Wizard		
					Host Management Allocate LUNs for File	Storage	
0 Selected Create Delete	Properties Conn		freshed: 2012-07-	1 items 30 18:41:12	Connectivity Status Update All Hosts		
Details			2 Y	4. 🖻 🕐			

27. Create host group for the first ESXi host as shown in Figure 116.



Storage Groups	🗳 🍸 🔩 🌛 🧿	Wizards
🕎 📮 Filter for		Storage Assignment Wiza
Storage Group N	WWN	Hypervisor Information C
📴 ~filestorage	60:06:01:60:00:00:00:00:00:00:00:00:00:00:00:04	Failover Wizard
		Host Management
Selected Creat	e Delete Properties Conne Storage System: VSPEX5500	Allocate LUNs for File Stor Connect Host Connectivity Status Update All Hosts
Details Hosts LUNs	SAN Copy Connections Snapshot L	
Long		

**28.** You will see a confirmation popup followed by an acknowledgement popup window. The acknowledgement window will ask for adding LUNs. Click **Yes** as shown in Figure 117.

Figure 117 Confirmation to Add LUNs

Results from call to create s	torage group:Success
Do you wish to add LUNs or	connect hosts?

I

29. Expand active SP and select LUN 0. Click Add to add LUN as shown in Figure 118.

Figure 118 Adding LUNs

💋 VSPEX5500 - V250-	ESXHost1: Storage Group Propertie	es				- • ×
General LUNs	Hosts					
Show LUNs: Not	in other Storage Groups 🔽					
Available LUNs-						
Name 🛆	ID		Capacity	Dr	rive Type	
🛨 – 💭 MetaLUNs						
庄 – 🎬 Snapshots						
🔁 🖗 SP B						
	0		50.000 GB	S#		
- 5 LUN 1	1		50.000 GB	SA		
	2 3		50.000 GB 50.000 GB	SA SA		
- 🔂 LUN 4	4		50.000 GB	S4		
- 📴 LUN 5	5		50.000 GB	SA		
- 🔂 LUN 6	6 7		50.000 GB 50.000 GB	SA SA		
	8		50.000 GB 50.000 GB	SA SA		
LUN 9	9		50.000 GB	SA		
🗄 – 🤯 Thin LUNs						
						- ( )
						A <u>d</u> d
-Selected LUNs-						
Name	ID	Capacity	Driv	е Туре	Host ID	
						<u>R</u> emove
					1 1	
	<ul> <li>Warning: HLU numbers higher t host failover software.</li> </ul>	nan 255 may result in (	application outa	ages if not supported	by the	
	Libbe failer of port and the					
			ſ			
				<u>o</u> k A	Apply <u>C</u> ar	icel <u>H</u> elp

**30.** You will see a confirmation popup window about adding LUN 0 for the storage group. Click **Ok**. Click the **Hosts** tab in the "Storage Group Properties" window. Select ESXi host 1 as shown in Figure 119.

General LUNs Ho	KHost1: Storage Group Properties			
Available Hosts Name	IP Address OS Type	Hosts to be Connecte Name	d IP Address O	
V250-ESXHost4 V250-ESXHost3 V250-ESXHost3 V250-ESXHost3 V250-ESXHost9 V250-ESXHost5 V250-ESXHost7 V250-ESXHost7	10.29.18 Fibre 10.29.18 Fibre 10.29.18 Fibre 10.29.18 Fibre 10.29.18 Fibre	)		
< <u>R</u> efresh		< :	:	>
		<u>O</u> K <u>A</u> pply	<u>C</u> ancel	<u>H</u> elp

#### Figure 119 Select

Selecting the Hosts to be Connected



Figure 120

## 120 Confirmation to Connect the Hosts to the Storage Group

VSPEX5500 - V250-ESXHost1: Storage Group Properties	- 0	23
General LUNs Hosts		
Show Hosts: Not connected		
Select Hosts		
Filter For:		
Available Hosts Hosts to be Connected		
Name IP Address OS Type Name IP Add	ress OS T	уре
V250-ESXHost10 10.29.18 Fibre	L8 F	ibre
V250-ESXHoet2 10.29.18 Ebva V250-ESXH Confirm: VSPEX5500 - V250-ESXHost1: Storage Group P	)	
V250-ESXH V250-ESXH V250-ESXH V250-ESXH V250-ESXH V250-ESXH		
Do you wish to continue?		
<u>Y</u> es <u>N</u> o		
< = > < =		>
Refresh		
	cel	<u>H</u> elp

**32.** Repeat steps 25 to 31 for all remaining 9 hosts. After adding all the hosts, the "Storage Groups" list is as shown in Figure 121.

EMC Unisphere	Po	ol LUN 🔽 Search		Advanced Search
A VSPEX5500      Dashboard     System     Syste	n 👔 Storage 🚺 Hos	ts 🛛 🔞 Data Protection	🐝 Settings	📀 Support
<u>VSPEX5500</u> > <u>Hosts</u> > Storage Groups				
Storage Groups		<b>2</b> `	7 4, 🖻 🤊	Wizards
T Filter for				Storage Assignment
Storage Group Name	- WWN			Hypervisor Informat Failover Wizard
😫 V250-ESXHost1	91:17:D6:88:94:E7:E1:11:91	FC:00:60:16:3A:2C:BB		Fallover Wizaru
V250-ESXHost2	07:95:AB:1B:97:E7:E1:11:91	FC:00:60:16:3A:2C:BB		Host Management
V250-ESXHost3	8C:73:6C:88:97:E7:E1:11:91	FC:00:60:16:3A:2C:BB		Allocate LUNs for File
V250-ESXHost4	DB:1E:B8:B8:97:E7:E1:11:91		Connect Host	
V250-ESXHost5	2E:6A:EF:FF:97:E7:E1:11:91:		Connectivity Status Update All Hosts	
V250-ESXHost6	45:07:B4:3F:98:E7:E1:11:91:			
V250-ESXHost7	C2:14:1F:6C:98:E7:E1:11:91	FC:00:60:16:3A:2C:BB		
V250-ESXHost8	BD:A7:5C:B0:98:E7:E1:11:91	:FC:00:60:16:3A:2C:BB	•	
V250-ESXHost9	FE:8D:F2:DC:98:E7:E1:11:91	FC:00:60:16:3A:2C:BB		
V250-ESXHost10	4D:E4:CE:53:99:E7:E1:11:91	FC:00:60:16:3A:2C:BB		
😫 ~filestorage	60:06:01:60:00:00:00:00:00:00	00:00:00:00:00:00:04		
1 Selected Create Delete Properties Connect LUNs	Connect Hosts	Last Refreshed: 2012-0	11 items 8-16 17:37:04	
Details	¥	2. 1	7 4. 🗟 🤉	
	erver Private Storage	Last Refreshed: 2012-08-		
Alerts: 17 🔞 1 Critical Certificates: 1				

# Figure 121 Storage Group After Adding All the Hosts

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**33.** Launch the Cisco UCS Manager GUI again, and click the **Equipment** tab and select a server. Click the **KVM Console** link on the right pane of the Cisco UCS Manager window as shown in Figure 122.



Figure 122 Launch the KVM Console

34. Click the Macros after KVM console is launched, and select Ctr-Alt-Del as shown in Figure 123.

🛦 V250-W <del>C5 / Chuss</del> is - 1 Server - 1 - KVM Console					
File View Macros Tools Help					
📣 Boot Serv	Ctrl-Alt-Del	J			
KVM Console	Alt-Tab				
KVM Virbua	Alt-Esc				
	Ctrl-Esc				
Reboot or Inse	Alt-Space	t device sted Boot device and p	iress a keu		
or mad	Alt-Enter	fed boe device and p	nood a nog		
	Alt-Hyphen				
	Alt-F4				
	PrtScrn				
	Alt-PrtScm				
	F1				
	Pause				
	Tab				
	Ctrl-Enter				
	SysRq				
	Alt-SysRq				
	Alt-LShift-RShift-Esc				
	Ctrl-Alt-Backspace				
	Alt-F?				
	Ctrl-Alt-F?				
	User Defined Macros 🔹 🕨				
Connected to IF	: 10.29.180.229			C Retrieving data	System Time: 2012-08-16T10:38

Figure 123 Reboot the Server

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**35.** This will power cycle the Cisco UCS B200 M3 Blade Server. After BIOS execution, you should see each vHBA being polled for boot media and Option ROM must list the WWPN of the VNX5500 FC port of given fabric as shown in Figure 124.





As there is no bootable image yet which is installed on the LUN, the server will not actually boot; however this is a validation of end-to-end SAN boot infrastructure from Cisco UCS B200 M3 Blade Servers to the VNX5500 LUN.

# **Configure NFS Storage**

This section covers the configuration of NFS storage on VNX5500 storage array.

To Create Storage Pools for NFS Datastore. Click Storage > Storage Configuration > Storage pools.

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Figure 125 Selecting Storage Pools in the EMC Unisphere

2. From the Storage Pools, click Create.

Figure 126

Creating Storage Pools

MC Unisphere					Poo	LUN	Sear	ch
< > 🏠 🗐 VSP	EX5500 🔽	🔠 Das	hboard	System	n Transt	orage	🕑 Hosts	Data Prot
VSPEX5500 > <u>Stora</u> c	<u>ie &gt; Stora</u>	qe Configura	<u>tion</u> > Sto	rage Pools				
Pools RAID Groups								
Pools							2	7 🔧 🖻 📀
ү 📮 Filter for		RAID Type A	II 💌					
Name 🔺	State	RAID Type	Drive Type	User Capa	Free Capa	Allocated	%Consu	Subscribe %
<								>
0 Selected Create	Delete	Propertie		nd				0 items
	۵			÷		Last Refres	hed: 2012-0	08-06 10:04:06

**3.** Enter the Storage Pool Name as "PerformancePool" and Select RAID type as RAID5 from the drop-down list. Then, Select the required SAS disks (150 Disks required for V250 validation) from the drop-down list as shown in Figure 127.



Note

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To Validate 250 VMs IO performance, VNX5500 storage configuration requires minimum of 165 disks. Out of 165 disks, 150 disks reserved for NFS configuration and 15 disks from "Bus 0 Enclosure 0" are reserved for three purposes: VNX OE operation system, Hot spare and SAN boot of ESXi hypervisor OS. Make sure, you did not choose "Bus0 Enclosure 0" drives during NFS Storage "PerformancePool" creation. Also, VNX5500 does not support more than 75 drives during storage pool creation. In order to choose 150 disks for the given storage pool, create the pool with 75 drives and then expand it with additional 75 drives.

	orage Pool						
eneral Advanced							
Storage Pool Para	meters						
Storage Pool Type:	Pool	RAID Group					
	-	led Auto-Tiering	1				
Storage Pool ID:			10.				~
Storage Pool Name:	Performance	Pool					i hanni
RAID Type:	RAID5						V
Number of Disks:							1.22
Extreme Perform	ance						
SSD Disks							
0	*						
Performance							
and the second							
SAS Disks							
75 (Recommend	×						
Capacity							
NL SAS Disks							
0	×						
Distribution							
	(0.571.00./	00.000					
Performance : 402	60.571 GB (1	100.00%)					
Dicks							
<b>DISKS</b>	Deman Cavie	a Distribute Distance					
🔘 Automatic 🛄 Use	Power Savin			<b>-</b>			10060
🔘 Automatic 🛄 Use	Power Savin	g Eligible Disks Selec		Т	otal Raw	Capacity:	40260
🔘 Automatic 🛄 Use				] T State	otal Raw	Capacity:	40260
<ul> <li>Automatic Use</li> <li>Manual</li> <li>Disk</li> <li>Bus 0 Enclosure 1</li> </ul>	Capacit 1 536.80	<u>S</u> elec y Drive Type SAS	t Model HUS15	State	otal Raw	Capacity:	^
<ul> <li>Automatic ☐ Use</li> <li>Manual</li> <li>Disk</li> <li>Bus 0 Enclosure 1</li> <li>Bus 0 Enclosure 1</li> </ul>	Capacit L 536.80 L 536.80	Selec y Drive Type SAS SAS	t Model HUS15 HUS15	State Un Un	otal Raw	Capacity:	
<ul> <li>Bus 0 Enclosure 1</li> <li>Bus 0 Enclosure 1</li> <li>Bus 0 Enclosure 1</li> </ul>	Capacit: L 536.80 L 536.80 L 536.80	Selec y Drive Type SAS SAS SAS	t Model HUS15 HUS15 HUS15	State Un Un Un	otal Raw	Capacity:	^
Automatic Use Manual Disk Bus 0 Enclosure 1 Bus 0 Enclosure 1 Bus 0 Enclosure 1 Bus 0 Enclosure 1 Bus 0 Enclosure 1	Capacit: L 536.80 L 536.80 L 536.80 L 536.80	Selec y Drive Type SAS SAS SAS SAS	t Model HUS15 HUS15 HUS15 HUS15	State Un Un Un Un	otal Raw	Capacity:	^
Automatic Use Manual Disk Bus 0 Enclosure 1 Bus 0 Enclosure 1 Bus 0 Enclosure 2 Bus 0 Enclosure 2 Bus 0 Enclosure 2 Bus 0 Enclosure 2	Capacit: L 536.80 L 536.80 L 536.80 L 536.80 L 536.80	Selec y Drive Type SAS SAS SAS SAS SAS SAS	t Model HUS15 HUS15 HUS15 HUS15 HUS15	State Un Un Un Un	otal Raw	Capacity:	^
Automatic Use Manual Disk Bus 0 Enclosure 1 Bus 0 Enclosure 1	Capacit L 536.80 L 536.80 L 536.80 L 536.80 L 536.80 L 536.80	<u>S</u> elec y Drive Type SAS SAS SAS SAS SAS SAS	t Model HUS15 HUS15 HUS15 HUS15 HUS15	State Un Un Un Un Un	otal Raw	Capacity:	
Automatic Use Manual Disk Bus 0 Enclosure 1 Bus 0 Enclosure 1	Capacit L 536.80 L 536.80 L 536.80 L 536.80 L 536.80 L 536.80	<u>S</u> elec y Drive Type SAS SAS SAS SAS SAS SAS	t Model HUS15 HUS15 HUS15 HUS15 HUS15	State Un Un Un Un Un	otal Raw	Capacity:	^
Automatic Use Manual Disk Bus 0 Enclosure 1 Bus 0 Enclosure 1	Capacit L 536.80 L 536.80 L 536.80 L 536.80 L 536.80 L 536.80	<u>S</u> elec y Drive Type SAS SAS SAS SAS SAS SAS	t Model HUS15 HUS15 HUS15 HUS15 HUS15	State Un Un Un Un Un	otal Raw	Capacity:	

the Pool creation.

4. Manually Select 75 SAS disks and click Apply to initiate Pool creation and Click Yes to continue

# Figure 127 Entering Details for Creating Storage Pools

1

	Band Barbarbarbarbarbarbarbarbarbarbarbarbarba	orage Pool							_ 🗆
eneral A	dvanced								
Storage P	ool Para	meters							
Storage Po	ool Type:	Pool	RAID Group						
		Schedul	ed Auto-Tiering	9					
Storage Po	ool ID:	0							~
Storage Po	ool Name:	Performance	Pool						
RAID Type		RAID5							~
Number of	Disks:								
Extreme	Performa	ance							
SSD Dis	<s< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></s<>								
0		~							
Perform	ance								
SAS Disk	cs Conf	firm: Create 9	Storage Pool				X	1	
75 (Reco	m	-	ate Pool operat	tion?				1	
Capacity	2								
NL SAS D	1444 B								
NE SAS L	Dis								
0	Dis								
0	io	Do you wish	to continue?						0
0 Distribut Performa	io	Do you wish	1 to continue?						
Distribut Performa	an(					Yes	No		
Distribut Performa Disks	an(		1 to continue? 9 Cligible Olsks Selec	<u></u>	[			ncity: 40	0260
Distribut Performa	an(		<u>g chylole Olsks</u> Selec	<u></u>	State	– Total Ra		ncity: 40	0260
0 Distribut Performa Disks Automa Manual Disk	io anc tic <del>ose</del>		g Chigiole Disks Selec y Drive Type	x	State	Total Ra		ncity: 40	D260
0         Distribut         Performa         Disks         ④ Automa         ● Manual         Disk         ✓ Bus 0 E         ✓ Bus 0 E	tic ose	Capacit 1 536.80	g Eligib <del>ie Disks <u>S</u>elec</del> y Drive Type . SAS . SAS	t Model HUS15 HUS15	State . Un	Total Ra		ncity: 4(	
Distribut Performa Disks Automa Manual Disk Bus 0 E Bus 0 E Bus 0 E	tic ose	Capaciti 536.80 1 536.80 1 536.80	g Eligible Disks Selec y Drive Type . SAS . SAS . SAS . SAS	t Model HUS15 HUS15 HUS15	State . Un . Un . Un	Total Ra		ncity: 40	^
Distribut Performa Disks Automa Manual Disk Bus 0 E Bus 0 E Bus 0 E	tic ose	Capacit 1 536.80	g Eligible Disks Selec y Drive Type . SAS . SAS . SAS . SAS	t Model HUS15 HUS15	State . Un . Un . Un	Total Ra		ncity: 4(	^
0         Distribut         Performa         0         Manual         Disk         Image: Second Seco	ilo anc tic ose inclosure 1 inclosure 1 inclosure 1	Capaciti 536.80 1 536.80 1 536.80	g Eligible Disks Selec y Drive Type . SAS . SAS . SAS . SAS	t Model HUS15 HUS15 HUS15	State . Un . Un . Un	Total Ra		ncity: 4	*
0       Distribut       Performa       Oisks       ● Manual       Disk       ● Bus 0 E	ilo anc tic ose inclosure 1 inclosure 1 inclosure 1	Capaciti 536.80 1 536.80 1 536.80	g Eligible Disks Selec y Drive Type . SAS . SAS . SAS . SAS	t Model HUS15 HUS15 HUS15	State . Un . Un . Un	Total Ra		city: 40	*
0 Distribut Performa Disks Manual Disk Ø Bus 0 E Ø Bus 0 E	ilo anc tic ose inclosure 1 inclosure 1 inclosure 1	Capaciti 536.80 1 536.80 1 536.80	g Eligible Disks Selec y Drive Type . SAS . SAS . SAS . SAS	t Model HUS15 HUS15 HUS15	State . Un . Un . Un	Total Ra		ncity: 4(	*

ſ

Figure 128

Confirmation on Creating Storage Pool

**5.** After the successful creation of "PerformancePool" with 75 Disks, click **Ok** in the success notification popup window.

	orage Pool					
neral Advanced						
Storage Pool Para	meters					
Storage Pool Type:	🖲 Pool 🔘 R	ATD Group				
storege i oor ryper		ed Auto-Tiering	-			
Storage Pool ID:		A Hato Hering				~
Storage Pool Name:	PerformanceP	ool				laine a
RAID Type:	RAIDS					~
Number of Disks:	130005460 G					(access)
Extreme Performa	2000					
SSD Disks	une b					
0	~					
	(2228)					
Performance						
SAS Disks					×	
SMS DISKS Mess	ane: Create S	forage Pool				
75 (Recon	age: Create S		- De el mere	internet at		
75 (Recon	The creation	torage Pool of Performanc	ePool was i	initiated		
75 (Recon Capacity			æPool was i	initiated		
75 (Recon Capacity NL SAS Di	The creation		ePool was i	initiated		
75 (Recon Capacity	The creation		æPool was i	initiated		
75 (Recon Capacity NL SAS Di 0	The creation		ePool was i	initiated		
75 (Recon Capacity NL SAS Di 0 Distributic	The creation		ePool was i	initiated		
75 (Recon Capacity NL SAS Di 0	The creation		ePool was i	initiated		
75 (Recon Capacity NL SAS Di O Distributic Performan	The creation		æPool was i	initiated		
75 (Recon Capacity NL SAS Di Distributic Performan Disks	The creation successfully.	of Performanc		initiated		
75 (Recon Capacity NL SAS Di Distributic Performan Disks Automatic	The creation successfully.	of Performanc			<u>o</u> K	
75 (Recon Capacity NL SAS Di Distributic Performan Disks Automatic	The creation successfully.	of Performanc				: 40260
75 (Recon Capacity NL SAS Di O Distributic Performan Disks Automatic Manual	The creation successfully,	of Performanc			<u>o</u> K	: 40260
75 (Recon Capacity NL SAS Di Distributic Performan Disks Manual Disk	The creation successfully.	of Performanc		Total Ra	<u>o</u> K	: 40260
75 (Recon Capacity NL SAS Di Distributic Performan Disks Manual Disk Puisk Manual	The creation successfully.	of Performanc Charles Disks Selec Drive Type SAS	t	Total Ra State Un	<u>o</u> K	
75 (Recon Capacity NL SAS Di 0 Distributic Performan Disks Manual Disk S Bus 0 Enclosure 1 S Bus 0 Enclosure 1	The creation successfully. Capacity 	of Performanc <u>Selec</u> Drive Type SAS SAS	t Model HUS15	Total Ra State Un Un	<u>o</u> K	^
75 (Recon Capacity NL SAS Di 0 Distributic Performan Disks Manual Disk S Bus 0 Enclosure 1 S Bus 0 Enclosure 1	The creation successfully. Fower Saving Capacity 536.80 536.80	of Performance Select Drive Type SAS SAS	t Model HUS15 HUS15	Total Re State Un Un Un	<u>o</u> K	
75 (Recon NL SAS Di 0 Distributic Performan Disks Manual Disk Bus 0 Enclosure 1 Bus 0 Enclosure 1 Bus 0 Enclosure 1	The creation successfully. Fower Saving Capacity 536.80 536.80	of Performance Select Drive Type SAS SAS	t Model HUS15 HUS15	Total Re State Un Un Un	<u>o</u> K	^
75 (Recon Capacity- NL SAS Di 0 Distributic Performan Disks Manual Disk Bus 0 Enclosure 1 Sus 0 Enclosure 1 Sus 0 Enclosure 1	The creation successfully. Fower Saving Capacity 536.80 536.80	of Performance Select Drive Type SAS SAS	t Model HUS15 HUS15	Total Re State Un Un Un	<u>o</u> K	

- 6. Select "PerformancePool" and click 💋 to refresh, until initialization state shows "Ready". To add 75 more disks to the pool, select "PerformancePool" and click Expand.

#### Figure 130 Adding More Disks to the Pool

MC Unisphere			_		100	LUN	✓ Sear	cinii
< > 🏦 💷 vs	SPEX5500 💌	Da:	shboard	System	st T st	orage	Hosts	👔 Data Pr
VSPEX5500 > Stor	age > <u>Stor</u>	age Configura	ation > Sto	rage Pools				
Pools RAID Groups	1							
Pools							2	7 4. 🝺 🤉
<b>Filter for</b>		RAID Type						
Name	- State	RAID Type	Drive Type	User Capa	Free Capa	Allocated	%Consu	Subscribe %
🚏 PerformancePo	Ready	RAIDS	SAS	32147.666	32147.666	0.000		0
	$\smile$							
<								>
1 Selected Creat	e Delete	Properti		ind				1 items
	Derete	Topera						
						Last Refres	hed: 2012-0	8-06 11:04:40

7. From the drop-down list, choose "75 (Recommended)" disks to expand. Click Select.

#### Figure 129 Window Showing Successful Creation of Storage Pool

VSPEX5500 - Expand Storage PerformancePool Properti		_ 0
Pool ID: 0	RAID Type:	RAID5
Jser Capacity: 32147.6	66 GB Consumed Ca	apacity: 0.000 GB
Available Capacity: 32147.6	66 GB Oversubscribe	ed By:
umber of disks to expand by	(: 75 (Recommended)	
isks ) Automatic		
Manual	Select	Total Raw Capacity: 7
	Capacity Drive Typ	
isk	Capacity Drive Typ 536.808 SAS	
isk Bus 1 Enclosure 4 Disk 4		oe Model State
isk Bus 1 Enclosure 4 Disk 4 Bus 1 Enclosure 4 Disk 5	536.808 SAS	oe Model State STE60 Un 4
isk Bus 1 Enclosure 4 Disk 4 Bus 1 Enclosure 4 Disk 5 Bus 1 Enclosure 4 Disk 5 Bus 1 Enclosure 4 Disk 6	536.808 SAS 536.808 SAS	oe Model State STE60 Un STE60 Un
Disk Bus 1 Enclosure 4 Disk 4 Bus 1 Enclosure 4 Disk 5 Bus 1 Enclosure 4 Disk 6 Bus 1 Enclosure 4 Disk 7 Bus 1 Enclosure 4 Disk 8	536.808 SAS 536.808 SAS 536.808 SAS	Model State STE60 Un STE60 Un STE60 Un
<ul> <li>Bus 1 Enclosure 4 Disk</li> <li>Bus 1 Enclosure 4 Disk 5</li> <li>Bus 1 Enclosure 4 Disk 5</li> <li>Bus 1 Enclosure 4 Disk 6</li> <li>Bus 1 Enclosure 4 Disk 7</li> </ul>	536.808 SAS 536.808 SAS 536.808 SAS 536.808 SAS 536.808 SAS 536.808 SAS	Model State STE60 Un STE60 Un STE60 Un STE60 Un
bisk Bus 1 Enclosure 4 Disk 4 Bus 1 Enclosure 4 Disk 5 Bus 1 Enclosure 4 Disk 6 Bus 1 Enclosure 4 Disk 8 Bus 1 Enclosure 4 Disk 8 Bus 1 Enclosure 4 Disk 9	536.808 SAS 536.808 SAS 536.808 SAS 536.808 SAS 536.808 SAS 536.808 SAS 536.808 SAS	Model State STE60 Un ? STE60 Un STE60 Un STE60 Un STE60 Un
bisk Bus 1 Enclosure 4 Disk 4 Bus 1 Enclosure 4 Disk 5 Bus 1 Enclosure 4 Disk 6 Bus 1 Enclosure 4 Disk 8 Bus 1 Enclosure 4 Disk 8 Bus 1 Enclosure 4 Disk 9	536.808 SAS 536.808 SAS 536.808 SAS 536.808 SAS 536.808 SAS 536.808 SAS 536.808 SAS 536.808 SAS	Model         State           STE60         Un
bisk Bus 1 Enclosure 4 Disk 4 Bus 1 Enclosure 4 Disk 5 Bus 1 Enclosure 4 Disk 6 Bus 1 Enclosure 4 Disk 7 Bus 1 Enclosure 4 Disk 8 Bus 1 Enclosure 4 Disk 9 Bus 1 Enclosure 4 Disk 9 Bus 1 Enclosure 4 Disk 10	536.808 SAS 536.808 SAS 536.808 SAS 536.808 SAS 536.808 SAS 536.808 SAS 536.808 SAS 536.808 SAS 536.808 SAS	Model         State           STE60         Un
Bus 1 Enclosure 4 Disk 4 Bus 1 Enclosure 4 Disk 5 Bus 1 Enclosure 4 Disk 5 Bus 1 Enclosure 4 Disk 7 Bus 1 Enclosure 4 Disk 7 Bus 1 Enclosure 4 Disk 9 Bus 1 Enclosure 4 Disk 10 Bus 1 Enclosure 4 Disk 11	536.808 SAS 536.808 SAS 536.808 SAS 536.808 SAS 536.808 SAS 536.808 SAS 536.808 SAS 536.808 SAS 536.808 SAS 536.808 SAS	Model         State           STE60         Un
Disk Bus 1 Enclosure 4 Disk 4 Bus 1 Enclosure 4 Disk 5 Bus 1 Enclosure 4 Disk 6 Bus 1 Enclosure 4 Disk 7 Bus 1 Enclosure 4 Disk 8 Bus 1 Enclosure 4 Disk 10 Bus 1 Enclosure 4 Disk 11 Bus 1 Enclosure 4 Disk 11 Bus 1 Enclosure 4 Disk 11 Bus 1 Enclosure 4 Disk 11	536.808 SAS 536.808 SAS	Model         State           STE60         Un           STE60         Un

8. Click Ok in the popup window on successful expansion of PerformancePool.

### Figure 132 Completion of Storage Pool Expansion

•	The expansion of PerformancePool was initiated successfully.	
		<u>о</u> к

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9. Wait for the expansion of the pool to be completed and the state to show "Ready".

VSPEX5	500 🗸	🔠 Das	hboard	System	T Stor	rage	Hosts		Data Pr
		and the second			<b>(1</b> )	-			
<u>SPEX5500</u> > <u>Storage</u> :	> <u>Storage</u>	Configura	<u>tion</u> > Storage	Pools					
ools RAID Groups									
Pools							2	74.	و 🙍
ү 📮 Filter for	RA	ID Type A	II 💌						
Name 🔺 Sta	ate R	AID Type	Drive Type Use	er Capa Free	Capa A	llocated	%Consu	. Subscri	be %
PerformancePool Rea	ady R	AID5	SAS 3	2147.666 321	147.666	0.000			0
				22.1					>
<									
Selected Create	Delete	Propertie			L	ast Refresh			1 items :08:28
Selected Create	Delete	Propertie		]	L	ast Refresh		08-06 11	1 items :08:28
Selected Create	Delete	Propertie		( User Ca			2	•08-06 11 🝸 🔍	1 items :08:28
Selected Create Details Pool LUNs Disks The Filter for			es Expand				2	•08-06 11 🝸 🔍	1 items :08:28
Selected Create Details Pool LUNs Disks Therefor Name	L Disk 0	State	Raw Capacity	808 N/A	LUN IDs		Z	08-06 11	1 items :08:28
Selected Create  Details  Pool LUNs Disks  Filter for  Name Bus 0 Enclosure 1	L Disk 0 L Disk 1	State Enabled	Raw Capacity 536.	808 N/A 808 N/A	LUN IDs N/A		Drive T SAS	08-06 11	1 items :08:28
Selected Create  Details  Pool LUNs Disks  T Filter for  Name Bus 0 Enclosure 1 Bus 0 Enclosure 1	L Disk 0 L Disk 1 L Disk 2	State Enabled Enabled	Raw Capacity 536.	808 N/A 808 N/A 808 N/A	LUN IDs N/A N/A		Drive T SAS SAS	08-06 11	1 items :08:28
Selected Create  Details  Pool LUNs Disks  T Filter for  Name Bus 0 Enclosure 1 Bus 0 Enclosure 1 Bus 0 Enclosure 1 Bus 0 Enclosure 1	L Disk 0 L Disk 1 L Disk 2 L Disk 3	State Enabled Enabled Enabled	Raw Capacity 536. 536.	808 N/A 808 N/A 808 N/A 808 N/A	LUN IDs N/A N/A N/A		Drive T SAS SAS SAS	08-06 11 <b>Power</b> Full Po Full Po Full Po	1 items :08:28
Details Pool LUNs Disks Filter for Name Bus 0 Enclosure 1 Bus 0 Enclosure 1 Bus 0 Enclosure 1 Bus 0 Enclosure 1 Bus 0 Enclosure 1	L Disk 0 L Disk 1 L Disk 2 L Disk 3 L Disk 4	State Enabled Enabled Enabled Enabled	Raw Capacity 536. 536. 536.	808 N/A 808 N/A 808 N/A 808 N/A 808 N/A	LUN IDs N/A N/A N/A N/A		Crive T SAS SAS SAS SAS SAS	08-06 11 <b>Power</b> Full Po Full Po Full Po	1 items :08:28

Figure 133 Window Showing Storage Pools After the Expansion

1

**10.** To create Hot Spares for the system, click **System > Hot Spares**.



Figure 134 Selecting Hot Spares in EMC Unisphere

**11.** Click **Create** to create Hot Spares.

Figure 135 Creating Hot Spares

EMC Unisphere			Pool LUN 💌	Search
< > 🏦 🗐 VNX5500 💌	<< rd	System 🛛 🇊 Storag	ge 📳 Hosts	👔 Data Protection 🧃
<u>VNX5500</u> > <u>System</u> > <u>Hardwa</u>	<u>re</u> > Hot Spares			
Hot Spares				💈 🍸 🔧 💿 🧿
<b>Y</b> Filter for	_			
Disk	Hot Spare	Hot Spare Replacing	User Capacity	Drive Type
				ŀ
0 Selected Create Delete	Properties			0 items

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12. In the Create Hot Spare Window. Click RAID Group radio button for Storage Pool Type. Select Storage Pool ID as 1 from the drop-down list, enter the Storage Pool Name, select the RAID Type as "Hot Spare" from the drop-down list, and select the Number of Disks as 1 from the drop-down list. Click Automatic radio button for disks and click Apply.

Storage Pool Paran Storage Pool Type:							
	notour						
		RAID G					
	<u>P</u> 001 (	<u> R</u> AID G	roup				
Storage Pool ID:	1						
Storage Pool Name:	RAID Grou	up 1					
RAID Type:	Hot Spa	are 🗸					
Number of Disks:	1				<u>_</u>		
Disks							
🖲 A <u>u</u> tomatic 📃 Use A	ower Sav	ing Eligibl	e Disks				
) <u>M</u> anual			Select		Total Raw Capacity: 536.80.		
Disk		Capacity	Drive Type	Model	State Power Saving Eligibl		
🔗 Bus 0 Enclosure 0	Disk 14	536.80	SAS	STE60	Un No		

Figure 136

Entering Storage Pool Parameters

**13.** Figure 137 shows the RAID Group 1 has been created successfully to create the first Hot Spare for this Storage. Click **Ok** and continue creating Hot Spares.

1

Storage Pool Parar	neters				
Storage Pool Type:	@ <u>P</u> ool (	<u>R</u> AID Gr	oup		
Storage Pool ID:	2				~
Storage Pool Name:	RAID Grou	p 2			
RAID Type:	Hot Spar	e			~
Number of Disks:	1				×
● A <u>u</u> tomatic 🗌 Use ○ <u>M</u> anual	Power Sav	ing Eligible	<u>S</u> elect		Total Raw Capacity: 536.80
Disk		Capacity	Drive Type	Model	State Power Saving Eligible
Bus 0 Enc 📝 Mes		up 1 was o LUN 7885	re created succe was automa		eated
	RAID Gro Hot Spare	up 1 was o LUN 7885	created succe		
	RAID Gro Hot Spare	up 1 was o LUN 7885	created succe		eated

I

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Figure 137 Window Showing Successful Creation of RAID Group 1

14. Repeat step 12 & Step 13 to create seven more hot spares as needed for this Storage configuration.

eneral Advanced							
Storage Pool Para	meters						
Storage Pool Type:	O <u>P</u> ool	<mark>●</mark> <u>R</u> AID G	roup				
Storage Pool ID:	8						V
Storage Pool Name:	RAID Gro	oup 8					
RAID Type:	Hot Sp	are					V
Number of Disks:	1						V
∑ <u>M</u> anual Disk		Capacity	Select	Model	a se nostrato	) Capacity: 5: ower Saving	
	Provide statements and statements	eate Hot Sp roup 7 was		essfully.		×	
	RAID G	roup 7 was re LUN 787	are created succ '9 was automa		reated	X	
	RAID G	roup 7 was re LUN 787	created succ		reated		
	RAID G	roup 7 was re LUN 787	created succ		reated	δκ	
	RAID G	roup 7 was re LUN 787	created succ		reated		

Figure 138

Window Showing Successful Creation of RAID Group 7

1

15. After creating the Hot Spares, make sure the Hot Spare state shows "Hot Spare Ready".

#### Figure 139 Window Showing Hot Spare Status

< > 🏦 🗐 VSPEX5500 🔽	🛛 🚟 Dashboard	System	Storage 🛛 🐌 Hos	sts 🛛 🔞 Data Prote
<u>VSPEX5500</u> > <u>System</u> > <u>Har</u>	<u>dware</u> > Hot Spares			
Hot Spares				272. 🖻 🤉
🝸 📮 Filter for				
Disk	🔺 Hot Spare	Hot Spare Replacing	User Capacity	Drive Type
🔗 Bus 0 Enclosure 0 Disk 8	Hot Spare Ready	Inactive	536.530	SAS
🔗 Bus 0 Enclosure 0 Disk 9	Hot Spare Ready	Inactive	536.530	SAS
🔗 Bus 0 Enclosure 0 Disk 10	Hot Spare Ready	Inactive	536.530	SAS
🔗 Bus 0 Enclosure 0 Disk 11	Hot Spare Ready	Inactive	536.530	SAS
🔗 Bus 0 Enclosure 0 Disk 12	Hot Spare Ready	Inactive	536.530	SAS
🔗 Bus 0 Enclosure 0 Disk 13	Hot Spare Ready	Inactive	536.530	SAS
No. 8 Bus 0 Enclosure 0 Disk 14	Hot Spare Ready	Inactive	536.530	SAS

**16.** To create LUNs from the newly created PerformancePool for NFS Datastore; Click **Storage**, right-click on the "PerformancePool" and click **Create LUN**.

MC Unisphere					Pool	LUN	✓ Sea	rch
< > 🏦 🗊 vs	SPEX5500 💌	🔠 Da	shboard	System	n 👔 Sto	rage	🔰 Hosts	🛛 🐻 Data Pr
/SPEX5500 > <u>Stor</u>	age > <u>Stora</u>	age Configur	<u>ation</u> > Sto	rage Pools				
Pools RAID Groups								
Pools							2	7 4, 🖻 🤉
<b>Filter for</b>		RAID Type	All 🔽					
Name	▲ State	RAID Type	Drive Type	User Capa	Free Capa	Allocated	%Consu	Subscribe %
💕 PerformancePg	- Lo J. Create LUN		SAS	32147.666	32147.666	0.000		0
<	Expand Delete							>
1 Selected Crea	Analyzer	> ert	ies Expa	nd				1 items
	Auto-Tiering	>			L	ast Refresi.	hed: 2012-	08-06 11:08:28
Details Pool LUNs Di	Properties sks						3	r 4, 🖻 📀
Filter f	or							
Name		▲ State	Daw Cana	citu ( Uron	Ca LUN IDs	Hat Can	Deino T	Dowor

Creating LUN

Figure 140

State Raw Capacity (... User Ca... LUN IDs Hot Spa... Drive T... Power ...
17. Click Pool radio button for the Storage Pool Type, Select RAID Type as "RAID5" from the drop-down list and Storage Pool for new LUN as "PerformancePool" from the drop-down list. In the LUN properties area, make sure to select User Capacity as "300GB" from the drop-down list. Select Number of LUNs to Create as "150" from the drop-down list. These 150 LUNs is equal to the number of disks selected for the "PerformancePool". Click Automatically Assign LUN IDs as LUN Names radio button for LUN Name. Click Apply to initiate the process for creating 150 LUNs.

Figure 141	Entering Details to Create LUNs
------------	---------------------------------

Storage Pool I	Properties	test test			
Storage Pool Ty	pe:	● Pool ○ RAID Gr	oup		
RAID Type:		RAID5: Distributed	Parity (	High Throug	hput) 💌
Storage Pool for new LUN:		PerformancePool		~	<u>N</u> ew
Oversubscriber	e (3797) (3797)				
LUN Propertie	5				
User Capacity:	300		~	GB	~
LUN ID:	11	Number of LUI	Ns to cr	eate: 150	*
LUN Name					
🔘 Name					
		2			

I

18. Click Yes to initiate a create LUN operation.

	e Pool	Туре:	● Pool ○ RAID Group
AID T	Гуре:		RAID5: Distributed Parity (High Throughput)
Storage Pool for new LUN:		for new LUN:	PerformancePool 💽 <u>N</u> ew
Capa			
1			.785 GB Consumed Capacity: 0.000 GB
Ove	Con	firm: Create LU	
UN 🧖 You are about	t to initiate a Create LUN Operation		
т	10		
ser			
UN :			
		Do xou wich t	to continue?
UN : LUN ) N		Do you wish t	
LUN		Do you wish t	to continue?
	tomati		

Figure 142

**Confirmation to Create LUNs** 

1

**19.** LUN creation is in progress. Wait for the task to be complete.



General Advanced	
Storage Pool Properties	2
Storage Pool Type:	● Pool ◎ RAID Group
RAID Type:	RAIDS: Distributed Parity (High Throughput)
Storage Pool for new LUN:	PerformancePool 😿 New
Capacity	
Available Capacity: 95307	.785 GB Consumed Capacity: 0.000 GB
Oversubscribed By:	
User Capacity: 300 LUN ID: 11	Image: Second state state       Image: Number of LUNs to create:       150
LUN Name	
🔘 Name	
Starting ID	0
Automatically assign LU	
C Automatically assign LO	
LUN Creation Progress	

20. Click Ok in the popup window on successful LUN creation.



ſ

#### Figure 144 Window Showing Successful LUN Creation

**21.** Select the "PerformancePool" and Select all the newly created LUNs and Click **Add to Storage Group** as shown in Figure 145. Make sure you select all the 150 LUNs from the PerformancePool. ſ

ools								2 7	* 🔍 🝺 (
🍸 📮 Filter for		RAID Type	All 💌						
ame	▲ State		Drive Type User	Capa Free C	apa Allocated	%Consu	Subscribe	%Subscri	Auto-Tieri
PerformancePo	ool Ready	RAIDS		CONTRACTOR OF TAXABLE	6.965 46590.820		46,440.527		7 Scheduled
etails				1 ¥ 1					
Pool LUNs D	isks							2 8	" 4, 🖻 (
Pool LUNs D	for		1	~					″ <b>Ҷ</b> , <u> </u> ≱ (
Rame	for <b>ID</b>	State	ALL User LUNs	GB)	Current Owner		Host Inform		
Name	for ID 1	State 1 Ready	1	5 <b>B)</b> 300.000	SP A		Host Inform		
Name	for <b>ID</b> 1: 1:	State 1 Ready 2 Ready	1	5 <b>B)</b> 300.000 300.000	SP A SP B		Host Inform		~
Name LUN 11 LUN 12 LUN 13	for ID 1	State 1 Ready 2 Ready 3 Ready	1	5 <b>B)</b> 300.000 300.000 300.000	SP A SP B SP A		Host Inform		~
Filter f Name LUN 11 LUN 12 LUN 13 LUN 14	for 10	State 1 Ready 2 Ready 3 Ready 4 Ready	1	5B) 300.000 300.000 300.000 300.000	SP A SP B SP A SP B		Host Inform		~
Y         Filter f           Name         IUN 11           UN 12         UN 13           UN 13         UN 14           UN 15         IUN 15	for 10 11 11 12 14 14 14 14 14 14 14 14 14 14 14 14 14	State 1 Ready 2 Ready 3 Ready 4 Ready 5 Ready	1	58) 300.000 300.000 300.000 300.000 300.000	SP A SP B SP A SP B SP A		Host Inform		~
Filter f           Name           LUN 11           LUN 12           LUN 13           LUN 14           LUN 15           LUN 16	for ID I I I I I I I I I I I I I I I I I I	State 1 Ready 2 Ready 3 Ready 4 Ready 5 Ready 6 Ready	1	5B) 300.000 300.000 300.000 300.000	SP A SP B SP A SP B SP A SP B		Host Inform		~
Y         Filter f           Name         IUN 11           UN 12         UN 13           UN 13         UN 14           UN 15         IUN 15	for ID 11 11 12 14 14 14 14 14 14 14 14 14 14	State 1 Ready 2 Ready 3 Ready 4 Ready 5 Ready	1	58) 300.000 300.000 300.000 300.000 300.000 300.000	SP A SP B SP A SP B SP A SP B SP A		Host Inform		~
Filter f           Name           LUN 11           LUN 12           LUN 13           LUN 14           LUN 15           LUN 16           LUN 17	For ID I I I I I I I I I I I I I I I I I I	State 1 Ready 2 Ready 3 Ready 4 Ready 5 Ready 6 Ready 7 Ready	1	300.000 300.000 300.000 300.000 300.000 300.000 300.000	SP A SP B SP A SP B SP A SP B SP A SP B		Host Inform		~

Figure 145 Adding the Created LUNs to Storage Group

1

**22.** From the Available Storage Groups, select "~filestorage" and click the arrow highlighted in Figure 146 to add it to the Selected Storage Group. Click **Ok**.

Figure 146	Adding Storage	Groups
------------	----------------	--------

Select Storage Groups	
Available Storage Groups Selected Stor	
	age Groups
Name Name	
😰 V250-ESXHost7	
V250-ESXHost2	
V250-ESXHost5	
V250-ESXHost6	
V250-ESXHost1	
V250-ESXHost4	
V250-ESXHost8	
V250-ESXHost3	
V250-ESXHost9	
V250-ESXHost10	
🗭 ~filestorage 🔿	

23. Make sure "~filestorage" is added to Selected Storage Groups. Click Ok.

torage System VSPEX5500	✓
Select Storage Groups	
Available Storage Groups	Selected Storage Groups
Vame	Nam <u>e</u>
V250-ESXHost7	A filestorage
V250-ESXHost2	
V250-ESXHost5	
V250-ESXHost6	
V250-ESXHost1	
V250-ESXHost4	
V250-ESXHost8	
V250-ESXHost3	
V250-ESXHost9	
V230-ESKHUSLIU	

#### Figure 147 Ensuring the Storage Group is Added

**24.** Click **Yes** to confirm the operation to add all the 150 LUNs to the "~filestorage" Storage group.

elect St	📄 Con	firm: Add to selected Storage Groups	×	
Select St         200           Available         ?           Name         ?           2000 V250-1         ?           2000 V250-1         ?           2000 V250-1         ?	ŝ	This operation will add the following LUN(s) to the storage group: [LUN 11, LUN 12, LUN 13, LUN 14, LUN 15, LUN 16, LUN 17, LUN 18, LUN 19, LUN 20, LUN 21, LUN 22, LUN 23, LUN 24, LUN 25, LUN 26, LUN 27, LUN 28, LUN 29, LUN 30, LUN 31, LUN 32, LUN 33, LUN 34, LUN 35, LUN 36, LUN 37, LUN 38, LUN 39, LUN 40, LUN 41, LUN 42, LUN 43, LUN 44, LUN 45, LUN 46, LUN 47, LUN 48, LUN 49, LUN 51, LUN 51, LUN 52, LUN 53, LUN 54, LUN 55, LUN 50 you wish to continue?	*	
		<u>Y</u> es	io	

ſ

25. Make sure, all the LUNs are added to filestorage and make sure the Host Information for all the LUNs are showing "Celerra\_VSPEX5500".

🕎 📮 Filter for	Usage	ALL User LUNs			
ame 🔺 I	D State	User Capacity (GB)	Current Owner	Host Information	
LUN 11	11 Ready	300.000	SP A	Celerra_VSPEX5500	
LUN 12	12 Ready	300.000	SP B	Celerra_VSPEX5500	
LUN 13	13 Ready	300.000	SP A	Celerra_VSPEX5500	
LUN 14	14 Ready	300.000	SP B	Celerra_VSPEX5500	
LUN 15	15 Ready	300.000	SP A	Celerra_VSPEX5500	
LUN 16	16 Ready	300.000	SP B	Celerra_VSPEX5500	
LUN 17	17 Ready	300.000	SP A	Celerra_VSPEX5500	
🚽 LUN 18	18 Ready	300.000	SP B	Celerra_VSPEX5500	
LUN 19	19 Ready	300.000	SP A	Celerra_VSPEX5500	

Figure 149 Host Information for All the Added LUNs

26. To discover all the 150 LUNs as volumes for NFS creation. Click Storage > Storage Configuration > Volumes. From Figure 150, you will see that the system volumes are created by default.

1

#### Figure 150 Window Showing System Volumes Created by Default

MC Unis	phere			Pool LUN	Search	
< > 1	VSPE	x5500 💌 🔠 Dashboa	rd 📗 System 👕 Storage	🔒 Hosts 🛛 👔 Data Protectio	n 🏾 🏶 Settings	0
VSPEX5500	> <u>Storag</u>	e > <u>Storage Configuration</u> >	• Volumes			
Volumes					ې 😓	<b>1</b> ?
🍸 🗸 Filte	r for	Show Volumes of Typ	pe: All Volumes ⊻ Storage Systems: /	All Systems 💌		
Name 4	Туре	Uses Volumes	Used by	Storage Capacity (	Storage Used(%)	Dis
😔 d3	disk		<u>⊚ md3</u>	1.990		CLS
🧐 d4	disk		<u> ∞ md4</u>	1.990		CLS
😔 d5	disk		🥯 <u>md5</u>	1.996		CLS
😏 d6	disk		🥯 <u>md6</u>	63.990		CLS
😔 md3	meta	💁 <u>d3</u>	root fs d3	1.990		CLS
😏 md4	meta	<u>∾ d4</u>	root fs d4	1.990		CLS
😔 md5	meta	🚱 <u>d5</u>	root fs d5	1.996		CLS
	meta	<u>⊗ d6</u>	root fs d6	63.990		CLS

**27.** Log in (ssh or telnet) to the VNX Control Station IP or Storage Processor IP for the CMD line console.

and	EMC, th	e GPL, or	r your use of this s	oftware	, even if ac	lvised	
of t	the poss	ibility (	of such damages.				
EMC,	, VNX, C	elerra, (	and CLARiiON are reg	istered	trademarks	or trademarks of	
EMC	Corpora	tion in t	the United States an	d/or ot	her countrie	es. All	
othe	er trade	marks us	ed herein are the pr	operty	of their rea	spective	
owne	ers.						
				0 /1114	7 0 501		
EMC							
			tion Linux release 3	.U (NAS	1.0.30)		
nase	admin@10	.29.150.3	201's password:			)11	
nase	admin@10	.29.150.3				011	
nase	admin@10 VNX Con	.29.150.3 trol Sta	201's password: tion Linux – Tue Dec	13 13:	13:21 EST 20	011	
nase	admin@10 VNX Con	.29.150.3 trol Sta	201's password:	13 13:	13:21 EST 20	911	
nas: EMC	admin@10 VNX Con ***	.29.150.2 trol Sta slot_0 p	201's password: tion Linux – Tue Dec	13 13:	13:21 EST 20	011	
nasa EMC [nas	admin@10 VNX Con *** sadmin@V	.29.150.2 trol Sta slot_0 ; SPEX5500	201's password: tion Linux Tue Dec primary control stat	13 13: ion ***	13:21 EST 20	)11 servers	
nasa EMC [nas	admin@10 VNX Con *** sadmin@V	.29.150.: trol Stat slot_0 p SPEX5500 sizeMB	201's password: tion Linux Tue Dec primary control stat ~]\$ nas_disk -list	13 13: ion *** type	13:21 EST 20 name	servers	
nasa EMC [nas	admin@10 VNX Con *** sadmin@V inuse y	.29.150.3 trol Stat slot_0 p SPEX5500 sizeMB 11260	201's password: tion Linux Tue Dec primary control stat ~]\$ nas_disk -list storageID-devID	13 13: ion *** type CLSTD	13:21 EST 20 name root_disk	servers 1,2	
nas: EMC	admin@10 VNX Con **** sadmin@V inuse y y y	.29.150. trol Sta slot_0 ) SPEX5500 sizeMB 11260 11260	201's password: tion Linux Tue Dec primary control stat ~]\$ nas_disk -list storageID-devID APM00121402878-2007	13 13: ion *** type CLSTD CLSTD	13:21 EST 20 name root_disk root_ldisk	servers 1,2	
nasa EMC [nas	admin@10 VNX Con *** sadmin@V inuse y y y	.29.150.3 trol Stat slot_0 ) SPEX5500 sizeMB 11260 11260 2038	201's password: tion Linux Tue Dec primary control stat ~] \$ nas_disk -list storageID-devID APM00121402878-2007 APM00121402878-2008	13 13: ion *** type CLSTD CLSTD CLSTD	13:21 EST 20 name root_disk root_ldisk d3	servers 1,2 1,2	
nasa EMC [nas	admin@10 VNX Con **** sadmin@V inuse y y y y y y	.29.150.3 trol Stat slot_0 ; SPEX5500 sizeMB 11260 11260 2038 2038	201's password: tion Linux Tue Dec primary control stat ~]\$ nas_disk -list storageID-devID APM00121402878-2007 APM00121402878-2009	13 13: ion *** CLSTD CLSTD CLSTD CLSTD CLSTD	13:21 EST 20 name root_disk root_ldisk d3 d4	servers 1,2 1,2 1,2	

Figure 151

**28.** From the CMD line console, Type the command **nas\_disk -list** to list the default volumes. Type the command **nas\_diskmark -mark -all** to discover all the 150 LUNs as 150 disk volumes.

Figure 152	Command to Show All the LUNs as Disk Volumes
------------	--

CLI Showing List of NAS Disks

```
nasadmin@¥SPEX5500:~
                                                                                  _ 🗆 X
                                                                                        .
EMC, VNX, Celerra, and CLARiiON are registered trademarks or trademarks of
EMC Corporation in the United States and/or other countries. All
ther trademarks used herein are the property of their respective
wners.
EMC VNX Control Station Linux release 3.0 (NAS 7.0.50)
nasadmin@10.29.150.201's password:
EMC VNX Control Station Linux Tu
                                 Tue Dec 13 13:13:21 EST 2011
        *** slot_0 primary control station ***
 nasadmin@VSPEX5500 ~]$ nas disk -list
     inuse sizeMB
                      storageID-devID
 d
              11260 APM00121402878-2008 CLSTD root_ldisk
             2044 APM00121402878-200B CLSTD d5
65526 APM00121402878-200C CLSTD d6
                                                                 1,2
 nasadmin@VSPEX5500 ~]$ nas_diskmark -mark -all
 iscovering storage on VSPEX5500 (may take several minutes)
                         29. Wait till the discovery process is complete.
```

ſ

Figure 153

🚰 nasadmin@¥SPEX550	10:~							
Discovering stora	an VEDRV5500	(men teke			inut	)		
lone	ge on variation	(may cake a	SEVE1	ai m	LIIU			
Info 26306752254:	APM00121402878	reassigned	LUN	0011	in	storage	aroup	'~filestor
qe' from host id								
nfo 26306752254:	APM00121402878	reassigned	LUN	0013	in	storage	group	'~filestor
.ge' from host id	0008 to 0159							
Info 26306752254:	APM00121402878	reassigned	LUN	0015	in	storage	group	'~filestor
age' from host id	0010 to 0161							
Info 26306752254:	APM00121402878	reassigned	LUN	0017	in	storage	group	'~filestor
age' from host id	0012 to 0163							
Info 26306752254:	APM00121402878	reassigned	LUN	0019	in	storage	group	'~filestor
age' from host id	0014 to 0165							
Info 26306752254:	APM00121402878	reassigned	LUN	0012	in	storage	group	'~filestor
age' from host id	0007 to 0156							
Info 26306752254:	APM00121402878	reassigned	LUN	0014	in	storage	group	'~fileston
age' from host id	0009 to 0158							
Info 26306752254:	APM00121402878	reassigned	LUN	0016	in	storage	group	'~filestor
age' from host id	0011 to 0160							
Info 26306752254:	APM00121402878	reassigned	LUN	0018	in	storage	group	'~fileston
age' from host id	0013 to 0162							
Info 26306752254:	APM00121402878	reassigned	LUN	0020	in	storage	group	'~fileston
age' from host id	0015 to 0164							
[nasadmin@VSPEX55	00 ~]\$							

**30.** Type the command **nas\_disk -list | grep 307 | wc -l** to make sure all the 150x300GB LUNs are discovered as 150 disk volumes.

1

Figure 154 Command Showing All the LUNs Discovered as Disk Volumes

**CLI Showing Discovery Process** 

137	307199	APM00121402878-0084	MIXED	d137	
138	307199	APM00121402878-0086	MIXED	d138	
139	307199	APM00121402878-0088	MIXED	d139	
140	307199	APM00121402878-008A	MIXED	d140	
141	307199	APM00121402878-008C	MIXED	d141	
142	307199	APM00121402878-008E	MIXED	d142	
143	307199	APM00121402878-0090	MIXED	d143	
144	307199	APM00121402878-0092	MIXED	d144	
145	307199	APM00121402878-0094	MIXED	d145	
146	307199	APM00121402878-0096	MIXED	d146	
147	307199	APM00121402878-0098	MIXED	d147	
148	307199	APM00121402878-009A	MIXED	d148	
149	307199	APM00121402878-009C	MIXED	d149	
150	307199	APM00121402878-009E	MIXED	d150	
151	307199	APM00121402878-00A0	MIXED	d151	
152	307199	APM00121402878-000C	MIXED	d152	
153	307199	APM00121402878-000E	MIXED	d153	
154	307199	APM00121402878-0010	MIXED	d154	
155	307199	APM00121402878-0012	MIXED	d155	
156	307199	APM00121402878-0014	MIXED	d156	

**31.** From the EMC Unisphere window, make sure all the new 150 disk volumes created with 300GB Storage Capacity (numbered from d7 to d156) as shown in Figure 155.

/olumes					🔹 🔧 🖉 🌛 🤇
Filter for         Show Volumes of Type: All Volumes V         Storage Systems: All Systems					
ame	. Туре	Uses Volumes	Used by	Storage Capacity ( Storage U	lsed(%) D
🦻 d3	disk		🥯 <u>md3</u>	1.990	c
y d4	disk		🚫 <u>md4</u>	1.990	c
ds 🖌	disk		🕙 <u>md5</u>	1.996	c c
🖌 d6	disk		🚫 <u>md6</u>	63.990	c
🖌 d7	disk			299.999	м
9 d8	disk			299.999	м
d9	disk			299.999	M
d10	disk			299.999	M
d11	disk			299.999	M
d12	disk			299.999	M
d13	disk			299.999	M
d14	disk			299.999	м
d15	disk			299.999	M
d16	disk			299.999	M
d17	disk			299.999	M
d18	disk			299.999	M
d19	disk			299.999	M
d20	disk			299.999	M
d21	disk			299.999	м
d22	disk			299.999	м
d23	disk			299.999	м
d24	disk			299.999	м
d25	disk			299.999	м
					>

### Figure 155 Verify the Storage Capacity for All the Disk Volumes



	EX5500 🗹 🔠 Dasht	oard 📗 System	🇊 Storage 🛛 📳 Hosts	Data Protection	Settings 3
SPEXS500 > Setting	<u>15 &gt; Network</u> > Settings	For File			
terfaces Devices	Network Services DNS Ro	utes			
Network Devices					4. 2
Filter for	Show Network	Devices for: All Data Move	rs Y		
Name	Data Mover	Type	Speed/Duplex	Devices	
Cge-2-0	Di# server 2	port	auto	bences	
Cge-2-0	D# server 3	port	auto		
Cge-2-1	D# server 2	port	auto		
Cge-2-1	D# server 3	port	auto		
Coge-2-2	D# server 2	port	auto		
Cge-2-2	Dit server 3	port	auto		
Cge-2-3	D# server 2	port	auto		
Cge-2-3	D# server 3	port	auto		
₽ fxg-1-0	D# server 2	port	10000FD		
₽ fxg-1-0	D# server 3	port	10000FD		
₽ fxg-1-1	D# server_2	port	10000FD		
fxg-1-1	D# server 3	port	10000FD		

ſ

#### Figure 156 Creating LACP Interface

33. Select Data Mover as "All Primary Data Movers" from the drop-down list.

https://10.29.150.201/a	action/deviceDisplay	😺 Certificate Error	
Data Mover:	All Primary Data Movers	*	
Туре:	© Ethernet Channel C Link Aggregation C Fail Safe Network		
Device Name:			
10/100 ports:	None available		
Gigabit ports:	None available		
10/100/1000 ports:	□ cge-2-0 □ cge-2-1 □ cge-2-2	🗆 cge-2-3	
10 Gigabit ports:	□ fxg-1-0 □ fxg-1-1		
Speed/Duplex:			

Figure 157

**34.** Click the **Link Aggregation** radio button for Type and enter Device Name as "lacp-1". Check the check boxes for 10 Gigabit ports "fxg-1-0" and "fxg-1-1" as highlighted below. Click **Ok** to proceed the Network Device creation.

1

Figure 158	Entering Details to Create Network Device
------------	---

Creating Network Device

https://10.29.150.201/4	action/portGroupNew	🤡 Certificate Er	Error	
Data Mover:	All Primary Data Movers	-		
Туре:	C Ethernet Channel			
[	C Link Aggregation			
-	C Fail Safe Network			
Device Name:	lacp-1			
10/100 ports:	None available			
Gigabit ports:	None available			
10/100/1000 ports:	🗖 cge-2-0 🗖 cge-2-1 🗖 cge-2-2	🗖 cge-2-3		
10 Gigabit ports:	🔽 fxg-1-0 🔽 fxg-1-1			
Speed/Duplex:	•			
	OK Apply Car	ncel Help		

35. Figure 159 shows the creation of LACP Network device name as "lacp-1"

Network Devices		i i function	(c)	٩	. 2 🗟 (
Name	Data Mover	evices for: All Data Mo	Speed/Duplex	Devices	
@ cge-2-0	B≢ server 2	port	auto		
@ cge-2-0	D# server 3	port	auto		
@ cge-2-1	B≢ server 2	port	auto		
🗬 cge-2-1	B# server 3	port	auto		
🗬 cge-2-2	B≢ server 2	port	auto		
🗬 cge-2-2	B≠ server 3	port	auto		
🗬 cge-2-3	B≢ <u>server_2</u>	port	auto		
🗬 cge-2-3	B≢ <u>server 3</u>	port	auto		
🗬 fxg-1-0	B≢ <u>server_2</u>	port	10000FD		
🗬 fxg-1-0	B≢ <u>server 3</u>	port	10000FD		
€ fxg-1-1	B≢ server 2	port	10000FD		
🗬 fxg-1-1	B≢ <u>server_3</u>	port	10000FD		
🝘 lacp-1	Bit server 2	lacp	10000FD	fxg-1-0,fxg-1-1	

#### Figure 159 New Network Device is Created

36. In the "Settings for File" window, click the Interfaces tab and click Create.

Figure 160	Creating Interfaces
------------	---------------------

nterfaces					<del>-</del>
Y.	Show Network I	nterfaces for: All Data M	Movers 💌		
ddress 🔺	Name	Netmask	Data Mover	Device	State
128.221.252.2	el30	255.255.255.0	server 2	mge0	Up
128.221.252.3	el30	255.255.255.0	server 3	<u>mge0</u>	Up
128.221.253.2	el31	255.255.255.0	server 2	mge1	Up
128.221.253.3	el31	255.255.255.0	server 3	mge1	Up

I

37. Select Data Mover as "server\_2" from the drop-down list and select Device name as "lacp-1" from the drop down list. Enter the valid IP address, Netmask. Enter the Interface Name as "fs01" and MTU value as "9000" to allow jumbo frames for the lacp interface. Click Ok.

#### Figure 161

Entering Details to Create Network Interface

	/action/interfaceDisplay	🛛 😵 Certificate Error 🛛 🗟
Data Mover:	server_2	<u> </u>
Device Name:	lacp-1	
Address:	10.10.40.11	
Name:	fs01	
Netmask:	255.255.255.0	
Broadcast Address:	10.10.40.255	
MTU:	9000	
LAN ID:		
	OK Apply Cancel Help	

**38.** Make sure that the Network Interface "fs01" is created for the lacp device "lacp-1".

Figure 162	New Network Interface is Created
------------	----------------------------------

nterfaces Devices	Network Services D	NS Routes			
Interfaces					- 🔧 🐉 📑
🝸 📮 Filter for	Show N	etwork Interfaces for: All Da	ata Movers 💌		
Address	.▲ Name	Netmask	Data Mover	Device	State
🗐 10.10.40.11	fs01	255.255.255.0	server 2	lacp-1	Up
🗐 128.221.252.2	el30	255.255.255.0	server 2.faulte	<u>d.smqe0</u>	Up
🗐 128.221.252.2	el30	255.255.255.0	server 2	<u>mge0</u>	Up
🗐 128.221.252.3	el30	255.255.255.0	server 2	<u>mqe0</u>	Up
🗐 128.221.253.2	el31	255.255.255.0	server 2.faulte	<u>d.smge1</u>	Up
🗐 128.221.253.2	el31	255.255.255.0	server 2	mge1	Up
128.221.253.3	el31	255.255.255.0	server 2	mge1	Up

39. To Create File system for NFS data store, Navigate to Storage > Storage Configuration > File Systems and Click Create. From the "Create File System" window, click Storage Pool radio button for "Create From" field and enter the File System Name as "NFS-OS" for 250 Virtual machine datastore. Select Storage Pool as "PerformancePool" from the drop down list. Enter Storage Capacity as "2 TB" for 250 VMs and Select Data Mover as "Server\_2" from the drop-down list as shown in Figure 163. Click Ok, to create "NFS-OS" File system.

e Systems	SPEX5500 - Create File Syste	em - Windows Internet Explorer		٦×
🍸 📮 Filter for	https://10.29.150.201/action/filesy	vstemDisplay	Certificate Error	8
me	Create from	C Meta Volume		×
	File System Name:	NFS-OS		
	Storage Pool:	PerformancePool 43.9 TB (46079850 MB	) 🔻	
	Storage Capacity:	2		
	Auto Extend Enabled:			
	Thin Enabled:			
	Slice Volumes:	<b>ସ</b>		
	Deduplication Enabled:			
	Data Mover (R/W):	server_2		
	Mount Point:	© Default O Custom		
		<u>OK</u> Apply	Cancel Hel	2

#### Figure 163 Entering Details to Create File System

**40.** Wait until the "NFS-OS" File system creation process is complete. Verify the process using "Background Tasks for File".

#### Figure 164 Window Showing NFS-OS File System Creation in Progress

MC Unisphe	ere					Pool L	UN	Search	
< > 🏠 🚺	VSPEX5500 🗸	🔠 Dashboard	System	Storage	Hosts	🐻 Data Pro	otection	🌼 Settings	📀 Sur
/SPEX5500 >	<u>System</u> > <u>Monitori</u>	ng and Alerts > Back	ground Tasks for F	ile					
ask Status								4. B	10 2
Y . 42835	8								
D	▲ State	Originator		Start Tin	e		Descri	ption	
2835	Running	nasadmin16	10.29.180.51	Mon Aug	06 19:10:08 EE	T 2012	Create	file system NFS-OS.	
	ОК								
		41. Make su	re the File	system '	'NFS-OS	" is creat	ed wit	h "2 TB" :	storag

ſ

**41.** Make sure the File system "NFS-OS" is created with "2 TB" storage capacity as shown in Figure 165.

Figure 165

< > 🏠 👔 vspe	x5500 🗹 🛛 🔠 Dashbo	oard 📗 System	Storage	🐌 Hosts	🐻 Data Protectio
/SPEX5500 > <u>Storag</u> e	<u>s &gt; Storage Configuration</u>	> File Systems			
File Systems Mounts	Tree Quotas User Quotas	Group Quotas			
File Systems					🔧 💈 🍺 🤉
ү 📮 Filter for	Show File System	ns for All Data Mover	5 💌		
Name	<ul> <li>Storage Capacity (GB)</li> </ul>	Storage Used	Data Movers		
nfs-os	2048.00	0	B≢ <u>server_2(</u> F	<u>(/w)</u>	
	20 J	14 m 10			

42. To validate the IO performance for 250 VMs, create 10xNFS-Data File systems with 2.5 TB capacity. From the "Create File System" window, click Storage Pool radio button for "Create From" field and enter the File System Name as "NFS-Data01" for 250 Virtual machine datastore. Select Storage Pool as "PerformancePool" from the drop down list. Enter Storage Capacity as "2.5 TB" for 250 VMs and Select Data Mover as "Server\_2" from the drop-down list. Keep the Mount Point radio

Window Showing NFS-OS Created with 2 TB Capacity

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	Figure 166	Creating File System with 2.5 TB Storage Capacity
--	------------	---

button at Default. Click Ok to create "NFS-Data01" File system.

Data Mover (R/W):	
Storage Pool:       PerformancePool 41.9 TB (43982704 MB)         Storage Capacity:       2.5         Auto Extend Enabled:       Image: Comparison of the storage capacity of the storag	
Storage Capacity:   2.5   Auto Extend Enabled:   Thin Enabled:   Slice Volumes:   V   Deduplication Enabled:   Data Mover (R/W):   Server_2   Mount Point:	
Auto Extend Enabled: Thin Enabled: Slice Volumes: Deduplication Enabled: Data Mover (R/W): Server_2 Mount Point: © Default	
Thin Enabled: Slice Volumes: Deduplication Enabled: Data Mover (R/W): Server_2 Mount Point: © Default	
Slice Volumes: Deduplication Enabled: Data Mover (R/W): server_2 Mount Point: © Default	
Deduplication Enabled: Data Mover (R/W): Server_2 Mount Point: O Default	
Data Mover (R/W): Server_2 Mount Point: © Default	
Mount Point: O Default	
⊙ Default	
C Custom	

43. Follow Step 42, to create 9 more NFS Data file systems with 2.5 TB each.

				SPEX5500 - Create File System	em - Windows Internet Explorer		
le Susteme	Tree Quotas User Quotas	Cours Courses		https://10.29.150.201/action/Files	ystemDisplay	😵 Certificate Error	8
File Systems		ns for All Data Movers		Create from File System Name:	C Meta Volume		
Same	<ul> <li>Storage Capacity (GB)</li> </ul>	Storage Used	Da		NFS-Data02		
				Storage Pool:	PerformancePool 39.4 TB (41361270 MB	) 🔻	
NFS-Data01	2560.00		D#	Storage Capacity:	2.5		
NFS-0S	2048.00	•	D#	Auto Extend Enabled:			
				Thin Enabled:			
				Slice Volumes:	되		
				Deduplication Enabled:			
				Data Mover (R/W):	server_2		
				Mount Point:	@ Default		
					C Custom		
					OK Apply	Cancel Hel	lр

### Figure 167 Creating NFS Data File Systems at 2.5 TB Storage Capacity

44. Make sure all the 10xNFS Data File systems are created as shown Figure 168.

#### Figure 168 Window Showing All the NFS Data File Systems Created

		for All Data Movers	~	
Name	▲ Storage Capacity (GB)	torage Used	Data Movers	
🛅 NFS-Data01	2560.000		B≄ <u>server_2(R/W)</u>	
🔟 NFS-Data02	2560.000		B≄ <u>server_2(R/W)</u>	
🛅 NFS-Data03	2560.000		B <b>≄</b> <u>server_2(R/W)</u>	
🛅 NFS-Data04	2560.000		B≄ <u>server 2(R/W)</u>	
🛅 NFS-Data05	2560.000		B≄ <u>server 2(R/W)</u>	
💼 NFs-Data06	2560.000		B≄ <u>server_2(R/W)</u>	
🛅 NFS-Data07	2560.000		B≄ <u>server 2(R/W)</u>	
🛅 NFS-Data08	2560.000		B≄ <u>server 2(R/W)</u>	
🛅 NFS-Data09	2560.000		B≄ <u>server_2(R/W)</u>	
💼 NFS-Data10	2560.000		B≄ <u>server 2(R/W)</u>	
nfs-os	2048.000		B≄ <u>server 2(R/W)</u>	

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To enable "Direct Writes" for all the NFS File system. Select Storage > Storage Configuration > File Systems. Click Mounts.

Mounts						n 🕹 🕹 🔹
🝸 🗸 Filter for	Show	Mounts for: All Data Mo	vers 🔽 File Syst	em Name: All	~	
Path	🔺 Data Mover	File System	Read Only	Access-Chec	¥irus Checki	CIFS Oplocks.
📮 /NFS-Data01	B≢ <u>server_2</u>	MFS-Data01	No	NATIVE	Yes	Yes
📮 /NFS-Data02	B≢ <u>server_2</u>	m NFS-Data02	No	NATIVE	Yes	Yes
📮 /NFS-Data03	B≢ <u>server_2</u>	m NFS-Data03	No	NATIVE	Yes	Yes
📮 /NFS-Data04	B≢ <u>server_2</u>	MFS-Data04	No	NATIVE	Yes	Yes
📮 /NFS-Data05	B≢ <u>server_2</u>	T NFS-Data05	No	NATIVE	Yes	Yes
📮 /NFs-Data06	B≢ <u>server_2</u>	T NFs-Data06	No	NATIVE	Yes	Yes
📮 /NFS-Data07	B≢ <u>server_2</u>	m NFS-Data07	No	NATIVE	Yes	Yes
📮 /NFS-Data08	B≢ <u>server_2</u>	T NFS-Data08	No	NATIVE	Yes	Yes
📮 /NFS-Data09	B <b>≉</b> <u>server_2</u>	T NFS-Data09	No	NATIVE	Yes	Yes
📮 /NFS-Data10	B≉ <u>server_2</u>	MES-Data10	No	NATIVE	Yes	Yes
INFS-OS	B <b>≄</b> <u>server_2</u>	NFS-OS	No	NATIVE	Yes	Yes

Figure 169 Mounts Tab of File System Window

**46.** Select the path "/NFS-OS" for the file system "NFS-OS" and click **Properties**.

1

Figure 170 Window Showing the Path for NFS File Systems

Ĵ /NFS-Data01	Data Mover B≄ <u>server_2</u> B≄ server_2	File System	Read Only	Access-Chec	<b>Virus Checki</b> Yes	CIFS Oplocks
		m NFS-Data01	No	NATIVE	Yes	
📮 /NFS-Data02	Pizt server 2				165	Yes
	Let <u>301701 2</u>	MFS-Data02	No	NATIVE	Yes	Yes
🕽 /NFS-Data03	B≄ <u>server_2</u>	MFS-Data03	No	NATIVE	Yes	Yes
📮 /NFS-Data04	B≄ <u>server_2</u>	NFS-Data04	No	NATIVE	Yes	Yes
📮 /NFS-Data05	B≄ <u>server_2</u>	NFS-Data05	No	NATIVE	Yes	Yes
📮 /NFs-Data06	B≄ <u>server_2</u>	MFs-Data06	No	NATIVE	Yes	Yes
📮 /NFS-Data07	B≄ <u>server_2</u>	MFS-Data07	No	NATIVE	Yes	Yes
📮 /NFS-Data08	B≄ <u>server_2</u>	T NFS-Data08	No	NATIVE	Yes	Yes
📮 /NFS-Data09	B≄ <u>server_2</u>	MFS-Data09	No	NATIVE	Yes	Yes
INFS-Data10	B≄ <u>server_2</u>	MFS-Data10	No	NATIVE	Yes	Yes
INFS-OS	B≢ <u>server_2</u>	T NFS-OS	No	NATIVE	Yes	Yes

**47.** From the "/NFS-OS" mount properties. Make sure the radio button **Read/Write** for "Read Only" and **Native** for Access-Checking Policy is selected. Then, check the "Set Advanced Options" check box.

Path:	/NFS-OS
DataMover:	server 2
File System Name:	NFS-OS
Read Only:	© Read/Write C Read Only
Access-Checking Policy: (	NT - CIFS client rights checked against ACLs; NFS client rights checked against ACLs and permission bits     UNIX - NFS client rights checked against permission bits; CIFS client rights checked against permission bits AND ACLs     SECURE - Bath NFS and CIFS client rights checked against permission bits; CIFS client rights checked against ACLs     NATIVE - NFS client rights checked against permission bits; CIFS client rights checked against ACLs     MIXED - Both NFS and CIFS client rights checked against ACL; Only a single set of security attributes maintained     MIXED_COMPAT - Both NFS and CIFS client rights checked against either permission bits or ACL depending on which     protocol was last used to set permission
Virus Checking Enabled:	<b>N</b>
Cifs Oplocks Enabled:	<b>v</b>
Set Advanced Options:	

Figure 171 Enabling Read/Write for NFS-OS

OK Apply Cancel Help

**48.** Check the "Advanced options" and the "Direct Writes Enabled" check boxes as shown in Figure 172 and Click **Ok**.

Figure 172	Enabling Parameters for NFS-OS
------------	--------------------------------

Path:	/NFS-OS	
DataMover:	server 2	
File System Name:	NFS-OS	
Read Only:	C Read/Write C Read Only	
Access-Checking Policy:	C NT - CIFS client rights checked against ACLs; NFS client right C NUX - NFS client rights checked against permission bits; CI C SECURE - Both NFS and CIFS client rights checked against I G NATUR- NFS client rights checked against permission bits; MIXED - Both NFS and CIFS client rights checked against A( MIXED - Both NFS and CIFS client rights checked against A( MIXED_COMPAT - Both NFS and CIFS client rights checked protocol was last used to set permissions	IFS client rights checked against permission bits AND ACLs both permission bits AND ACLs CIFS client rights checked against ACLs CL; Only a single set of security attributes maintained
Virus Checking Enabled:	<b>N</b>	
Cifs Oplocks Enabled:	<b>A</b>	
Set Advanced Options: <		
Use NT Credential:	C	
Direct Writes Enabled: C		
Prefetch Enabled:	<b>A</b>	
Multi-Protocol Locking Policy:	© nolock C writelock C rwlock	
CIFS Sync Writes Enabled:		
CIFS Notify Enabled:	CIFS Notify Trigger Level:	
	cirs noury migger Leven	512
	CIFS Notify On Access Enabled:	
	CIFS Notify On Write Enabled:	E.

I

- **49.** Follow the Steps 46, 47 & 48 to enable Direct Writes for all the remaining NFS Data file systems.
- **50.** To Create NFS-Exports for all the NFS File systems. Click **Storage > Shared Folders > NFS** and Click **Create**.

EMC Unisphere			Pool	LUN	Search
< > 🁔 🗊 VSPEX5500 💌	🔠 Dashboard	System	Storage	Hosts	👔 Data Protection 🧯
<u>VSPEX5500</u> > <u>Storage</u> > <u>Shared</u>	Folders > NFS				
NFS Exports					4, 💈 📄 🧿
Tilter for Sho	ow NFS Exports for: serve	er_2 🔽	Select a File Sys	tem: NFS-Data0	1 💌
Path	🔺 File System			Data Mover	
0 Selected Create Properties	Delete				Filtered: 0 of 1
				Last Refre	eshed: 2012-08-31 17:52:54

Figure 173 Creating NFS Exports

51. Select Data Mover as "server-2" from the drop-down list and select File System as "NFS-OS" and enter the Path as "/NFS-OS". Enter the IP address of all the ESXi hosts "VMKernel Storage NIC" in "Root Hosts" and "Access Hosts" fields. Separate multiple host vmkernel IP's by ":" (colon) and Click Ok.

Figure 174 Entering Details for Creating NFS Exports



52. Make sure the NFS exports for "NFS-OS" file system is created as shown in Figure 175.

> NFS	
	🔧 💈 🜛 🤉
xports for: All Data Movers 📝 Select a File	e System: All File Systems 🔽
File System	Data Mover
T NFS-OS	B≄ <u>server 2</u>
	File System

Figure 175 Window Showing Created NFS Export for NFS-OS

53. Repeat the Steps 50 and 51 to create NFS-Exports for all the remaining NFS-Data file systems.

## Installing ESXi Servers and vCenter Infrastructure

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1. In the Cisco UCS Manager window, click the **Equipment** tab, select a Cisco UCS B200 M3 Blade Server and click the **KVM Console** link to launch the KVM for the server on the right pane of the Cisco UCS Manager window.



Figure 176 Launch KVM Console

2. When the Java applet for KVM is launched, click the **Virtual Media** tab and click the **Add Image** tab as shown in Figure 177. This will open a dialog box to select an ISO image. Traverse the local directory structure and select the ISO image of ESXi 5.1 hypervisor installer media.

1

/ ¥250-ESX-Ho	st1 (Chassis - 1 Server -	1) - KVM Console				
ile Help						
🍰 Boot Server 🛛 🛁	🖁 Shutdown Server 🛛 🧕 Re	set				
VM Console Prope	rties					
(VM Virtual Media	]					
Client View						
Mapped	Read Only Drive					Exit
	🔲 🖃 F: - Remo	vable Disk			1	Create Image
	🖾 🛛 🔊 E: - CD/D	/D			r d	Add Image
	🔽 🛛 🙆 D: - CD/D'	VD			L.	
						Remove Image
						Details 🛳
•					Þ	
Details						
Target Drive	Mapped To	Read Bytes	Write Bytes	Duration		
Virtual CD/DVD	Not mapped					USB Reset
Removable Disk	Not mapped					
Floppy	Not mapped					

Figure 177 Adding Image in Virtual Media

3. After the ISO image is shown in the list, check the "Mapped" check box and reset the server.

🜲 / ¥250-ESX-He	ost1 (Chassis	s - 1 Server - 1) - K	/M Console				
File Help							
📣 Boot Server 🖕	🛃 Shutdown S	ierve 🧕 🥺 Reset					
KVM Console Prop	erties		,				
KVM Virtual Media	3						
Client View							
Mapped	Read Only	Drive					Exit
		🖃 F: - Removable D	Disk			Ē	Create Image
	$\checkmark$	🔊 E: - CD/DVD					
	M	🔓 v: - cojovo				-	Add Image
		2 C:\ISO\ESX5\ES	(i-5.0.0-469512-	custom-Cisco-2.0	).1d.iso - ISO Image File		Remove Image
							Details 🔹
•						•	
			-			_	
Details Target Drive	Mappe	d To	Read Bytes	Write Bytes	Duration		
Virtual CD/DVD		ISO\ESX5\ESXi-5.0.0.		0	00:01:25		USB Reset
Removable Disk	_						
Floppy	Not ma						
(opp)	noc ma	ppod					

ſ

Figure 178 Reset the Server After Adding the ISO Image

4. Click the radio button **Power Cycle** in the popup window, to immediately reboot the B200 M3 server as shown in Figure 180.

Boot Server 🚽 Shutdown S	erver 🤐 Reset	
M Console Properties		
M Virtual Media	Reset Server Service Profile V250-ESX-Host1	
Client View Mapped Read Only Client View Mapped Read Only	You are attempting to reset a server. The server can be reset by gracefully restarting the OS or via a brute force power cycle. now would you like to reset?	Exit Create Image
	<u>Power Cycle</u> Gracefully restart OS	Add Image
	If Graceful OS Restart is not supported by the OS or it does not happen within a reasonable amount of time, the system will perform a power cycle.	Remove Image Details <b>±</b>
Details	To reset the slot, please go to the recover server action. The UCS system might be in the process of performing some tasks	
Target Drive Mappe Virtual CD/DVD 🚑 C:	on this server. Would you like this operation to wait until the completion of outstanding activities?	USB Reset
Removable Disk Not ma	Wait for completion of outstanding UCS tasks on this server.	
Floppy Not ma	OK Cancel	

#### Figure 179 Selecting Power Cycle Option to Restart the Server

- **5.** After rebooting the server, ESXi 5 install media will boot. Make sure to enter the following to install the hypervisor on each of the servers.
  - ESXi hostnames
  - IP addresses
  - Root password
  - See, Customer Configuration Data Sheet, page 172 for appropriate values.
- **6.** The ESXi OS should be installed on the SAN LUN of the B200 M3 servers. When the ESXi is installed, verify the network connectivity and accessibility of each server from each other.

## Installing and Configuring Microsoft SQL Server Database

SQL server is used as database for the VMware vCenter server. Follow these steps to configure Microsoft SQL server.

Create a VM for Microsoft® SQL server—The requirements for processor, memory, and OS vary
for different versions of SQL Server. To obtain the minimum requirement for each SQL Server
software version, see the Microsoft technet link. The virtual machine should be created on one of
the ESXi servers designated for infrastructure virtual machines, and should use the datastore
designated for the shared infrastructure.



- The customer environment may already contain an SQL Server that is designated for this role. For more information, see *Configure database for VMware vCenter*.
- Install Microsoft® Windows on the VM—The SQL Server service must run on Microsoft Windows Server 2008 R2 SP1. Install Windows on the virtual machine by selecting the appropriate network, time, and authentication settings.

- **3.** Install SQL server—Install SQL Server on the virtual machine from the SQL Server installation media. The Microsoft TechNet website provides information on how to install SQL Server.
- 4. Configure database for VMware vCenter—To use VMware vCenter in this solution, you will need to create a database for the service to use. The requirements and steps to configure the vCenter Server database correctly are covered in Preparing vCenter Server Databases. It is a best practice to create individual login accounts for each service accessing a database on SQL Server.



Do not use the Microsoft SQL Server Express-based database option for this solution.

- 5. Configure database for VMware Update Manager—To use VMware Update Manager in this solution you will need to create a database for the service to use. The requirements and steps to configure the Update Manager database correctly are covered in Preparing the Update Manager Database. It is a best practice to create individual login accounts for each service accessing a database on SQL Server. Consult your database administrator for your organization's policy.
- 6. Deploy the VNX VAAI for NFS plug-in—The VAAI for NFS plug-in enables support for the vSphere 5.1 NFS primitives. These primitives reduce the load on the hypervisor from specific storage-related tasks to free resources for other operations. Additional information about the VAAI for NFS plug-in is available in the plug-in download vSphere Storage APIs for Array Integration (VAAI) Plug-in. The VAAI for NFS plug-in is installed using vSphere Update Manager. Refer process for distributing the plug demonstrated in the EMC VNX VAAI NFS plug-in installation HOWTO video available on the www.youtube.com web site. To enable the plug-in after installation, you must reboot the ESXi server.

### VMware vCenter Server Deployment

This section describes the installation of VMware vCenter for VMware environment and to complete the following configuration:

- A running VMware vCenter virtual machine
- A running VMware update manager virtual machine
- VMware DRS and HA functionality enabled.

For detailed information on Installing a vCenter Server, see the link:

http://pubs.vmware.com/vsphere-50/index.jsp?topic=/com.vmware.vsphere.install.doc\_50/GUID-A71 D7F56-6F47-43AB-9C4E-BAA89310F295.html

For detailed information on vSphere Virtual Machine Administration, see the link:

http://pubs.vmware.com/vsphere-50/index.jsp?topic=/com.vmware.vsphere.install.doc\_50/GUID-A71 D7F56-6F47-43AB-9C4E-BAA89310F295.html

For detailed information on creating a Virtual Machine in the vSphere 5.1 client, see the link:

http://pubs.vmware.com/vsphere-50/index.jsp?topic=/com.vmware.vsphere.vm\_admin.doc\_50/GUID-0433C0DC-63F7-4966-9B53-0BECDDEB6420.html

Following steps provides high level configuration to configure vCenter server:

 Create the vCenter host VM—If the VMware vCenter Server is to be deployed as a virtual machine on an ESXi server installed as part of this solution, connect directly to an Infrastructure ESXi server using the vSphere Client. Create a virtual machine on the ESXi server with the customer's guest OS configuration, using the Infrastructure server datastore presented from the storage array. The memory and processor requirements for the vCenter Server are dependent on the number of ESXi hosts and virtual machines being managed. The requirements are outlined in the vSphere Installation and Setup Guide.

- 2. Install vCenter guest OS—Install the guest OS on the vCenter host virtual machine. VMware recommends using Windows Server 2008 R2 SP1. To ensure that adequate space is available on the vCenter and vSphere Update Manager installation drive, see vSphere Installation and Setup Guide.
- **3.** Create vCenter ODBC connection—Before installing vCenter Server and vCenter Update Manager, you must create the ODBC connections required for database communication. These ODBC connections will use SQL Server authentication for database authentication.

For instructions on how to create the necessary ODBC connections see, vSphere Installation and Setup and Installing and Administering VMware vSphere Update Manager.

- **4.** Install vCenter server—Install vCenter by using the VMware VIMSetup installation media. Use the customer-provided username, organization, and vCenter license key when installing vCenter.
- Apply vSphere license keys—To perform license maintenance, log into the vCenter Server and select the Administration - Licensing menu from the vSphere client. Use the vCenter License console to enter the license keys for the ESXi hosts. After this, they can be applied to the ESXi hosts as they are imported into vCenter.

## **Configuring Cluster, HA and DRS on the vCenter**

To add all the VMware on virtual machine vCenter, follow these steps:

- 1. Log into VMware ESXi Host using VMware vSphere Client.
- **2.** Create a vCenter Datacenter.
- 3. Create a new management cluster with DRS and HA enabled.
  - a. Right-click on the cluster and, in the corresponding context menu, click Edit Settings.
  - b. Select the check boxes "Turn On vSphere HA" and "Turn On vSphere DRS".
- 4. Click **Ok**, to save changes. Add all ESXi hosts to the cluster by providing servers' management IP addresses and login credentials one by one. After all the servers are added to the vCenter cluster, the window will look as shown in Figure 180.

🛛 VSPEX - vSobere Client \_ 🗆 × File Edit View Inventory Administration Plug-ins Help F 🕎 Home 🕨 🚮 Inventory 🕨 🛅 Hosts and Clusters 🚮 🗸 Search Inventory Q Ð 「話 C 🖃 🛃 VSPEX ¥250-Cluster 🛨 🌆 Datacenter Virtual Machines Hosts Resource Allocation Performance Tasks & Even □ □ Old □ □ V250 Name or State contains: -Clear D 🙀 V250-Cluster 10.29.180.121 Name State Status % CPU % Memory Ĵ. 10.29.180.122 10.29.180.122 Connected 🦁 Normal 0 1 10.29.180.123 10.29.180.124 🤣 Normal -Connected 2 0 10.29.180.124 10.29.180.121 0 📀 Normal Connected 1 10.29.180.125 10.29.180.123 Connected 📀 Normal 0 2 10.29.180.126 0 \_ 10.29.180.125 Connected 🦁 Normal 2 10.29.180.127 0 -10.29.180.126 Connected Normal ۲ 10.29.180.128 2 10.29.180.127 10.29.180.129 Connected 🐼 Normal 0 1 2 10.29.180.130 -10.29.180.128 Connected 🦁 Normal 0 10.29.180.129 Normal Connected ۲ 0 1 10.29.180.130 Connected 📀 Normal 0 2

Figure 180 Window Showing vCenter Cluster in VMware vSphere Client

### **Configure Cisco VMFEX**

Technology Overview section detailed about benefits of Cisco VMFEX technology. This section explains step by step configuration guide for Cisco UCS Manager/ vCenter management plane integration and Cisco VMFEX technology implementation. Follow these steps to configure Cisco VMFEX architecture.

Click the VM tab in the Cisco UCS Manager window, click VMware on the left pane of the Cisco UCS Manager window and click the Modify Extension Key link on right pane of the Cisco UCS Manager window as shown in Figure 181.

### Figure 181 Modifying Extension Key in the Cisco UCS Manager Window



2. Change the default extension key to a value that represents the UCS pod used in this solution as shown in Figure 182 and click Ok.

	Figure 182	Modifying Extension Key
Modify Extension Key	_ 🗆	X
Key: Cisco-UCSM-VSPEX-V250		_
U		
ОК Арріу	Cancel Help	

Figure 182

3. To establish trusted relationship between the Cisco UCS Manager and vCenter. Click the Export

vCenter Extension link on the right pane in the General tab of VMware as shown in Figure 183.

Figure 183 Exporting vCenter Extension



Specify the location where the vCenter extension XML file should be saved on the popup window 4. as shown in Figure 184. Click Ok.

Figure 184 Specifying Path for vCenter Extension File



5. Using vSphere 5.1 client application, connect to the vCenter 5.1 server, click the **Plug-ins** tab in the menu bar, and click Manage Plug-ins... as shown in Figure 185.

#### Figure 185 Managing Plug-ins in VMware vSphere Client

🚱 ¥SPEX - vSphere Client	
File Edit View Inventory Administra	at on Plug-ins Help
🔄 💽 🏠 Home 🕨 🖗 Adr	mnist, Manage Plug-ins Manager
VSPEX     VSPEX	VSPEX
ᡖ vSphere ESX Agent Manager ᡖ vService Manager	Getting Started Summary Solutions Health
6. Right-click on the whitespace after the list of installed plug-ins populates, and click New Plug-In... as shown in Figure 186.

lug-in	Name	Vendor	Version	Status	Description	Progress	Errors
nstal	led Plug-ins						
8	VMware vCenter Storage Mon	VMware Inc.	5.0	Enabled	Storage Monitoring and		
-					Reporting		
3	VMware vSphere Update Ma	VMware, Inc.	5.0.0	Enabled	VMware vSphere Update		
					Manager extension		
ے	vCenter Service Status	VMware, Inc.	5.0	Enabled	Displays the health status of		
-					vCenter services		
8	vCenter Hardware Status	VMware, Inc.	5.0	Enabled	Displays the hardware status of		
-					hosts (CIM monitoring)		
vaila	ble Plug-ins						
3	Cisco_Nexus_1000V_111247	Cisco Systems I	1.0.0	No client side d			
8	Cisco_Nexus_1000V_173677	Cisco Systems I	1.0.0	No client side d			
8	Cisco_Nexus_1000V_175067	Cisco Systems, I	1.0.0	No client side d			
8	Cisco_Nexus_1000V_175374	Cisco Systems I	1.0.0	No client side d			
<u>ě</u> .	Cisco_Nexus_1000V_451490	Cisco Systems I	1.0.0	No client side d			
-			-				
				New Plug-in			
			L	New Plug-In	····		
He	lo I						Cl

#### Figure 186 Creating New Plug-in—Plug-in Manager Window

7. In the "Register Plug-In" window, browse to the Cisco UCS Manager extension XML file and select it. Make sure that the extension key set in step 1 shows up in the <key> tag in this window, and then click **Register Plug-In** as shown Figure 187.

I

Figure 187 Registering the Plug-in
🚰 Register Plug-in 🛛 🔀
Current vCenter Server: VSPEX
Provide an input nlug-in xml file which needs to be registered with vCenter Server File name: C:\Users\Administrator\Desktop\cisco_nexus_1000v_extension.xml Browse View Xml: (read-only)
<pre>- <extensiondata> - <obj versionid="uber" xmlns="um:vim25" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:type="Extension"> - <description></description></obj></extensiondata></pre>
<subjectname>/C=US/ST=CA/O=Cisco/OU=NexusCertificate/CN=Cisco_Nexus_1000V_ - <server></server></subjectname>
<ur> <li><url> <li><description></description></li> <li><label></label></li> </url></li></ur>
<summary></summary> <company>Cisco Systems Inc.</company> <type>DVS</type>
<adminemail></adminemail>  - <client></client>
<ur> <li><url> <li><description></description></li> <li><description></description></li> <li></li> </url></li></ur>
Help Cancel

8. Given that Cisco UCS Manager has self-signed SSL certificate, you may see an untrusted certificate warning. Ignore the warning. After that, you should see a success notification as shown in Figure 188.

1

#### Figure 188 Window Showing the Plug-in Registered in vCenter

Register Plug-in		
The plug-in "Cisco-UCSM-VSPEX-V25 Server jumpsrv-vc5.	i0" is successfully regist	ered on vCenter
		ОК

**9.** Cisco UCS Manager plug-in should be listed now in the "Available Plug-ins" list as shown Figure 189.

Fig	ure	189

89 Cisco UCS Manager Plug-in Listed in the Available Plug-ins

- 🍣	Cisco_Nexus_1000V_111247	Cisco Systems I	1.0.0	No client side d
- 🍣	Cisco_Nexus_1000V_173677	Cisco Systems I	1.0.0	No client side d
٩	Cisco_Nexus_1000V_175067	Cisco Systems, I	1.0.0	No client side d
2	Cisco_Nexus_1000V_175374	Cisco Systems I	1.0.0	No client side d
2	Cisco Nexus 1000V 451490	Cisco Systems L	1.0.0	No client side d
4	Cisco-UCSM-VSPEX-V250	Cisco Systems, I	1.0.0	No client side d

**10.** Trust relationship is now established between the Cisco UCS Manager and vCenter. In the VM tab of the Cisco UCS Manager and click **Configure vCenter** link on the right pane of the Cisco UCS Manager window as shown Figure 190.



Figure 190 Configuring vCenter in Cisco UCS Manager

**11.** Enter the name of the vCenter in Name field (can be any arbitrary name), provide description (optional), and Host Name as hostname or the dotted decimal IP address of the vCenter host as shown in Figure 191. Click **Next**.





**12.** If your datacenter on vCenter is in a folder then you need to create same folder name in the next window. In our case, the datacenter is not contained in a folder, so simply click **Next** on this window as shown in Figure 192.

langure vCenter	•		<u> </u>		×
Unified C	omputing	g Systen	n Manag	er	
Configure vCenter 1. √ <u>Configure vCenter</u>	Folders				0
2. √ <u>Folders</u> 3. □ <sub>Datacenters</sub>	🕰 Filter 🖨 Export 📚 Prin	nt			
	Name	Description	System UUID	Owner	
					•
		🗄 Add 🍵	Delete 🏢 Info		
			< Prev Next >	Finish C	ancel

Figure 192 Folders Window of the Configure vCenter Wizard

1

13. In the "Datacenters" window, click Add .

Figure 193Datacenters Window of the Configure vCenter Wizard

📥 Configure vCenter				×
Unified C	omputing	g Systen	n Manag	er
	Datacenters			0
1. √ <u>Configure vCenter</u> 2. √ <u>Folders</u> 3. √ <u>Datacenters</u>	🔍 Filter 👄 Export 📚 Prir	nt		
	Name	Description	System UUID	Owner 🛱
				- -
		Add 🗄	Delete 📑 Info	
			< Prev Next >	Finish Cancel

**14.** Enter the name of the Datacenter in the vCenter. This name must match exactly as that given in the vCenter. Description is optional. Click **Next**.

# Figure 194 Identifying the Datacenter Create Datacenter 1. videntify Datacenter 1. videntify Datacenter 0. videntify Datacenter </t

**15.** Now, create a folder that would contain the virtual Distributed Switch (vDS). click **Add** on this window as shown in Figure 195.

¥

Figure 195	Adding the Datacenter

Create Datacent

ſ

Unified C	omputing	g Systen	n Manag	er
Create Datacenter 1. √ <u>Identify Datacenter</u>	Folders			Q
<sup>2.</sup> √ <u>Folders</u>	🔍 Filter 👄 Export 😸 Prin	nt		
	Name	Description	System UUID	Owner 🛱
				<u> </u>
		Add 📄	Delete 🎆 Info	
			< Prev Next >	Finish Cancel

**16.** Enter folder name and description (optional). Click **Next**.

	Figure 196 Cre	ating Folder		
🗼 Create Folder		-		x
Unified C	omputing	System M	anage	
Create Folder	Create Folder			0
1. √ <u>create Folder</u> 2. ⊉ <sub>DVSs</sub>	Name: UCSM Description: UCSM folder crea	ted by this UC5M on vCenter		
	-	< Pre	Next >	Finish Cancel

17. Click Add in the DVSs window, to add a Distributed Virtual Switch.



📥 Create Folder					×
Unified C	omputing	g Systen	n Manag	er	
Create Folder	DVSs				0
1. V <u>Create Folder</u>					
2. √ <u>D¥5s</u>	🔍 Filter 👄 Export 😸 Prin	nt			
	Name	Description	System UUID	Owner	Ę
					<b>T</b>
		🖬 Add	Delete 🎆 Info		
			< Prev Next >	Finish	ncel

**18.** Enter the name of the DVS, description (optional) and click the radio button **Enable** for the "Admin State" of the DVS. Click **Ok**.

1

	Figure 198	Creating a Distributed Virtual Switch	
🚔 Create D¥S			×
Create DVS			0
Name: UCS-DVS			
Description: DVS created by	y this UCS on vCenter		
Admin State: O Disable 💿	Enable		
		ОК	Cancel

#### . . . . . . 10.00 400 ...





Treate roluer					<u>^</u>
Unified C	omputir	ng System	n Manag	er	
Create Folder 1. √ <u>Create Folder</u>	DVSs				•
2. √ <u>D¥5s</u>	🔍 Filter 👄 Export 📚	Print			
	Name	Description	System UUID	Owner	4
	🐹 UCS-DVS	DVS created by this U		Managed	<b></b>
		🛨 Add  💼	Delete 🎆 Info		
			< Prev Next >	Finish	Cancel

20. Click Finish in the "Folders" window.

Γ

🗭 Create Datacenter					2
reate Datacenter	Folders				Ø
<ol> <li>√<u>Identify Datacenter</u></li> <li>✓<u>Folders</u></li> </ol>	🕰 Filter 🖨 Export 😸	Print			_
	Name	Description	System UUID	Owner	
	Folder UCSM	UCSM folder created b		Managed	
					¥
		🛨 Add 🍵	Delete 🔛 Info		
			< Prev Next >	Finish	Cancel

#### Figure 200 Wizard Showing Created Folder Cisco UCS Manager

1





Configure vCenter 1. √ <u>Configure vCenter</u>	Datacenters				Ø
2. VFolders	🔍 Filter 🖨 Export 🃚 Pr	int			
3. √ <u>Datacenters</u>	Name	Description	System UUID	Owner	<b>₽</b>
	a Datacenter V250	¥250 Datacenter on th		Managed	
					Ŧ
		🛨 Add 🍵	Delete 🛄 Info		
			< Prev Next >	Finish	Iancel

22. You will get a success notification popup window as shown Figure 202.





🜲 Configure vCenter

**23.** In the vCenter window, click **Inventory** > **Networking**, you should see the folder and DVS created, with two default port-profiles "uplink-pg-<vDS-Name>" and "deleted-pg-<vDS-Name>" as shown in Figure 203.

X



Figure 203 vCenter Window Showing the Folder and DVS Created

24. In the VM tab of the Cisco UCS Manager window, right-click on the "Port Profiles" and click Create Port Profile as shown in Figure 204.

#### Figure 204 Creating Port profile in Cisco UCS Manager



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**25.** Create an infrastructure port profile. Provide description (optional). The name and description would show up on vCenter when the Cisco UCS Manager pushes the port profile to the vCenter. You can restrict maximum ports for the infrastructure port profile to 10. Select infra VLAN as part of the allowed VLANs list and mark it as native VLAN. Figure 205 shows infra port profile configuration. Click **Ok**.

Figure 205

Description:       Port-profile for infrastructure and managmenet traffic         QoS Policy: <not set="">         rk Control Policy:       <not set="">         Max Ports:       10         IO Performance:       • None C High Performance         Pin Group:       <not set="">         Select       Name         Max Ports:          Gefault          Storage          WM-DATA          Whotion          VSphereMgmt</not></not></not>	Name	pp-infra			
rk Control Policy: <not set=""> Max Ports: 10 IO Performance:  None  High Performance Pin Group: <not set=""> Select  Name  Native VLAN Gefault C Storage VM-DaTA VMotion VMotion C</not></not>	Description	Port-profile for infrastructure	and managmenet traffi	ic	
Max Ports: 10 IO Performance: None C High Performance Pin Group: <not set=""> Select Name Native VLAN G default Storage VM-DATA VMotion VMotion C</not>	QoS Policy	() <not set=""></not>			
Max Ports: 10 IO Performance: None High Performance Pin Group: <not set=""> Select Name Native VLAN IC Gefault C A Storage C VM-DATA C VMotion C</not>	Network Control Policy	/: <not set=""></not>			
IO Performance: None C High Performance Pin Group: <not set="">   Select Name Native VLAN C default C default C VM-DATA C VMOtion C</not>					
Pin Group:        Select     Name       default     Image       Storage     Image       VM-DATA     Image       VMotion     Image		0			
Select Name Native VLAN IC default C A Storage C A VM-DATA C A VMotion C	st Network IO Performance	e: • None • High Performance			
default     Image       Storage     Image       VM-DATA     Image       vMotion     Image	Pin Group	o: <not set=""> 💌</not>			
default     Image       Storage     Image       VM-DATA     Image       vMotion     Image	'LANs				
Storage     C       VM-DATA     C       vMotion     C	Select	Name	Native VLAN	E.	
VM-DATA C vMotion C		default			
vMotion O		-			
	-				
	V		۲		

**26.** Select the newly created port profile and click **Create Profile Client**. In the Cisco UCS Manager window you can configure multiple vCenter and create multiple (up to 8) vDS per vCenter. A given port profile will be pushed to a set of vDS based on port profile client regex match. As we have only one vCenter and one vDS, we will simply push the port profile to **all** vDS in next step.

#### Figure 206 Creating Profile Client in Cisco UCS Manager

**Entering Details to Create Port Profile** 

📥 Cisco Unified Computing System Manage	r - ¥250-UCS	_ 🗆
Fault Summary	🚱 💿 🗳 New 👻 📝 Options 🛛 🕐 🕕 📥 Pending Activities 🛛 💽 Exit	alu CIS
1 35 9	>> All > = Port Profiles > = Port Profile pp-infra = Port	t Profile pp-infr
Equipment Servers LAN SAN VM Adm	General VM LANs Profile Clients Virtual Machines Events	
Filter: All 🔻	Actions	
• -	Create Profile Client Name: pp-infra	
	Obscription: Port-profile for infrastructure and management     Description: Port-profile for infrastructure and management	enet traffic
E 🤤 All I → I → I → I → I → I → I → I → I → I →	Delete     QoS Policy: <a href="https://www.endited.com"></a>	
Port Profiles	Network Control Policy: <not set=""></not>	
Port Profile pp-infra ⊕- ⊕ VMware	Max Ports: 10	
	Host Network IO Performance: 💿 None 🕤 High Performance	
	Pin Group: <not set=""></not>	

27. Default parameters for port profile client are "all", and we will retain that. To reflect that, let us name the port profile client "all" as sown in Figure 207. Click Ok.





**28.** Similarly, create a "vMotion" port profile as shown Figure 208. Make sure that the "vMotion" is selected for the QoS policy field.

🚔 Create Port Profile				×
Create Port Profile	e			0
Description QoS Policy: v Network Control Policy: 4 Max Ports: 6 Host Network IO Performance:	<ul> <li>A ▼</li> <li>None ○ High Performance</li> </ul>			
Pin Group: <	(not set>			
Select	News	B1-12	<b>₽</b>	
Select	Name default	Native VLAN		
	Storage	0		
	VM-DATA	0		
	vMotion	·	<b>-</b> h	
	vSphereMgmt	0		
				OK Cancel

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Figure 208 Creating Port Profile

29. Create an NFS port profile for storage traffic as shown in Figure 209.

Figure 209

reate Port Profile				
reate Port Profi	ile			C C
Namer	pp-nfs			
	0 0			
Description:	]			
QoS Policy:	NFS 🔽			
Network Control Policy:	<not set=""></not>			
Max Ports:	64			
st Network IO Performance:	None C High Performance			
Pin Group:	<not set=""> 🔻</not>			
/LANs				
Select	Name	Native VLAN	Ę	
	default	0		
	Storage	•		
	VM-DATA	0		
	vMotion	0		
	vSphereMgmt	0		

**30.** Figure 210 shows a sample VM application/ data port profile.

**Creating Port Profile for Storage Traffic** 

Figure 210 Window Showing Sample Port Profile Created

Create Port Profile				×
Create Port Pro	file			0
Nam	e: pp-data			
	Ų			
Description				
QoS Policy	y: <not set=""> 💌</not>			
Network Control Policy	y: <not set=""></not>			
Max Port	s: 256			
Host Network IO Performance	e: 💿 None 🔿 High Performance			
Pin Grou	o: <not set=""> 💌</not>			
VLANs				
Select	Name	Native VLAN	<b>₽</b>	
	default	0		
	Storage	0		
	VM-DATA	•		
	vMotion	0		
	vSphereMgmt	0		
				OK Cancel

**31.** Create "all" port profile clients for port profiles created in steps 28 to 30. This will be shown in the vCenter server.

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#### 🛃 VSPEX - vSphere Client File Edit View Inventory Administration Plug-ins Help 🏫 Home 🕨 🚮 Inventory 🕨 🧟 Networking 4 🕼 🛎 🍇 🗆 🛃 VSPEX UCS-DVS Datacenter Old V250 Networks Ports Confi Name, Port binding, VLAN 📂 UCSM Port binding 🗄 👝 UCS-DVS Name 📇 uplink-pg-UCS-DVS 🟯 pp-infra Static binding deleted-pg-UCS-DVS deleted-pa-UCS-DVS Static binding 2 pp-data 2 pp-data Static binding pp-vMotion Static binding 2 🚑 pp-nfs Static binding pp-nfs 2 🟯 pp-vMotion uplink-pg-UCS-DVS Static binding

Figure 211

**32.** In the vCenter server, click **Inventory** > **Networking** in the menu bar. Right-click on the vDS created by Cisco UCS Manager and click **Add Host...** as shown in Figure 212.

UCS-DVS Showing All the Created Port Profiles

#### Figure 212 Adding Host in UCS-DVS



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**33.** Select all the ESXi 5.1 hosts and all the uplinks on the servers. There is only one implicit uplink port profile created by Cisco UCS Manager and that uplink port profile is automatically selected for the migration to vDS from vSwitch as shown in Figure 213. Click **Next**.

Cisco Virtualization Solution for EMC VSPEX with VMware vSphere 5.1 for 250 Virtual Machines

Figure 213

#### Selecting Hosts and Physical Adapters

## 🚰 Add Host to vSphere Distributed Switch

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#### Select Hosts and Physical Adapters

Select hosts and physical adapters to add to this vSphere distributed switch.

Select Host and Physical Adapters				Settings View Incompatible Hosts
Network Connectivity	Host/Physical adapters	In use by switch	Settings	Uplink port group
Virtual Machine Networking	□ □ 10.29.180.121	1	View Details	
Ready to Complete	Select physical adapters			
	vmnic0	vSwitch0	View Details	uplink-pg-UCS-DVS
	Vinico	vSwitch0	View Details	uplink-pg-UCS-DVS
	□ <b>□</b> 10.29.180.122	*Dirice to	View Details	opinik pg oco ovo
	Select physical adapters		TOT DOCUMPT	
		vSwitch0	View Details	uplink-pg-UCS-DVS
	Vinico	*5****	View Details	uplink-pg-UCS-DVS
	□ □ □ □ 10.29.180.123		View Details	opinik-pg-oco-ovo
	Select physical adapters		View Decais	
			View Details	uplink-pg-UCS-DVS
		vSwitch0	View Details	uplink-pg-UCS-DVS
		VOWICEID	View Details	аршик-ру-осэ-очэ
	Select physical adapters		view Decails	
			Ulaw Dahaila	
	Vmnic0	vSwitch0	View Details View Details	uplink-pg-UCS-DVS
				uplink-pg-UCS-DVS
	□ 🗹 📋 10.29.180.125		View Details	
	Select physical adapters		U.S. Datata	
	Vmnic0	vSwitch0	View Details	uplink-pg-UCS-DVS
	Vmnic2		View Details	uplink-pg-UCS-DVS
	□ 🗹 🗍 10.29.180.126		View Details	
	Select physical adapters	C 140	the Batal	
	Vmnic0	vSwitch0	View Details	uplink-pg-UCS-DVS
	Vmnic2		View Details	uplink-pg-UCS-DVS
	□ □ □ 10.29.180.127		View Details	
	Select physical adapters			h.t
		vSwitch0	View Details	uplink-pg-UCS-DVS
	Vmnic2		View Details	uplink-pg-UCS-DVS
	□ 🔽 📋 10.29.180.128		View Details	
	Select physical adapters			
	Vmnic0	vSwitch0	View Details	uplink-pg-UCS-DVS
	Vmnic2		View Details	uplink-pg-UCS-DVS
	□ 🗹 🗍 10.29.180.129		View Details	
	Select physical adapters			
	Vmnic0	vSwitch0	View Details	uplink-pg-UCS-DVS
	Vmnic2		View Details	uplink-pg-UCS-DVS
	- 🖌 📋 10.29.180.130		View Details	
	Select physical adapters			
	Vmnic0	vSwitch0	View Details	uplink-pg-UCS-DVS
	Vmnic2		View Details	uplink-pg-UCS-DVS
	1			
Help				<back cancel<="" next="" td="" ≥=""></back>
Toth				

**34.** As we are migrating both the uplinks to vDS, any traffic going to native vSwitch will be "black-holed". Migrate the ESXi kernel management ports to the vDS. Choose the appropriate infrastructure port profiles for all the management kernel interfaces as shown in Figure 214.

\_ \_ \_ >

Figure 214 Network Connectivity Window in Adding Hosts Wizard

st to vSphe	re usrrinu	ren swirch
se co i spile	C Distribu	ceu sincen

Network Connectivity

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Select port group to provide network connectivity for the adapters on the vSphere distributed switch.

	.29.180.121				
	vmk0	vSwitch0	VMkernel	pp-infra	
E 🖟 10	.29.180.122				
	vmk0	vSwitch0	Management Network	pp-infra	
🗆 🔂 10	.29.180.123				
	vmk0	vSwitch0	Management Network	pp-infra	
🖃 🔂 10	.29.180.124				
	vmk0	vSwitch0	Management Network	pp-infra	
🖃 🖟 10	.29.180.125				
	vmk0	vSwitch0	Management Network	pp-infra	
🖃 强 10	.29.180.126				
	vmk0	vSwitch0	Management Network	pp-infra	
🖃 强 10	.29.180.127				
	vmk0	vSwitch0	Management Network	pp-infra	
🖃 强 10	.29.180.128				
<b>•</b>	vmk0	vSwitch0	Management Network	pp-infra	
🖃 强 10	.29.180.129				
<b>A</b>	vmk0	vSwitch0	Management Network	pp-infra	
- <u>a</u>					
<b>I</b>	vmk0	vSwitch0	Management Network	pp-infra	
				$\square$	
		<ul> <li>vmk0</li> <li>in 10.29.180.123</li> <li>vmk0</li> <li>in 10.29.180.124</li> <li>vmk0</li> <li>in 10.29.180.125</li> <li>vmk0</li> <li>in 10.29.180.125</li> <li>vmk0</li> <li>in 10.29.180.126</li> <li>vmk0</li> <li>in 10.29.180.127</li> <li>vmk0</li> <li>in 10.29.180.128</li> <li>vmk0</li> <li>in 10.29.180.129</li> <li>vmk0</li> <li>in 10.29.180.130</li> <li>vmk0</li> </ul>	Image: Number of Section 123         Image: Number of Section 123         Image: Number of Section 123         Image: Number of Section 124         Image: Number of Section 125         Image: Number of Section 125         Image: Number of Section 125         Image: Number of Number of Section 125         Image: Number of Number of Section 125         Image: Number of Number of Number of Number of Number of Section 125         Image: Number of Number o	Image: New Section of Section S	Image: Number of the second

35. Click Next as we have not yet created any Virtual Machines on the ESXi hosts.

#### Figure 215 Virtual Machine Networking Window in Adding Hosts Wizard

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🛃 Add Host to vSphere Distributed Switch

Virtual Machine Networking Select virtual machines or network adapters to migrate to the vSphere distributed switch.

	_			
Select Host and Physical Adapters	Migrate virtual machine networking			
Network Connectivity	Host/Virtual machine/Network adapter NIC count Source po	rt aroup D	estination port group	)
Virtual Machine Networking Ready to Complete			pp	
Ready to Complete				
	Network adapter details		0 esir	n port group
			-10019	in porcigroup
	]			
Help		< Back	Next >	Cancel

**36.** Verify the configuration change before submitting the configuration and click **Finish** to complete the migration as shown in Figure 216.

#### Figure 216 Ready to Complete Window in Adding Hosts Wizard

#### 🛃 Add Host to vSphere Distributed Switch

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#### Ready to Complete

Verify the settings for the new vSphere distributed switch.



**37.** Verify that all the hosts shown under the "Hosts" tab and their "VDS Status" is "Up" as shown in Figure 217.



Figure 217 Cisco UCS-DVS Showing Hosts Details in vCenter

38. In the Cisco UCS Manager window, you can validate the hosts added to VM-FEX vDS by clicking on the VM tab, and expanding "VMware", "Virtual Machines" as shown in Figure 218. The "Status" of all the ten servers should show as "Online". Note that Cisco UCS Manager identifies hypervisor hosts by chassis ID and blade ID combination, unlike vCenter which identifies the servers by IP addresses.



#### Figure 218 Window Showing Host Server Status in Cisco UCS Manager

We need to create two more kernel interfaces per host, one for vMotion and one for NFS storage access by the kernel. Choose the appropriate port profiles for the same. For both the vMotion and the NFS kernel interfaces, choose the MTU to be jumbo 9000 MTS for bulk transfer efficiency. Follow these steps:

 In the vCenter window, click Inventory > Hosts and Clusters. Select an individual ESX host and click Configuration > Networking > vSphere Distributed Switch on the right pane of the vCenter window. Click Manage Virtual Adapters... link as shown in Figure 219.

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Eile Edit Vie <u>w</u> Inventory Administrat	ion Plug-ins Help		
🖸 🔝 🚺 Home 🕨 🚮 Inve	ntory 🕨 🛐 Hosts and Clusters		🔊 🗸 Search In
et et 🚼			
•••••••••••••••••••••••••••••	10.29.180.124 VMware ESXi, 5.0.0, 4695 Summary Virtual Machines Performance  Frocessors Memory Srosge Networking Subargur Adapters Advanced Settings Power Management  Software Licensed Features Time Configuration DNS and Routing Authentication Services Power Management Virtual Machine Startup/Shutdown Virtual Machine Startup/Shu	Switch       Image: Switch	rage Views Hardware Status Manage Vietual Adapters Panage Physi □ uplink-pg-UCS-DVS II III Uplink00 (1 NIC Adapter) IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII

Figure 219 Managing Virtual Adapters in vCenter

- \_\_\_\_\_
- Figure 220

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Adding Virtual Kernel Interface

🖗 Manage Virt	ual Adapte	ers				×
	Add	Edit	Remove	Migrate		
Name					-Network Connection	1
<b>V</b> Mkernel					Port Group:	
vmk0					Port:	
					vMotion:	
					Fault Tolerance Logging:	
					Management Traffic:	
					iSCSI Port Binding:	

3. Click New virtual adapter radio button for Creation Type and click Next as shown in Figure 221.

#### Figure 221 Creation Type Window in Adding Virtual Adapter Wizard

1

Add Virtual Adapter Creation Type Add a new virtual network	adapter or migrate existing virtual network adapters from switches.	
Creation Type Virtual Adapter Type Connection Settings Ready to Complete	Creation Type  New virtual adapter  Add a new virtual adapter to the vSphere distributed switch.  Migrate existing virtual adapters  Migrate virtual adapters to this vSphere distributed switch. IP address, subnet mask, and default gateway will remain unchanged.	
Help	< Back Next >	Cancel

**4.** Select the "pp-vMotion" port profile from the drop-down list and check the check box "Use this virtual adapter for vMotion". Click **Next**.

#### Figure 222 Connection Settings Window in Adding Virtual Adapter Wizard

🚱 Add Virtual Adapter		
Connection Settings		
Specify VMkernel connection	n settings.	
Creation Type Virtual Adapter Type	Network Connection	
Connection Settings	vSphere Distributed Switch:	UCS-DVS
IP Settings Ready to Complete	Select port group	pp-vMotion Port: N/A
Roddy to complete	C Select port	
		Use this virtual adapter for vMotion
		Use this virtual adapter for Fault Tolerance logging
		Use this virtual adapter for management traffic
Help		< Back Next > Cancel

5. Enter IP address and subnet mask. See Customer Configuration Data Sheet, page 172 for assigning the IP address. Click Next.

Add Virtual Adapter VMkernel - IP Connection 9 Specifiy VMkernel IP settin			
Creation Type Virtual Adapter Type Connection Settings IP Settings Ready to Complete	C Obtain IP settings automatically Use the following IP settings: IP Address: Subnet Mask: VMkernel Default Gateway:	10       . 10       . 40       . 124         255       . 255       . 255       . 0         10       . 29       . 180       . 1	Edit
Help		< Back	Next > Cancel

Figure 223 Entering IP Address Details

6. Click **Finish** to deploy the new virtual interface.

Γ

<b>dd Yirtual Adapter</b> Ready to Complete Click Finish to confirm the	new virtual adapter configuration.			
Treation Type //rtual Adapter Type Connection Settings Ready to Complete	UCS-DVS		uplink-pg-UCS-DVS	· ·
Help	1		< Back Finish	Cancel

7. Repeat steps 1 to 6 for the storage access vmkernel virtual interface. On step 4, you need to select "pp-nfs" port profile and enable "vMotion".

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8. Both vMotion and NFS based storage access require jumbo MTU for the efficient bulk transfer. Select the "vmk1" interface and click Edit as shown in Figure 225.

Add Edit Remove Migrate		
Name	Network Connection	
/Mkernel	Port Group:	pp-vMotion
/mk0	Port:	331
/mk1	vMotion:	Enabled
/mk2	Fault Tolerance Logging:	Disabled
	Management Traffic:	Disabled
	iSCSI Port Binding:	Disabled
	NIC Settings	
	MAC Address:	00:50:56:7f:be:d2
	MTU:	1500
	IP Settings	
	IP Address:	10.10.41.12
	Subnet Mask:	255.255.255.0
		View Routing Table
Help		Close

#### Figure 225 Editing the VMkernel Interface

Vetwork Connection	
Sphere Distributed Switch:	UCS-DVS
Select port group	pp-vMotion   Port: 331
Select port	
	Use this virtual adapter for vMotion
	$\square$ Use this virtual adapter for Fault Tolerance logging
	Use this virtual adapter for management traffic
	Use this virtual adapter for iSCSI port binding
VIC Settinas	
ATU:	9000
MTU:	9000
чтu: 	9000
мтU: 	9000
мтU: 	9000
чти: 	9000
чти: 	9000
чти: 	9000
MTU:	9000
MTU:	9000
	9000

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Figure 226

Changing the MTU Size for the VMkernel Interface

- 10. Repeat steps 8 and 9 for "mk2" interface as well.
- You can verify in the Cisco UCS Manager window that every hypervisor host has now 3 vNICs, one in each "pp-vMotion", "pp-infra" and "pp-nfs" port-profile. This can be verified on the "VM" tab by clicking VMware > Virtual Machines, "Host Server x/y" and "vNICs" as highlighted in Figure 227.



Figure 227 VIrtual Machine Properties in Cisco UCS Manager

### Jumbo MTU Validation and Diagnostics

To validate the jumbo MTU from end-to-end, SSH to the ESXi host. By default, SSH access is disabled to ESXi hosts. Enable SSH to ESXi host by editing hosts' security profile under "Configuration" tab.

When connected to the ESXi host through SSH, initiate ping to the NFS storage server with large MTU size and set the "Do Not Fragment" bit of IP packet to 1. Use the vmkping command as shown in the example:

#### Example 5

```
~ # vmkping -d -s 8972 10.10.40.6411
PING 10.10.40.64 (10.10.40.64): 8972 data bytes
8980 bytes from 10.10.40.64: icmp_seq=0 ttl=64 time=0.417 ms
8980 bytes from 10.10.40.64: icmp_seq=1 ttl=64 time=0.518 ms
8980 bytes from 10.10.40.64: icmp_seq=2 ttl=64 time=0.392 ms
--- 10.10.40.64 ping statistics ---
3 packets transmitted, 3 packets received, 0% packet loss
round-trip min/avg/max = 0.392/0.442/0.518 ms
~ #
```

Ensure that the packet size is 8972 due to various L2/L3 overhead. Also ping all other hosts' vMotion and NFS vmkernel interfaces. Ping must be successful. If ping is not successful verify that 9000 MTU configured. Follow these steps to verify:

- 1. 9000 MTU on the NFS share IP address on the VNX5500 storage device(s).
- 2. Make sure that a "jumbo-mtu" policy map is created at Nexus 5000 series servers with default class having MTU 9216. Make sure that the "jumbo-mtu" policy is applied to the system classes on the ingress traffic.
- **3.** Make sure that the traffic from storage array to Cisco UCS B200 M3 Blade Servers are marked properly.

- 4. Make sure that the MTU 9216 is set in the Cisco UCS Manager system class configuration, and QoS policy is correctly set in the port-profiles.
- Make sure that the 9000 MTU is set for vmkernel ports used for vMotion as well as storage access VNICs.

## **Template-Based Deployments for Rapid Provisioning**



In an environment with established procedures, deploying new application servers can be streamlined, but this can still take many hours or days to complete. Not only should you complete an OS installation, but downloading and installing service packs and security updates can add a significant amount of time. Many applications require features that are not installed with Microsoft Windows by default and must be installed before installing the applications. Inevitably, those features require more security updates and patches. By the time all the deployment aspects are considered, more time is spent waiting for downloads and installs than that spent on configuring the application.

Virtual machine templates can help speed up this process by eliminating most of these monotonous tasks. By completing the core installation requirements, typically to the point where the application is ready to be installed, you can create a golden image which can be sealed and used as a template for all the virtual machines. Depending on how granular you want to make a specific template, the time to deploy can be as less as the time it takes to install, configure, and validate the application. You can use PowerShell tools and VMware vSphere Power CLI to bring down the time and manual effort dramatically, especially when you have a large number of VMs to deploy.

# Validating Cisco Solution for EMC VSPEX VMware Architectures

This section provides a list of items that should be reviewed when the solution has been configured. The goal of this section is to verify the configuration and functionality of specific aspects of the solution, and ensure that the configuration supports core availability requirements.

## **Post Install Checklist**

The following configuration items are critical to functionality of the solution, and should be verified before deploying for production.

- On each vSphere server, verify that the port-profile of virtual Distributed Switch that hosts the client VLANs is configured with sufficient ports to accommodate the maximum number of virtual machines it may host.
- On each vSphere server used, as part of this solution, verify that all the required virtual machine port-profiles is configured and that each server has access to the required VMware datastores.
- On each vSphere server used in the solution, verify that an interface is configured correctly for vMotion, using the correct port-profile and jumbo MTU.
- Create a test virtual machine that accesses the datastore and does read/write operations. Perform the virtual machine migration (vMotion) to a different host on the cluster. Also perform storage vMotion from one datastore to another datastore and ensure correctness of data. During the vMotion of the virtual machine, you need to have a continuous ping to the default gateway and make sure that the network connectivity is maintained during and after the migration.

## Verify the Redundancy of the Solution Components

Following redundancy checks were performed at the Cisco lab to verify solution robustness:

- Administratively shutdown one of the four links connected between Cisco UCS FI-A and Cisco UCS Fabric Extender. Make sure that connectivity is not affected. Upon administratively enabling the shutdown port, the traffic should be rebalanced. This can be validated by clearing interface counters and showing the counters after sending some of the data from the virtual machines.
- 2. Administratively shutdown one of the two uplinks connected to the Cisco Nexus 5548UP switches from FIs. Make sure that connectivity is not affected. Upon administratively enabling the shutdown port, the traffic should be rebalanced. This can be validated by clearing interface counters and showing the counters after sending some of the data from the virtual machines.
- **3.** Administratively shutdown one of the two data links connected to the storage array from the Cisco Nexus 5548UP switches. Make sure that storage is still available from all the ESXi hosts. Upon administratively enabling the shutdown port, the traffic should be rebalanced.
- 4. Reboot one of the two Cisco Nexus 5548UP switches while storage and network access from the servers are going on. The switch reboot should not affect the operations of storage and network access from the VMs. Upon rebooting the switch, the network access load should be rebalanced across the two Cisco Nexus switches.
- 5. Reboot one of the two UCS fabric interconnects while storage and network access from the servers are going on. The switch reboot should not affect the operations of storage and network access from the VMs. Upon rebooting the switch, the network access load should be rebalanced across the two switches.
- **6.** Reboot the active storage processor of the VNX storage array and make sure that all the NFS shares are still accessible during and after the reboot of the storage processor.
- 7. Fully load all the virtual machines of the solution. Put one of the ESXi host in maintenance mode. All the VMs running on that host should be migrated to other active hosts. No VM should lose any network or storage accessibility during or after the migration. There is enough head room for memory in other servers to accommodate 25 additional virtual machines.

## **Cisco Validation Test Profile**

"vdbench" testing tool was used with Windows 2008 R2 SP1 server to test scaling of the solution in Cisco labs. Table 14 details on the test profile used.

Table 14Test profile details

Profile characteristic	Value
Number of virtual machines	250
Virtual machine OS	Windows Server 2008 R2 SP1
Processors per virtual machine	1
Number of virtual processors per physical CPU core	4
RAM per virtual machine	2 GB
Average storage available for each virtual machine	100 GB
Average IOPS per virtual machine	25 IOPS
Number of datastores to store virtual machine disks	2

# **Bill of Material**

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Table 15 gives the list of the components used in the CVD for 250 virtual machines configuration

Table 15List of hardware components used in the CVD

Description	Part #
UCS B200 M3 blade servers	UCSB-B200-M3
CPU for B200 M3 blade servers	UCS-CPU-E5-2630
Memory for B200 M3 blade servers	UCS-MR-1X082RY-A
Cisco VIC adapter	UCSB-MLOM-40G-01
UCS 5108 Chassis	N20-C6508
UCS 2204XP Fabric Extenders	UCS-IOM-2204XP
UCS 6248UP Fabric Interconnects	UCS-FI-6248UP
Nexus 5548UP switches	N5K-C5548UP-FA
10 Gbps SFP+ multifiber mode	SFP-10G-SR

For more information on details of the hardware components, see:

http://www.cisco.com/en/US/prod/collateral/ps10265/ps10280/B200M3\_SpecSheet.pdf

# **Customer Configuration Data Sheet**

Before you start the configuration, gather the customer-specific network and host configuration information. Table 16, Table 17, Table 18, Table 19, Table 20, Table 21, Table 22 provide information on assembling the required network, host address, numbering, and naming information. This worksheet can also be used as a "leave behind" document for future reference.

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Server Name	Purpose	Primary IP	
	Domain Controller		
	DNS Primary		
	DNS Secondary		
	DHCP		
	NTP		
	SMTP		
	SNMP		
	vCenter Console		
	SQL Server		

#### Table 16 Common Server Information

#### Table 17 ESXi Server Information

Server Name	Purpose	Primary IP	Private Net (storage) addresses	VMkernel IP	vMotion IP
Host 1	ESXi				
Host 10	ESXi				

#### Table 18 Array Information

Array name	
Admin account	
Management IP	
Storage pool name	
Datastore name	
NFS Server IP	

Name	Purpose	IP	Subnet Mask	Default Gateway
	Cisco Nexus 5548UP A			
	Cisco Nexus 5548UP B			
	Cisco UCSM Virtual IP			
	Cisco UCS FI-A			
	Cisco UCS FI-B			

#### Table 19 Network Infrastructure Information

#### Table 20VLAN Information

Name	Network Purpose	VLAN ID	Allowed Subnets
vlan-infra	Virtual Machine Networking		
ESXi Management			
vlan-nfs	NFS Storage Network		
vlan-vMotion	vMotion traffic network		
vlan-data	Data VLAN of customer		
(multiple)	VMs as needed		

#### Table 21 VSAN Information

Name	Network Purpose	VSAN ID	Allowed Subnets
vsan-storage	FC connectivity from server to		
	storage		

#### Table 22Service Accounts

Account	Purpose	Password (optional, secure appropriately)
	Windows Server administrator	
root	ESXi root	
	Array administrator	
	vCenter administrator	
	SQL Server administrator	
admin	Nexus 5548UP administrator	
admin	Cisco UCS Manager administrator	

# References

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Cisco UCS:

 $http://www.cisco.com/en/US/solutions/ns340/ns517/ns224/ns944/unified\_computing.html$ 

VMware vSphere:

http://www.vmware.com/products/vsphere/overview.html

Cisco Nexus 5000 Series NX-OS Software Configuration Guide:

http://www.cisco.com/en/US/docs/switches/datacenter/nexus5000/sw/configuration/guide/cli/CLIConf igurationGuide.html

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EMC VNX 5xxx series resources:

http://www.emc.com/storage/vnx/vnx-series.htm#!resources

Microsoft SQL Server installation guide:

http://msdn.microsoft.com/en-us/library/ms143219.aspx