

## Cisco Virtualization Solution for EMC VSPEX with VMware vSphere 5.1 for 50 Virtual Machines

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Building Architectures to Solve Business Problems

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## About the Authors



Sanjeev Naldurgkar

#### Sanjeev Naldurgkar, Technical Marketing Engineer, Server Access Virtualization Business Unit, Cisco Systems

Sanjeev Naldurgkar is a Technical Marketing Engineer at Cisco Systems with Server Access Virtualization Business Unit (SAVBU). With over 12 years of experience in information technology, his focus areas include UCS, Microsoft product technologies, server virtualization, and storage technologies. Prior to joining Cisco, Sanjeev was Support Engineer at Microsoft Global Technical Support Center. Sanjeev holds a Bachelor's Degree in Electronics and Communication Engineering and Industry certifications from Microsoft, and VMware.

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1

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

# Cisco Virtualization Solution for EMC VSPEX with VMware vSphere 5.1 for 50 Virtual Machines

## **Executive Summary**

Cisco solution for EMC VSPEX proven and modular infrastructures are built with best of-breed technologies to create complete virtualization solutions that enable you to make an informed decision in the hypervisor, compute, and networking layers. VSPEX eases server virtualization planning and configuration burdens. VSPEX 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 50 virtual machines with Cisco solution for EMC VSPEX.

## Introduction

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Virtualization is a key and a 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 the appropriate platform for virtualization can be challenging. Platform should be flexible, reliable and cost effective to facilitate the virtualization platform to deploy various enterprise applications. Also, the ability to slice and dice the underlying platform to size the application requirement is essential for a virtualization platform to utilize compute, network and storage resources effectively. In this regard, Cisco solution implementing EMC VPSEX provide a very simplistic yet fully integrated and validated infrastructure for you to deploy VMs in various sizes to suite your application needs.

## **Target Audience**

The reader of this document is expected to have the necessary training and background to install and configure VMware vSphere, EMC VNXe3150, Cisco Nexus 3048 switch, and Cisco Unified Computing (UCS) C220 M3 rack 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.



Corporate Headquarters: Cisco Systems, Inc., 170 West Tasman Drive, San Jose, CA 95134-1706 USA

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## **Purpose of this Document**

This document describes the steps required to deploy and configure the Cisco solution for EMC VSPEX for VMware architecture to a level that will allow for confirmation that the basic components and connections are working correctly. This CVD covers the VMware vSphere 5.1 for 50 Virtual Machines private cloud architecture. While readers of this CVD are expected to have sufficient knowledge to install and configure the products used, configuration details that are important for deploying this solution are specifically mentioned.

The 50 virtual machine environment discussed is based on a defined reference workload. While not every virtual machine has the same requirement, this document contains methods and guidance to adjust the system to be cost-effective when deployed.

A private cloud architecture is a complex system offering. This document facilitates its setup by providing up-front software and hardware material lists, step-by-step sizing guidance and worksheets, and verified deployment steps. When the last component has been installed, there are validation tests to ensure that your system is operating properly. Following the procedures defined in this document ensures an efficient and painless journey to the cloud.

## **Business Needs**

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. 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. Cisco solution for EMC VSPEX for VMware helps to reduce complexity of configuring every component of a traditional deployment. 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. Following are the business needs for the Cisco solution of EMC VSPEX with VMware architectures:

- Provide an end-to-end virtualization solution to take full advantage of unified infrastructure components.
- Provide a Cisco VSPEX for VMware ITaaS (IT as a Service) solution for efficiently virtualizing up to 50 virtual machines for varied customer use cases.
- Provide a reliable, flexible and scalable reference design.

## **Solutions Overview**

This section provides a list of components used for deploying the Cisco solution for EMC VSPEX for 50 VMs using VMware vSphere 5.1.

## **Cisco Solution for EMC VSPEX with VMware Architectures**

This solution provides an end-to-end architecture with Cisco, EMC, VMware, and Microsoft technologies that demonstrate support for up to 50 generic virtual machines and provide high availability and server redundancy.

Following are the components used for the design and deployment:

- Cisco C-series Unified Computing System servers
- Cisco Nexus 3000 Series Switch
- Cisco virtual Port Channels (vPC) for network load balancing and high availability
- EMC VNXe3150 storage components
- EMC Next Generation Backup Solutions
- VMware vSphere 5.1
- Microsoft SQL Server Database
- VMware DRS
- VMware HA

The solution is designed to host scalable, mixed application workloads. The scope of this CVD is limited to the Cisco solution for EMC VSPEX with VMware solutions up to 50 virtual machines only.

## **Technology Overview**

## **Cisco Unified Computing System**

The Cisco Unified Computing System is a next-generation data center platform that unites computing, network, storage access, and virtualization into a single cohesive system.

The main components of the Cisco UCS are:

- **Computing**—The system is based on an entirely new class of computing system that incorporates rack mount and blade servers based on Intel Xeon E-2600 Series Processors. The Cisco UCS servers offer the patented Cisco Extended Memory Technology to support applications with large datasets and allow more virtual machines per server.
- **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.

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The Cisco Unified Computing System is designed to deliver:

- A reduced Total Cost of Ownership (TCO) 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.
- Industry standards supported by a partner ecosystem of industry leaders.

## Cisco UCS C220 M3 Rack-Mount Servers

Building on the success of the Cisco UCS C200 M2 Rack Servers, the enterprise-class Cisco UCS C220 M3 server further extends the capabilities of the Cisco Unified Computing System portfolio in a 1-rack-unit (1RU) form factor. And with the addition of the Intel® Xeon® processor E5-2600 product family, it delivers significant performance and efficiency gains.



The Cisco UCS C220 M3 offers up to 256 GB of RAM, up to eight drives or SSDs, and two 1GE LAN interfaces built into the motherboard, delivering outstanding levels of density and performance in a compact package.

## **Cisco Nexus 3048 Switch**

The Cisco Nexus® 3048 Switch is a line-rate Gigabit Ethernet top-of-rack (ToR) switch and is part of the Cisco Nexus 3000 Series Switches portfolio. The Cisco Nexus 3048, with its compact one-rack-unit (1RU) form factor and integrated Layer 2 and 3 switching, complements the existing Cisco Nexus family of switches. This switch runs the industry-leading Cisco® NX-OS Software operating system, providing customers with robust features and functions that are deployed in thousands of data centers worldwide.





## **EMC Storage Technologies and Benefits**

The VNXe<sup>TM</sup> series is powered by Intel Xeon processor, for intelligent storage that automatically and efficiently scales in performance, while ensuring data integrity and security.

The VNXe series is purpose-built for the IT manager in smaller environments. The EMC VNXe storage arrays are multi-protocol platform that can support the iSCSI, NFS, and CIFS protocols depending on the customer's specific needs. The solution was validated using iSCSI for data storage.

VNXe series storage arrays have 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 Available

- 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 Available

Total Value Pack-Includes all protection software suites and the Security and Compliance Suite

This is the available EMC protection software pack.

The VNXe<sup>TM</sup> series is powered by Intel Xeon processor, for intelligent storage that automatically and efficiently scales in performance, while ensuring data integrity and security.

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## EMC NetWorker and Data Domain

EMC's NetWorker coupled with Data Domain deduplication storage systems seamlessly integrate into virtual environments, providing rapid backup and restoration capabilities. Data Domain deduplication results in vastly less data traversing the network by leveraging the Data Domain Boost technology, which greatly reduces the amount of data being backed up and stored, translating into storage bandwidth and operational savings.

The following are two of the most common recovery requests made to backup administrators:

- **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 common root causes for full system recovery requests are–viral infestation, registry corruption, or unidentifiable unrecoverable issues.

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

## **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 – translating into storage, bandwidth and operational savings.

## VMware vSphere 5.1

VMware vSphere 5.1 transforms a computer's physical resources by virtualizing the CPU, memory, storage and network functions. This transformation creates fully functional virtual machines that run isolated and encapsulated operating systems and applications just like physical computers.

The high availability features of VMware vSphere 5.1 such as vMotion and Storage vMotion enable seamless migration of virtual machines and stored files from one vSphere server to another with minimal or no performance impact. Coupled with vSphere DRS and Storage DRS, virtual machines have access to the appropriate resources at any point in time through load balancing of compute and storage resources.

#### **VMware vCenter**

VMware vCenter is a centralized management platform for the VMware Virtual Infrastructure. It provides administrators with a single interface for all aspects of monitoring, managing, and maintaining the virtual infrastructure that can be accessed from multiple devices.

VMware vCenter is also responsible for managing some of the more advanced features of the VMware virtual infrastructure like VMware vSphere High Availability (vSphere HA) and Distributed Resource Scheduling (DRS), along with the vMotion and Update Manager.

## **Architectural overview**

This CVD focuses on VMware solution for up to 50 virtual machines.

For the VSPEX solution, the reference workload was defined as a single virtual machine. Characteristics of a virtual machine are defined in Table 1.

#### Table 1 Virtual Machine Characteristics

Characteristics	Value
Virtual machine operating system	Microsoft Windows Server 2012
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

See "Sizing Guideline" section on page 20 for more detailed information.

## Solution architecture overview

Table 2 lists the mix of hardware components, their quantities and software components used in this architecture.

Components	Specifications
Servers	3 Cisco C220 M3 Rack-Mount Servers
Adapters	1 Broadcom NetXtreme II 5709 quad-port per server
Network Switches	2 Cisco Nexus 3048 switches
Storage	EMC VNXe3150
Network Speed	1G Ethernet
Hypervisor	VMware ESXi 5.1

1

#### Table 2Hardware and Software Components

Table 3 lists the various hardware and software versions of the components which occupies different tiers of the Cisco solution for EMC VSPEX with VMware architectures under test.

Vendor	Name	Version	Description
Cisco	C220 M3 Servers	1.4(7a) – CIMC C220M3.1.4.7b.0 - BIOS	Cisco C220M3 Rack Servers
Cisco	Nexus 3048 Switches	5.0(3)U2(2b)	Nexus 3000 Series Switches running NX-OS
EMC	VNXe3150	2.4.0.20932	VNXe Storage Array
EMC	Avamar	6.1 SP1	EMC Next-Generation Backup
EMC	NetWorker	6.1 SP1	EMC Next-Generation Backup
EMC	Data Domain OS	8.0 SP1	Data Next-Generation Backup
VMware	ESXi 5.1	5.1 build 799733	Hypervisor
VMware	vCenter Server	5.1 build 799731	VMware Management
Micorsoft	Windows Server 2008 R2	2008 R2 SP1	OS to Host vCenter Server
Microsoft	SQL Server	2008 R2	Database Server SQL R2 Enterprise Edition for vCenter

Table 3Firmware and Software Versions of Components

Table 4 outlines the C220 M3 server configuration across all the VMware architectures. Table 4 shows the configuration on per server basis.

Components	Capacity
Memory (RAM)	64 GB (8x8MB DIMM)
Processor	2 x Intel® Xeon ® E5-2650 CPUs, 2 GHz, 8 cores, 16 threads
Local Storage	Cisco UCS RAID SAS 2008M-8i Mezzanine Card,
	With 2 x 67 GB slots for RAID 1 configuration each

#### Table 4 Cisco UCS C220 M3 Server Hardware Configuration

The reference architecture assumes that there is an existing infrastructure/ management network available where a virtual machine hosting vCenter server and Windows Active Directory/ DNS server are present. The below diagram illustrates high level solution architecture for 50 virtual machines.





As it is evident in the above diagrams, following are the high level design points of VMware architectures:

- Only Ethernet is used as network layer 2 media to access storage as well as TCP/IP network.
- 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 dictate or require any specific layout of infrastructure network. The vCenter server and Microsoft Windows Active Directory are hosted on 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 local hard drives. Typical 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 4 shows the use of memory settings parameters in the virtual machine.





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. Also, this value is the size of the per-virtual machine swap file that is created on the VMware Virtual Machine File System (VMFS) file system (VSWP file). If the balloon driver is unable to reclaim memory quickly enough, or is disabled or not installed, vSphere forcibly reclaims memory from the virtual machine using the VMkernel swap file.

#### 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 1 outlines the resources used by 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.

## **Storage Guidelines**

VSPEX architecture for VMware virtual machines at 50 VMs scale uses iSCSI 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.

#### **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 protecting the availability of your environment. In this solution, the redundancy comes from the "Fabric Failover" feature of the dynamic vNICs of Cisco UCS for NFS storage access.
- 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 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.

## VMware Memory Virtualization for VSPEX

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.

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#### 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 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.
- Use NIC Teaming—Use two physical NICs per vSwitch, and if possible, uplink the physical NICs to separate physical switches. Teaming provides redundancy against NIC failure and, if connected to separate physical switches, against switch failures. NIC teaming does not necessarily provide higher throughput.
- 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.
- Jumbo MTU for vMotion and Storage traffic—This best practice is implemented in the architecture by configuring jumbo MTU end-to-end.

## VMware Storage Layout for VSPEX

This section explains the EMC storage layout used for this solution.

#### **Storage Layout**

The architecture diagram in this section shows the physical disk layout. Disk provisioning on the VNXe series 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 5 shows storage architecture for 50 virtual machines on VNXe3150:



#### Figure 5

Storage Architecture for 50 VMs on EMC VNXe3150

Table 5 provides size of datastores for VMware 50 VMs architecture laid out in Figure 5.

#### Table 5 Datastore Details for V50 Architecture

Parameters	50 Virtual Machines
Disk capacity and type	300GB SAS
Number of disks	45
RAID type	4 + 1 RAID 5 groups
Number of pools	1
Hot spare disks	2

The reference architecture uses the following configuration:

- Forty-five 300 GB SAS disks are allocated to a single storage pool as nine 4+1 RAID 5 groups (sold as nine packs of five disks)
- At least one hot spare disk is to be allocated for each 30 disks of a given type.
- At least four iSCSI LUNS are allocated to the ESXi cluster from the single storage pool to serve as datastores for the virtual machines.

The VNX/VNXe family 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**

VMFS is a cluster file system that provides storage virtualization optimized for virtual machines. Each virtual machine is encapsulated in a small set of files and VMFS is the default storage system for these files on physical SCSI disks and partitions.

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 50 VMware virtual machines

Figure 6 demonstrates logical layout of 50 VMware virtual machines. Following are the key aspects of this solution:

- Three Cisco C220 M3 servers are used.
- The solution uses Nexus 3048 switches, two Intel mLoM and a quad-port Broadcom 1Gbps NIC. This results in the 1Gbps solution for the storage access.
- Virtual port-channels on storage side networking provide high-availability and load balancing.
- On server side, NIC teaming provides simplified load balancing and network high availability.
- Jumbo MTU set to 9000 end-to-end for efficient storage and vMotion traffic.
- EMC VNXe3150 with two storage processors is used as a storage array.



#### Figure 6 Logical Layout Diagram for VMware 50 VMs

## **Sizing Guideline**

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 reference workload. By comparing your actual 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 characteristics is shown in Table 1. 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 that 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 your virtual machines may not exactly match the specifications above. In that case, you can say that a single specific 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 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, the following resources are needed from the resource pool:

- CPU resources for one VM
- Memory resources for two VMs
- Storage capacity for one VM
- IOPS for one VM

In this example, a single virtual machine uses the resources of two of the reference VMs. If the original pool had the capability to provide 50 VMs worth of resources, the new capability is 48 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 are the requirements to virtualize this application:

- CPUs of four reference VMs
- Memory of eight reference VMs
- Storage of two reference VMs
- IOPS of eight reference VMs

In this case the one virtual machine uses the resources of eight reference virtual machines. If this was implemented on a resource pool for 50 virtual machines, there are 42 virtual machines of capability remaining in the pool.

#### 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 are the requirements to virtualize this application:

- CPUs of two reference VMs
- Memory of four reference VMs
- Storage of one reference VMs
- IOPS of two reference VMs

In this case the virtual machine would use the resources of four reference virtual machines. If this was implemented on a resource pool for 50 virtual machines, there are 46 virtual machines of capability remaining in the pool.

#### 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 ten CPUs and 48 GB of memory. It uses 5 TB of storage and generates 700 IOPS during an average busy cycle.

The following are the requirements to virtualize this application:

- CPUs of ten reference VMs
- Memory of twenty-four reference VMs
- Storage of fifty-two reference VMs
- IOPS of twenty-eight reference VMs

In this case the one virtual machine uses the resources of fifty-two reference virtual machines. If this was implemented on a resource pool for 100 virtual machines, there are 48 virtual machines of capability remaining in the pool.

#### **Summary of Example**

The three examples presented illustrate the flexibility of the resource pool model. In all three cases the workloads simply reduce the number of available resources in the pool. If all three examples were implemented on the same virtual infrastructure, with an initial capacity of 50 virtual machines they can all be implemented, leaving the capacity of thirty 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 outside the scope of this document.

However, once the change in resource balance has been examined, and the new level of requirements is known; these virtual machines can be added to the infrastructure using the method described in the examples.

## **VSPEX Configuration Guidelines**

The configuration for Cisco solution for EMC VSPEX with VMware architectures is divided into the following steps:

- 1. Pre-deployment tasks
- 2. Customer configuration data
- 3. Cabling information
- 4. Prepare and configure the Cisco Nexus Switches
- 5. Prepare the Cisco UCS C220 M3 Servers
- 6. Install ESXi 5.1 on Cisco UCS C220 M3 Servers
- 7. VMware vCenter server deployment
- 8. Adding ESXi hosts to vCenter or configuring hosts and vCenter server
- 9. Configure ESXi networking
- 10. Prepare the EMC VNXe Series Storage
- 11. Configure discover address for iSCSI adapters
- 12. Configuring vSphere HA and DRS
- 13. Test and validate the installation

Each of these steps are discussed 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 Table 6. These are used throughout the 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 2, Table 3 and Table 4 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" section on page 121 for reference during the deployment process.

Requirement	Description	Reference	
Hardware	Cisco UCS C220 M3 servers to host virtual machines	EMC-Cisco Reference Architecture: VSPEX Server	
	Cisco Nexus switches: Two Cisco Nexus 3048 switches for high availability	Virtualization with VMware vSphere 5.1 for up to 50 Virtual Machines.	
	VMware vSphere <sup>TM</sup> 5.1 server to host virtual infrastructure servers		
	Note This requirement may be covered in the existing infrastructure		
	EMC VNXe storage—Multiprotocol storage array with the required disk layout as per architecture requirements		
Software	VMware ESXi <sup>™</sup> 5.1 installation media	See the corresponding product documentation	
	VMware vCenter Server 5.1 installation media		
	EMC VSI for VMware vSphere: Unified Storage Management – Product Guide		
	EMC VSI for VMware vSphere: Storage Viewer—Product Guide		
	Microsoft Windows Server 2012 installation media (suggested OS for VMware vCenter)		
	Microsoft SQL Server 2008 R2 SP1		
	<b>Note</b> This requirement may be covered in the existing infrastructure		
Licenses	VMware vCenter 5.1 license key	Consult your corresponding	
	VMware ESXi 5.1 license key	vendor to obtain license keys	
	Microsoft SQL Server license key		
	Note This requirement may be covered in the existing infrastructure		
	Microsoft Windows Server 2008 R2 SP1 license key		

#### Table 6Deployment prerequisites

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## **Customer Configuration Data**

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

"Customer Configuration Data Sheet" section on page 121 provides a set of tables to maintain a record of relevant information. This form can be expanded or contracted as required, and information may be added, modified, and recorded as deployment progresses.

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

## **Cabling Information**

The following information is provided as a reference for cabling the physical equipment in a VSPEX V50 environment. Figure 8 and Figure 9 in this section provide both local and remote device and port locations in order to simplify cabling requirements.

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

Be sure to follow the cable directions in this section. Failure to do so will result in necessary changes to the deployment procedures that follow because specific port locations are mentioned. Before starting, be sure that the configuration matches what is described in Figure 7, Figure 8, and Figure 9.

Figure 7 shows a VSPEX V50 cabling diagram. The labels indicate connections to end points rather than port numbers on the physical device. For example, connection A is a 1 Gb target port connected from EMC VNXe3150 SP B to Cisco Nexus 3048 A and connection R is a 1 Gb target port connected from Broadcom NIC 3 on Server 2 to Cisco Nexus 3048 B. Connections W and X are 10 Gb vPC peer-links connected from Cisco Nexus 3048 A to Cisco Nexus 3048 B.

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#### Figure 7 VSPEX V50 Cabling Diagram

Figure 7, Figure 8, Figure 9 elaborates the detailed cable connectivity for the 50 virtual machines configuration.

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Cable ID on both ends	Ethernet Interface	VLAN ID	Mode	Speed	Port Channel	Remote Device Port
Е	Eth1/3	1, 23,613	trunk	1G	3	C220 Srv1- 1GE LOM 1
F	Eth1/4	1,23,613	trunk	1G	4	C220 Srv2- 1GE LOM 1
G	Eth1/5	1,23,613	trunk	1G	5	C220 Srv3- 1GE LOM 1
W	Eth1/51	1,20,22,23,613	trunk	10G	10	vPC peer link
Х	Eth1/52	1,20,22,23,613	trunk	10G	10	vPC peer link
K	Eth1/13	20	access	1G		C220 Srv1- Broadcom NIC 1
L	Eth1/15	20	access	1G		C220 Srv2- Broadcom NIC 1
М	Eth1/17	20	access	1G		C220 Srv3- Broadcom NIC 1
Q	Eth1/14	1,22	trunk	1G	14	C220 Srv1- Broadcom NIC 3
R	Eth1/16	1,22	trunk	1G	16	C220 Srv2- Broadcom NIC 3
S	Eth1/18	1,22	trunk	1G	18	C220 Srv3- Broadcom NIC 3
Not shown	Eth1/9	1, 23,613	trunk	10G		Uplink to Infra n/w
Not shown	Eth1/10	1,23,613	trunk	10G		Uplink to Infra n/w
A	Eth1/25	20	access	1G		VNXe3150 (eth10) - SPA
С	Eth1/26	20	access	1G		VNXe3150 (eth10) - SPB

Fiaure 8	Cisco Nexus 3048-A	Ethernet Cab	ling Information
i iguio o	01000 110/10 00 10 /1		ing intomation

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Figure 9

Cisco Nexus 3048-B Ethernet Cabling Information

Cable ID on both ends	Ethernet Interface	VLAN ID	Mode	Speed	Port Channel	Remote Device Port
H	Eth1/3	1, 23,613	trunk	1G	3	C220 Srv1-1GELOM 2
Ι	Eth1/4	1,23,613	trunk	1G	4	C220 Srv2-1GELOM 2
J	Eth1/5	1,23,613	trunk	1G	5	C220 Srv3-1GELOM 2
Y	Eth1/51	1,20,22,23,613	trunk	10G	10	VPC peer link
Z	Eth1/52	1,20,22,23,613	trunk	10G	10	VPC peer link
N	Eth1/13	21	access	1G		C220 Srv1-Broadcom NIC 2
0	Eth1/15	21	access	1G		C220 Srv2- Broadcom NIC 2
Р	Eth1/17	21	access	1G		C220 Srv3- Broadcom NIC 2
Т	Eth1/14	1,22	trunk	1G	14	C220 Srv1-Broadcom NIC 4
U	Eth1/16	1,22	trunk	1G	16	C220 Srv2- Broadcom NIC 4
V	Eth1/18	1,22	trunk	1G	18	C220 Srv3- Broadcom NIC 4
Not shown	Eth1/9	1, 23,613	trunk	10G		Uplink to Infra n/w
Not shown	Eth1/10	1,23,613	trunk	10G		Uplink to Infra n/w
В	Eth1/25	21	access	1G		VNXe3150 (eth11) - SPA
D	Eth1/26	21	access	1G		VNXe3150 (eth11) - SPB

Connect all the cables as outlined in the Figure 7, Figure 8, and Figure 9.

## Prepare and Configure the Cisco Nexus 3048 Switch

This section provides a detailed procedure for configuring the Cisco Nexus 3048 switches for use in EMC VSPEX V50 solution.

See the Nexus 3048 configuration guide for detailed information about how to mount the switches on the rack. Following diagrams show connectivity details for the VMware architecture covered in this document.

As it is apparent from these figures, there are five major cabling sections in these architectures:

- 1. Inter switch links
- 2. vMotion connectivity for servers
- **3.** Infrastructure and Management connectivity for servers
- 4. Storage connectivity

Figure 10 shows two switches configured for vPC. In vPC, a pair of switches acting as vPC peer endpoints looks like a single entity to port-channel-attached devices, although the two devices that act as logical port-channel endpoint are still two separate devices. This provides hardware redundancy with port-channel benefits. Both switches form a **vPC Domain**, in which one vPC switch is Primary while the other is secondary.

Note

The configuration steps detailed in this section provides guidance for configuring the Cisco Nexus 3048 running release 5.0(3)U2(2b).



#### Figure 10 Network Configuration for EMC VSPEX V50

#### **Initial Setup of Nexus Switches**

This section details the Cisco Nexus 3048 switch configuration for use in a VSPEX V50 environment.

This section explains switch configuration needed for the Cisco solution for EMC VSPEX with VMware architectures. Details about configuring password, management connectivity and strengthening the device are not covered here; please refer to the Nexus 3000 series configuration guide for that.

On initial boot and connection to the serial or console port of the switch, the NX-OS setup should automatically start. This initial configuration addresses basic settings such as the switch name, the mgmt0 interface configuration, and SSH setup and defines the control plane policing policy.

#### Initial Configuration of Cisco Nexus 3048 Switch A and B



#### Figure 11 Initial Configuration

#### Software Upgrade (Optional)

It is always recommended to perform any required software upgrades on the switch at this point in the configuration. Download and install the latest available NX-OS software for the Cisco Nexus 3048 switch from the Cisco software download site. There are various methods to transfer both the NX-OS kick-start and system images to the switch. The simplest method is to leverage the USB port on the Switch. Download the NX-OS kick-start and system files to a USB drive and plug the USB drive into the external USB port on the Cisco Nexus 3048 switch.

Copy the files to the local bootflash and update the switch by using the following procedure.

#### Figure 12 Procedure to update the Switch

copy usb1:<<kickstart\_image\_file>> bootflash: copy usb1:<<system\_image\_file>> bootflash: install all kickstart bootflash:<<kickstart\_image\_file>> system bootflash:<<system\_image\_file>>

#### **Enable Features**

Enable certain advanced features within NX-OS. This is required for configuring some additional options. Enter configuration mode using the (config t) command, and type the following commands to enable the appropriate features on each switch.

#### Enabling Features in Cisco Nexus 3048 Switch A and B

Figure 13 Command to Enable Features

feature interface-vlan feature lacp feature vpc

#### **Global Port-Channel Configuration**

The default port-channel load-balancing hash uses the source and destination IP to determine the load-balancing algorithm across the interfaces in the port channel. Better distribution across the members of the port channels can be achieved by providing more inputs to the hash algorithm beyond the source and destination IP. For this reason, adding the source and destination TCP port to the hash algorithm is highly recommended.

From configuration mode (config t), type the following commands to configure the global port-channel load-balancing configuration on each switch.

#### Configuring Global Port-Channel Load-Balancing on Cisco Nexus Switch A and B

Figure 14 Commands to Configure Global Port-Channel and Load-Balancing

port-channel load-balance ethernet source-dest-port

#### **Global Spanning-Tree Configuration**

The Cisco Nexus platform leverages a new protection feature called bridge assurance. Bridge assurance helps to protect against a unidirectional link or other software failure and a device that continues to forward data traffic when it is no longer running the spanning-tree algorithm. Ports can be placed in one of a few states depending on the platform, including **network** and **edge**.

The recommended setting for bridge assurance is to consider all ports as network ports by default. From configuration mode (config t), type the following commands to configure the default spanning-tree options, including the default port type and BPDU guard on each switch.

#### Configuring Global Spanning-Tree on Cisco Nexus Switch A and B

#### Figure 15 Configuring Spanning-Tree

spanning-tree port type network default spanning-tree port type edge bpduguard default

#### **Enable Jumbo Frames**

Cisco solution for EMC VSPEX with VMware architectures require MTU set at 9000 (jumbo frames) for efficient storage and live migration traffic. MTU configuration on Nexus 5000 series switches fall under global QoS configuration. You may need to configure additional QoS parameters as needed by the applications.

From configuration mode (config t), type the following commands to enable jumbo frames on each switch.

#### Enabling Jumbo Frames on Cisco Nexus 3048 Switch A and B

#### Figure 16 Enabling Jumbo Frames

policy-map type network-qos jumbo class type network-qos class-default mtu 9000 system qos service-policy type network-qos jumbo

#### **Configure VLANs**

For VSPEX M50 configuration, create the layer 2 VLANs on both the Cisco Nexus 3048 Switches using the Table 7 as reference. Create your own VLAN definition table with the help of "Customer Configuration Data Sheet" section on page 121.

From configuration mode (config t), type the following commands to define and describe the L2 VLANs.

#### Table 7 Reference VLAN Definitions for EMC VSPEX with VMWare V50 Setup

VLAN Name	VLAN Purpose	ID used in this document	Network Address	Host NICs in VLAN
iSCSI-A	For iSCSI-A traffic	20	10.10.20.0/24	1 Broadcom NIC
iSCSI-B	For iSCSI-B traffic	21	10.10.21.10/24	1 Broadcom NIC
vMotion	For Live Migration	22	10.10.22.0/24	2 Broadcom NICs in a team and on trunk link
VMComm	For VM data	23	10.10.23.0/24	2 Cisco 1GigE I350
Mgmt	For Mgmt	613	10.29.150.0/24	LOM in team and on trunk link

#### Defining L2 VLANs on Cisco Nexus 3048 Switch A and B

an 1	
an <iscsi-a vlan_id=""></iscsi-a>	
ame iscsi-a	
an <iscsi-b vlan_id=""></iscsi-b>	
ame iscsi-b	
an <vmotion vlan_id=""></vmotion>	
ame vmotion	
an <vmcomm vlan_id=""></vmcomm>	
ame vmcomm	
an <mgmt vlan_id=""></mgmt>	
ame mgmt	

#### Figure 17

Commands to Define L2 VLANs

#### Virtual Port-Channel (vPC) Global Configuration

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.

The vPC feature requires an initial setup between the two Cisco Nexus switches to function properly. From configuration mode (config t), type the following commands to configure the vPC global configuration for Switch A.

#### **Configuring vPC Global on Cisco Nexus Switch A**

Figure 18 Commands to Configure vPC Global Configuration on Switch A

```
vpc domain 101
role priority 10
peer-keepalive destination <mgmt0_ip_address of switchB>
int eth1/51-52
channel-group 10 mode active
int Po10
description vPC peer-link
switchport mode trunk
switchport mode trunk
switchport trunk allowed vlan 1, <iscsia vlan_id>, <iscsib vlan_id>, <vmotion
vlan_id>, <vmcomm vlan_id>, <mgmt vlan_id>
spanning-tree port type network
vpc peer-link
no shut
```

From configuration mode (config t), type the following commands to configure the vPC global configuration for Switch B.

#### Configuring vPC Global on Cisco Nexus Switch B

#### Figure 19

Commands to Configure vPC Global Configuration on Switch B

```
vpc domain 101
role priority 10
peer-keepalive destination <mgmt0_ip_address of switchA>
int eth1/51-52
channel-group 10 mode active|
int Po10
description vPC peer-link
switchport mode trunk
switchport trunk allowed vlan 1, <iscsia vlan_id>, <iscsib vlan_id>, <vmotion
vlan_id>, <vmcomm vlan_id>, <mgmt vlan_id>
spanning-tree port type network
vpc peer-link
no shut
```

#### **Configuring Storage Connections**

Switch interfaces connected to the VNXe storage ports are configured as access ports. Each controller will have two links to each switch.

From the configuration mode (config t), type the following commands on each switch to configure the individual interfaces.

#### **Cisco Nexus 3048 Switch A with VNXe SPA configuration**

#### Figure 20 Commands to Configure VNXe Interface on Switch A

interface Ethernet1/25 description VNXe3150 SPA:eth10 switchport access vlan 20 spanning-tree port type edge no shut	
interface Ethernet1/26 description VNXe3150 SPB:eth10 switchport access vlan 20 spanning-tree port type edge no shut	

#### **Cisco Nexus 3048 Switch B with VNXe SPA configuration**

```
Figure 21
```

Commands to Configure VNXe Interface on Switch B

interface Ethernet1/25 description VNXe3150 SPA:eth11 switchport access vlan 21 spanning-tree port type edge no shut interface Ethernet1/26 description VNXe3150 SPB:eth11 switchport access vlan 21 spanning-tree port type edge

no shut

## **Configuring Server Connections**

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Each server has six network adapters (two Intel and four Broadcom ports) connected to both switches for redundancy as shown in Figure 10. This section provides the steps to configure the interfaces on both the switches that are connected to the servers.

#### **Cisco Nexus Switch A with Server 1 configuration**

Figure 22 Commands to Configure Interface on Switch A for Server 1 Connectivity

interface Ethernet1/3 description Server1 vmnic0 Intel MLoM1 switchport mode trunk channel-group 3 mode on
interface port-channel3 switchport mode trunk switchport trunk allowed vlan 1, <vmcomm vlan_id="">, <mgmt vlan_id=""> spanning-tree port type edge vpc 3 no shut</mgmt></vmcomm>
interface Ethernet1/13 description Server1 vmnic4 Broadcom 01 switchport access vlan 20 spanning-tree port type edge no shut
interface Ethernet1/14 description Server1 vmnic6 Broadcom 03 switchport mode trunk channel-group 14 mode on
interface port-channel14 switchport mode trunk switchport trunk allowed vlan 1, <vmotion vlan_id=""> spanning-tree port type edge vpc 14 no shut</vmotion>

#### Cisco Nexus Switch B with Server 1 configuration

#### Figure 23

3 Commands to Configure Interface on Switch B and Server 1 Connectivity

1

interface Ethernet1/3 description Server1 vmnic1 Intel MLoM2 switchport mode trunk channel-group 3 mode on
interface port-channel3 switchport mode trunk switchport trunk allowed vlan 1, <vmcomm vlan_id="">, <mgmt vlan_id=""> spanning-tree port type edge vpc 3  no shut</mgmt></vmcomm>
interface Ethernet1/13 description Server1 vmnic5 Broadcom 02 switchport access vlan 21 spanning-tree port type edge no shut
interface Ethernet1/14 description Server1 vmnic7 Broadcom 04 switchport mode trunk channel-group 14 mode on
interface port-channel14 switchport mode trunk switchport trunk allowed vlan 1, <vmotion vlan_id=""> spanning-tree port type edge vpc 14 no shut</vmotion>

#### Cisco Nexus Switch A with Server 2 configuration

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Figure 24	Commands to Configure Interface on Switch A and Server 2 Connectivity
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interface Ethernet1/4 description Server2 vmnic0 Intel MLoM1 channel-group 4 mode on
interface port-channel4 switchport mode trunk switchport trunk allowed vlan 1, <vmcomm vlan_id="">, <mgmt vlan_id=""> spanning-tree port type edge vpc 4 no shut</mgmt></vmcomm>
interface Ethernet1/15 description Server2 vmnic4 Broadcom 01 switchport access vlan 20 spanning-tree port type edge no shut
interface Ethernet1/16 description Server2 vmnic6 Broadcom 03 channel-group 16 mode on
interface port-channel16 switchport mode trunk switchport trunk allowed vlan 1, <vmotion vlan_id=""> spanning-tree port type edge vpc 16 no shut</vmotion>

#### Cisco Nexus Switch B with Server 2 configuration

#### Figure 25

25 Commands to Configure Interface on Switch B and Server 2 Connectivity

1

interface Ethernet1/4 description Server2 vmnic1 Intel MLoM2 channel-group 4 mode on	
interface port-channel4 switchport mode trunk switchport trunk allowed vlan 1, <vmcomm vlan_id="">, <mgmt vlan_id=""> spanning-tree port type edge vpc 4 no shut</mgmt></vmcomm>	
interface Ethernet1/15 description Server2 vmnic5 Broadcom 02 switchport access vlan 21 spanning-tree port type edge no shut	
interface Ethernet1/16 description Server2 vmnic7 Broadcom 04 channel-group 16 mode on	
interface port-channel16 switchport mode trunk switchport trunk allowed vlan 1, <vmotion vlan_id=""> spanning-tree port type edge vpc 16 no shut</vmotion>	
### Cisco Nexus Switch A with Server 3 configuration

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rigure 20 Commands to Configure Interface on Switch A and Server 3 Connectivity
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interface Ethernet1/5 description Server3 vmnic0 Intel MLoM1 channel-group 5 mode on
interface port-channel5 switchport mode trunk switchport trunk allowed vlan 1, <vmcomm vlan_id="">, <mgmt vlan_id=""> spanning-tree port type edge vpc 5 no shut</mgmt></vmcomm>
interface Ethernet1/17 description Server3 vmnic4 Broadcom 01 switchport access vlan 20 spanning-tree port type edge no shut
interface Ethernet1/18 description Server3 vmnic2 Broadcom 03 channel-group 18 mode on
interface port-channel18 switchport mode trunk switchport trunk allowed vlan 1, <vmotion vlan_id=""> spanning-tree port type edge vpc 18 no shut</vmotion>

### **Cisco Nexus Switch B with Server 3 configuration**

#### Figure 27

7 Commands to Configure Interface on Switch B and Server 3 Connectivity

interface Ethernet1/5 description Server3 vmnic1 Intel MLoM2 channel-group 5 mode on
interface port-channel5 switchport mode trunk switchport trunk allowed vlan 1, <vmcomm vlan_id="">, <mgmt vlan_id=""> spanning-tree port type edge vpc 5 no shut</mgmt></vmcomm>
interface Ethernet1/17 description Server3 vmnic5 Broadcom 02 switchport access vlan 21 spanning-tree port type edge no shut
interface Ethernet1/18 description Server3 vmnic3 Broadcom 04 channel-group 18 mode on
interface port-channel18 switchport mode trunk switchport trunk allowed vlan 1, <vmotion vlan_id=""> spanning-tree port type edge vpc 18 no shut</vmotion>

### Configure ports connected to infrastructure network

Port connected to infrastructure network need to be in trunk mode, and they require at least infrastructure and management 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 the following figures.

SwitchA#sh vlan brief		
VLAN Name	Status	Ports
1 default	active	Po3, Po4, Po5, Po10, Po14, Po16 Po18, Eth1/1, Eth1/2, Eth1/6 Eth1/7, Eth1/8, Eth1/9, Eth1/10 Eth1/11, Eth1/12, Eth1/19 Eth1/20, Eth1/21, Eth1/22 Eth1/23, Eth1/24, Eth1/27 Eth1/28, Eth1/29, Eth1/30 Eth1/31, Eth1/32, Eth1/33 Eth1/34, Eth1/35, Eth1/36 Eth1/37, Eth1/38, Eth1/39 Eth1/40, Eth1/41, Eth1/42 Eth1/43, Eth1/44, Eth1/45 Eth1/46, Eth1/47, Eth1/48
20 iscsi-a	active	Po3, Po4, Po5, Po10, Po14, Po16 Po18, Eth1/9, Eth1/13, Eth1/15 Fth1/17, Fth1/25, Fth1/26
21 iscsi-b	active	Po3, Po4, Po5, Po10, Po14, Po16 Po18 Eth1/9
22 vmotion		active P03, P04, P05, P010, P014, P016 P018 Fth1/9
23 vmcomm		active Po3, Po4, Po5, Po10, Po14, Po16 Po18 Fth1/9
613 mgmt	active	Po3, Po4, Po5, Po10, Po14, Po16 Po18,Eth1/9

Figure 28 Show vlan brief

Figure 29

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Show Port-Channel Summary Output

Swi Flag	tchA# sh po gs: D - Dow I - Indivio s - Susper S - Switch U - Up (p	ort-chani /n F lual H - nded r ned R ort-chan	nel summary - Up in por Hot-standby - Module-res - Routed nel)	, t-channel (memb γ (LACP only) moved	iers)
Gro	up Port- Channel	Туре	Protocol	Member Ports	
3 4 5 10 14 16 18	Po3(SU) Po4(SU) Po5(SU) Po10(SU) Po14(SU) Po16(SU) Po18(SU)	Eth Eth Eth Eth Eth Eth Eth	NONE NONE LACP NONE NONE NONE	Eth1/3(P) Eth1/4(P) Eth1/5(P) Eth1/51(P) Eth1/14(P) Eth1/16(P) Eth1/18(P)	Eth1/52(P)

In this example, port-channel 10 is the vPC peer-link port-channel, port-channels 3, 4 and 5 are connected to the Cisco 1GigE I350 LOM on the host and port-channels 14, 16 and 18 are connected to the Broadcom NICs on the host. Make sure that state of the member ports of each port-channel is "P" (Up in port-channel). Note that port may not come up if the peer ports are not properly configured. Common reasons for port-channel port being down are:

• Port-channel protocol mis-match across the peers (LACP v/s none)

Figure 30

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 brief** command. Example output is shown in Figure 30:

Swi Leg	tchA# sh end:	ı vpc bri	ef		
_	(	*) - loca	l vPC is down	, forwarding	j via vPC peer-link
VPC Pee VPC Cor Per Typ VPC Nur	C domain r status C keep-al figuratic Vlan cor ve-2 cons C role mber of v	id ive stati on consi nsistency sistency /PCs con	us : stency status: y status : status : nfigured :	101 peer adjac peer is aliv success success success primary 6	ency formed ok /e
Pee	r Gatewa	ly avcluda		Disabled	
Gra	ceful Co	nsistenc	y Check	Enabled	
vPC	Peer-lin	ık status			
id	Port St	atus Act	ive vlans		
1	Po10 ι	ıp 1,2	0-23,613		
vPC	status				
id	Port	Status	Consistency	Reason	Active vlans
3 4	Po3 Po4	up up	success success	success success	1,23,613 1,23,613
5 14	Po5	up	SUCCESS	SUCCESS	1,23,613
16	Po16	up	success	success	1,22
18	Po18	up	success	success	1,22

Show vpc Brief Output

Make sure that vPC peer status is peer adjacency formed ok and all the port-channels, including the peer-link port-channel, have status up.

## Prepare the Cisco UCS C220 M3 Servers

This section provides the detailed procedure for configuring a Cisco Unified Computing System C-Series standalone server for use in VSPEX M50 configurations. Perform all the steps mentioned in this section on all the hosts.

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For information on physically mounting the servers, see:

http://www.cisco.com/en/US/docs/unified\_computing/ucs/c/hw/C220/install/install.html

### **Configure Cisco Integrated Management Controller (CIMC)**

These steps describe the setup of the initial Cisco UCS C-Series standalone server. Follow these steps on all servers:

- 1. Attach a supplied power cord to each power supply in your server, and then attach the power cord to a grounded AC power outlet.
- **2.** Connect a USB keyboard and VGA monitor by using the supplied KVM cable connected to the KVM connector on the front panel.
- 3. Press the **Power** button to boot the server. Watch for the prompt to press F8.
- 4. During bootup, press F8 when prompted to open the BIOS CIMC Configuration Utility.
- 5. Set the NIC mode to Dedicated and NIC redundancy to None.
- 6. Choose whether to enable DHCP for dynamic network settings, or to enter static network settings.
- 7. Press F10 to save your settings and reboot the server.

```
Figure 31
```

#### CIMC Configuration Utility

CIMC Configurati	on Utility Vers	ion 1.5 Cisco Systems, Inc. #Ρασασσαστασταστασταστασταστασταστασταστασ
NIC Properties		
NIC mode		NIC redundancy
Dedicated:	[ <u>X]</u>	None: [X]
Shared LOM:	[]	Active-standby:[]
Shared LOM 10G:	[]	Active-active: []
Cisco Card:	[]	
IPV4 (Basic)		Factory Defaults
DHCP enabled:	[]	CIMC Factory Default:[]
CIMC IP:	10.29.150.101	Default User (Basic)
Subnetmask:	255.255.255.0	Default password:
Gateway:	10.29.150.1	Reenter password:
VLAN (Advanced)		
VLAN enabled:	[ ]	
VLAN ID:	1	
Priority:	0	
Notototototototototototototo	alatataiaiatatatatatatata	yo totototototototototototototototototot
<up arrow="" down=""></up>	Select items	<f10> Save <space bar=""> Enable/Disable</space></f10>
<f5> Refresh</f5>		<esc> Exit</esc>

Once the CIMC IP is configured, the server can be managed using the https based Web GUI or CLI.

<u>Note</u>

The default username for the server is "admin" and the default password is "password". Cisco strongly recommends changing the default password.

### **Enabling Virtualization Technology in BIOS**

Vmware requires an x64-based processor, hardware-assisted virtualization (Intel VT enabled), and hardware data execution protection (Execute Disable enabled). Follow these steps on all the servers to enable Intel ® VT and Execute Disable in BIOS:

- 1. Press the **Power** button to boot the server. Watch for the prompt to press F2.
- 2. During bootup, press F2 when prompted to open the BIOS Setup Utility.
- 3. Choose the Advanced tab > Processor Configuration.
- 4. Enable Execute Disable and Intel VT as shown in Figure 32.

Figure 32 Cisco UCS C220 M3 KVM Console

Aptio Setup Utility - Advanced	Copyright (C) 2011 American	Megatrends, Inc.
Processor Configuration ▶ Socket 1 Processor Information ▶ Socket 2 Processor Information		Socket specific Processor Information
Intel(R) HyperThreading Technology Number of Enabled Cores Execute Disable Intel(R) VT Intel(R) VT-d Coherency Support ATS Support	[Enabled] [A11] [Enabled] [Enabled] [Enabled] [Disabled]	
Processor Performance Configuration CPU Performance Workload Configuation Direct Cache Access Support	[Enterprise] [Balanced] [Enabled]	↔ Select Screen ↑↓ Select Item Enter Select Field +/- Change Value F1 General Help F9 BIOS Defaults
Processor Power Management Configura	tion	ESC Exit
Version 2 14 1219 Co	nunight (C) 2011 American M	edatrends Inc

## **Configuring RAID**

The RAID controller type is Cisco UCSC RAID SAS 2008 and supports 0, 1, 5 RAID levels. We need to configure RAID level 1 for this setup and set the virtual drive as boot drive.

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To configure RAID controller, follow these steps on all the servers:

- 1. Using a web browser, connect to the CIMC using the IP address configured in the CIMC Configuration section.
- 2. Launch the KVM from the CIMC GUI.

cisco Cisco Integ	rated Manageme	ent Controller	CIMC Hostname: ucs-c220-m3 Logged in as: admin@10.6 Log Out
Overall Server Status	C   J J 🗮   0	0	
Good	Server Summary		
Server Admin	Actions	Server Properties	<u> </u>
Summary	Power On Server	Product Name:	UCS C220 M3S
Inventory	Power Off Server	Serial Number:	FCH1617V0PC
Sensors	+ Chut Down Conver	PID:	UCSC-C220-M3S
System Event Log	Shut Down Server	UUID:	08769099-2A2D-4FA5-B369-479909DF3D66
Remote Presence	Power Cycle Server	BIOS Version:	C220M3.1.4.7b.0 (Build Date: 10/05/2012)
BIOS	Hard Reset Server	Description:	
Power Policies	Launch KVM Console	Server Status	
Fault Summary	O Turn On Locator LED	Power State:	0 On
		Overall Server Status:	Good
		Temperature:	Good
		Power Supplies:	Good
		Fans:	Good
		Locator LED:	⊖ off
		Cisco Integrated Manage	ement Controller (CIMC) Information
		Hostname:	ucs-c220-m3
		IP Address:	10.29.150.101 -
		MAC Address:	50:57:A8:E1:BD:1E
	ৰ	Firmware Version:	14(7a)
			Save Changes Reset Values

Figure 33 Cisco UCS C220 M3 CIMC GUI

**3.** During bootup, press **<Ctrl> <H>** when prompted to configure RAID in the WebBIOS.

### Figure 34 Cisco UCS C220 M3 KVM Console - Server Booting

File View	Macros T	ools Help			
KVM Virt	ual Media	]			
PCI SLOT	ID LUN	VENDOR	PRODUCT	REVISION	CAPACITY
3	12 0 13 0	SEAGATE	 ST973452SS ST973452SS	0005	70007MB 20007MB
3	Õ	LSI	Virtual Drive	RAID1	68664MB
0 JBOD(s) 0 JBOD(s)	) found ) handle	on the ho ed by BIOS	st adapter		
1 Virtual	Drive	(s) found	on the host adapter.		
1 Virtua) Press <mark>(</mark> Ct	Drive rl> <h></h>	(s) handle for WebBl	d by BIOS OS or press <ctrl><y)< td=""><td>&gt; for Preboot CLI</td><td></td></y)<></ctrl>	> for Preboot CLI	

4. Select the adapter and click **Start**.

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Figure 35	Adapter	Selection	for RAID	Configuration

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🔲 10.29.150.151 - KV	M Console			
File View Macros	Tools Help	)		
KVM Virtual Med	lia			
Adapter Selecti	on			
Adapter No.	Bus No.	Device No.	Туре	Firmware Version
Adapter No.	Bus No.	Device No.	Type Cisco UCSC RAID SAS 2008M-8i	Firmware Version 2.120.234–1471
Adapter No.	Bus No.	Device No.	Type       Cisco UCSC RAID SAS       2008M-8i       Start	Firmware Version 2.120.234-1471

5. Click New Configuration and click Next.

### Figure 36 MegaRAID BIOS Config Utility Configuration Wizard

MegaRAID BIOS Config Utilit	y Configuration Wizard
Configuration Wizard guid system easily and efficien	es you through the steps for configuring the MegaRAID tly. The steps are as follows:
1. Drive Group definitions	Group drives into Drive Groups.
2. Virtual Drive definitions	Define virtual drives using those drive groups.
3. Configuration Preview	Preview configuration before it is saved-
Please choose appropriate o	onfiguration type:
C Clear Configuration	Allows you to clear existing configuration only.
New Configuration	Clears the existing configuration. If you have any existing data in the earlier defined drives, the data will be lost-
	Cancel at Nevr
	V Junear Mere

6. Select Yes and click Next to clear the configuration.

Figure 37	MegaRAID BIOS Config Utility Confirmation Page	
MegaRAID BIOS Config Utility C	onfirm Page	LSI
You have chosen to clear All data on all virtual dr	the configuration. This will destroy all virtual drives- rives will be lost-	
Are you sure you want to	clear the configuration?	
	No	

7. If you click Automatic Configuration radio button and Redundancy when possible for Redundancy and only two drives are available, WebBIOS creates a RAID 1 configuration.

Figure 38	MegaRAID BIOS Config Utility Configuration Wizard - Select Configuration Method
-----------	---

Mega	RAID BIOS Config Utility	Configuration Wizard	151
			C 21 2 3
Sele	ect Configuration Method	:	
0	Manual Configuration		
	Manually create drive	groups and virtual drives and set their parameters as desir	ed.
ē	Automatic Configuratio	n	
Carrow	Automatically create t	he most efficient configuration.	
	<u>R</u> edundancy:	Redundancy when possible	
		🗙 Cancel 🛛 🛻 Back 🚺 🗰	Mext

8. Click Accept when you are prompted to save the configuration.

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MegaRAID BIOS Config Utility Con	nfig Wizard – P	review
Configuration Preview:	This is the co this configu	onfiguration defined. Click ACCEPT to save ration.
Drives		<u>V</u> irtual Drives
Les Backplane	GB, Online GB, Online	Virtual DriveO: RAID1: 67-054 GB:
	<u> </u>	X Cancel 🗰 Back 🖡 Accept

Figure 39 MegaRAID BIOS Config Utility Config Wizard - Preview

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9. Click Yes when prompted to initialize the new virtual drives.

### Figure 40 MegaRAID BIOS Config Utility Confirmation Page

MegaRAID BIOS Config Utility Confirm Page	LSI
All data on the new Virtual Drives will be lost. Want to Initialize?	

10. Click the Set Boot Drive radio button for the virtual drive created above and click GO.

MegaRAID BIOS Config Utility Virtual Drives	LSD2
	Virtual Drives:
	C East Initialize C Slow Initialize
	Check Consistency C Properties Set Boot Drive (current= NONE)
1 Home	

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### Figure 41 MegaRAID BIOS Config Utility Virtual Drives

**11**. Click **Exit** and reboot the system.



### Figure 42 MegaRAID BIOS Config Utility Virtual Configuration

## Install ESXi 5.1 on Cisco UCS C220 M3 Servers

This section provides detailed procedures for installing ESXi 5.1 in a V50 VSPEX configuration. Multiple methods exist for installing ESXi in such an environment. This procedure highlights using the virtual KVM console and virtual media features within the Cisco UCS C-Series CIMC interface to map remote installation media to each individual server.

### **Connect and log into the Cisco UCS C-Series Standalone Server CIMC Interface**

- **1.** Open a web browser and enter the IP address for the Cisco UCS C-series CIMC interface. This will launch the CIMC GUI application
- 2. Log in to CIMC GUI with admin user name and credentials.

Cisco Integrate	ed Management Controller Logi https://1 ▼ 😵 C 🔶 S	n - Windows Internet Explorer provided 🗖 🗖 🗾 🔀	•	
Eile       Edit       View       Favorites       Tools       Help         Pavorites       Cisco Integrated Management Controller Login				
•:    . cisco	Cisco Integrated Management Controller ucs-c220-m3 Version: 1.4(4a) Cisco Systems, Inc. All rights re	Username: Password: Log In Cancel		

### Figure 43 CIMC Manager Login Page

- **3**. In the home page, choose the **Server** tab.
- 4. Click launch KVM Console.
- 5. Enable the Virtual Media feature, which enables the server to mount virtual drives:
  - a. In the CIMC Manager Server tab, click **Remote Presence**.
  - **b.** In the Remote Presence window, click the **Virtual Media** tab and check the check box to enable Virtual Media.
  - c. Click Save Changes.

### Figure 44 CIMC Manager Remote Presence - Virtual Media

CIMC Provide Cisco Integrated Management Controller					
Overall Server Status Good Server Admin Summary Inventory Sensors System Event Log Remote Presence BIOS Power Policies Fault Summary	C C Market Marke				

6. On the Remote Presence window, click the Virtual KVM tab and then click Launch KVM Console.

cisco Cisco Integ	rated Management Controller CIMC Hostname: ucs-c22 Logged in as: admine Log Out
Overall Server Status Good Server Admin Summary Inventory Sensors System Event Log Remote Presence BIOS Power Policies Fault Summary	C C C C C C C C C C C C C C C C C C C
	Save Changes Reset Values

#### Figure 45 CIMC Manager Remote Presence - Virtual KVM

- 7. When the Virtual KVM Console window launches, click the Virtual Media tab.
- 8. In the Virtual Media Session window, provide the path to the Windows installation image by clicking Add Image and then use the dialog to navigate to your VMware ESXi ISO file and select it. The ISO image is displayed in the Client View pane.

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10.65.122.90 - K	¥M Consol	e					_ 🗆
e Help							
/M Virtual M	edia						
Client View							
Mapped F	Read Only	Drive					Exit
		🚽 A: - Floppy					
	>	😂 D: - CD/DVD				1	Create Image
		😫 E:NSO/ESXI5.1	VMware-VMvi	sor-Installer-5.	1.0-799733.x86	_64.iso - ISO	Add Image
							Remove Image
							Details ±
						L	
•						•	
Details							
Target Drive	Mapp	ed To	Read Bytes	Write Bytes	Duration		
Virtual CD/DVD	🙆 E:V	ISO\ESXi5.1\VMwa.	0	0	00:00:30	<b>^</b>	USB Reset

#### Figure 46 CIMC Manager Virtual Media - Add Image

- **9.** When mapping is complete, power cycle the server so that the BIOS recognizes the media that you just added.
- **10.** In the Virtual KVM Console window, watch during bootup for the F2 prompt, and then press **F2** to enter BIOS setup. Wait for the setup utility screen to appear.
- **11.** On the BIOS Setup utility screen, choose the **Boot Options** tab and verify that you see the virtual DVD device that you just added in the above step 8 listed as a bootable device and move it up to the top under Boot Option Priorities as shown in Figure 47.

Aptio Setup Utility Main Advanced Security Server	– Copyright (C) 2011 America Management Boot Options Sa	n Megatrends, Inc. ve & Exit
Boot Configuration Setup Prompt Timeout Bootup NumLock State	1 [Off]	Number of seconds BIOS will pause at the end of POST to allow user to press F2 key for
UCSM boot order rules	[Loose]	entering BIOS Setup Utility. 65535(0xFFFF) means indefinite waiting.
Boot Option Priorities Boot Option #1 Boot Option #2 Boot Option #3 Boot Option #4 Boot Option #5	[Cisco Virtual CD/D] [(BUS 82 DEV 00)PCI] [Cisco Virtual Flop] [IBA GE Slot 0300 v] [UEFI: Built-in EFI]	
Hard Drive BBS Priorities Floppy Drive BBS Priorities Network Device BBS Priorities CD/DVD ROM Drive BBS Priorities		<pre>++ Select Screen 14 Select Item Enter Select Field +/- Change Value F1 General Help F9 BIOS Defaults F10 Save &amp; Exit ESC Exit</pre>
Version 2.14.1219.	Copyright (C) 2011 American	Megatrends, Inc.

Figure 47

Cisco UCS C220 M3 BIOS Setup Utility

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12. Exit the BIOS Setup utility and restart the server.

## Installing VMware ESXi

The section explains the steps to complete the installation of ESXi 5.1 on Cisco C220 M3 server and basic configuration of management network for remote access. Follow these steps on all the three Cisco C220 M3 servers:

1. Boot the host from the Virtual CD drive and then select the standard installer option



2. Once the loading of ESXi is complete, press Enter to continue.





- 3. In the End User License Agreement (EULA) page, press F11 to accept and continue.
- 4. In the Select a Disk to Install or Upgrade window, choose the Local RAID drive that was created in the previous section and press **Enter**.
- 5. Select the language and press Enter.
- 6. Enter a Password for the ESXi management and press Enter.

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	Figure 50	ESXi ins	tallation – Set Passwo	rd
Please e	nter a root	password	(recommended)	
Root pass firm pass	word: ***** word: *****	*** ***_		

Passwords match.

sc)	Cancel	(F9)	Back	(Enter)	Cont inue

7. Press F11 to confirm the installation and wait for the installation to complete.

Figure 51 ESXi installation – Confirm Install



- 8. After the installation is complete, press Enter to reboot.
- Figure 52 ESXi installation Complete Reboot



9. Once the server boots up, press F2 to customize your system.

- **10.** When prompted for a username/password, enter root as the username and the password that was set during the installation.
- 11. In the system Customization window, select Configure Management Network and press Enter.

### Figure 53 ESXi System Customization

System Customization
Configure Password Configure Lockdown Mode
Configure Management Network
Кезтагт пападемент петногк
Test Management Network
Network Restore Options
Configure Keyboard Troubleshooting Options
View System Logs
View Support Information
Reset System Configuration

- 12. In the Configure Management Network, select Network Adapters and press Enter to change.
- 13. Select the vmic that is configured on the switch end for management traffic and press Enter.

Figure 54	ESXi Configure Management Network – Network Adapters

Network Adapters VLAN (optional)		งกก งกก	ic0 (e0:2f:6d:bb:9e:62) ic1 (e0:2f:6d:bb:9e:63)
IP Configuration IPv6 Configuration DNS Configuration Custon DNS Suffixes		The con are tra	adapters listed here provide the nection to and fron this host. Wh used, connections will be fault- ffic will be load-balanced.
	Network Adapters		
	Select the adapt connection. Use load-balancing.	ers for this host's defau two or nore adapters for	lt management network Fault-tolerance and
	Device Name	Handware Label (MAC Addr	ess) Status
	[X] vnnic0	N/A (e0:2f:6d:bb:9e:62)	Connected ()
	L J VIINTCI	M/A (00:21:00:00:90:03)	Connected ()
	[]vnnic4	N/A (00:10:18:eb:b7:00)	Connected ()
	[] vnnic5	N/A (00:10:18:eb:b7:02)	Connected ()
	[] vnnic6	N/A (00:10:18:eb:b7:04)	Connected ()
	[] vnnic7	N/A (00:10:18:eb:b7:06)	Connected ()
	⟨D> View Details	<pre>Space&gt; Toggle Selected</pre>	<pre></pre>

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- 14. Go to IP Configuration under Configure Management Network and press Enter.
- **15.** Select Set static IP address and network configuration and enter in your IP Address, Subnet Mask and Default Gateway and press **Enter**.

Configure Management N	letwork	IP Configuration
Network Adapters		Manual
VLAN (optional) IP Configuration IPv6 Configuration DNS Configuration Custon DNS Suffixes		IP Address: 10.104.252.90 Subnet Mask: 255.255.255.0 Default Gateway: 10.104.252.1
		This host can obtain an IP address ar parameters automatically if your meti server. If not, ask your metwork admi appropriate settings.
	IP Configuration	
	This host can obtain network settings includes a DHCP server. If it does no specified:	autonatically if your network t, the following settings must be
	( ) Use dynamic IP address and network (o) Set static IP address and network	k configuration configuration:
	IP Address Subnet Mask	[ 10.104.252.90 ] [ 255.255.255.0 ]
	Default Gateway <up down=""> Select <space> Mark Selecter</space></up>	[ 10.104.252.1 ] d <enter> OK <esc> Cancel</esc></enter>

#### Figure 55 ESXi Configure Management Network – IP Configuration

- **16.** This step is optional. If the management vmic is not in the default/native vlan then select VLAN (Optional) in the Configure Management Network and press **Enter** to change the settings.
- 17. Enter a VLAN ID for the management network.



Figure 56 ESXi Configure Management Network – VLAN

**18.** Press **ESC** to exit the Configure Management Network window and when prompted press **Y** to apply these changes and restart the management network.

Once the above steps are completed you can further configure and manage the ESXi remotely using the vSphere Client, the vSphere Web client and vCenter Server. To manage the host with the vSphere Client, the vSphere Web Client, and vCenter Server, the applications must be installed on a computer that serves

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as a management station with network access to the ESXi host. To download and install vSphere client, open a web browser and enter the IP address of the ESXi management network that you configured in the above step 15. Use the below URL for detailed information on installing the vSphere client:

http://pubs.vmware.com/vsphere-51/index.jsp?topic=/com.vmware.vsphere.install.doc\_50/GUID-A71 D7F56-6F47-43AB-9C4E-BAA89310F295.html#com.vmware.vsphere.install.doc/GUID-B15F4221-A BDB-4CA7-A6C4-6C96E72F04A5.html

### VMware vCenter Server Deployment

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

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

For more information on installing a vCenter Server, see:

http://pubs.vmware.com/vsphere-51/index.jsp?topic=/com.vmware.vsphere.install.doc\_50/GUID-A71 D7F56-6F47-43AB-9C4E-BAA89310F295.html#com.vmware.vsphere.install.doc/GUID-BC044F6C-4 733-4413-87E6-A00D3BDEDE58.html

http://kb.vmware.com/selfservice/microsites/search.do?language=en\_US&cmd=displayKC&externalId =2032885

Following steps provides high level configuration steps to configure vCenter server:

1. 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. Appendix A Customer Configuration Data provides SQL login information.

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.

5. 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 server.

### Adding ESXi hosts to vCenter or Configuring Hosts and vCenter Server

This section describes on how to populate and organize your inventory by creating a virtual datacenter object in vCenter server and adding the ESXi hosts to it. A virtual datacenter is a container for all the inventory objects required to complete a fully functional environment for operating virtual machines.

1. Open a vSphere client session to a vCenter server by providing IP address and credentials as shown in Figure 57.

Figure 57 vSphere Client

 <i>p</i>	0

<b>m</b> ware <sup>.</sup>		
'Mware vSphere <sup>™</sup>		
lient		
To directly manage a sing To manage multiple hosts,	le host, enter the IP address or hos , enter the IP address or name of a	t name.
To directly manage a sing To manage multiple hosts, vCenter Server. IP address / Name:	le host, enter the IP address or hos , enter the IP address or name of a 10.104.252.107	t name. ▼
To directly manage a sing To manage multiple hosts, vCenter Server. IP address / Name: User name:	le host, enter the IP address or hos , enter the IP address or name of a 10.104.252.107	rt name. ▼
To directly manage a sing To manage multiple hosts, vCenter Server. IP address / Name: User name: Password:	le host, enter the IP address or hos , enter the IP address or name of a [10.104.252.107	•t name.
To directly manage a sing To manage multiple hosts, vCenter Server. IP address / Name: User name: Password:	le host, enter the IP address or hos , enter the IP address or name of a 10.104.252.107	vit name.

2. Go to Home > Inventory > Hosts and Clusters.

Ø	١	/SPEX - vSpl	here Client	_	
File Edit	View Inventory Administ	ration Plug-ir	ns Help		
	😭 Home				Inve 🔍
Inventory		/			^
Q		Ð			=
Search	Hosts and Clusters	VMs and Templates	Datastores and Datastore Clusters	Networking	
Administra	tion	/			
6				₽	
Roles	Sessions	Licensing	System Logs	vCenter Server Settings	
	-				~
🚰 Tasks	💇 Alarms		Evaluation Mode: 53 day	ys remaining Ad	Iministrator //

Figure 58 VMware vCenter – Host and Clusters

**3**. Choose **File** > **New** > **Datacenter**. Rename the datacenter.

### Figure 59 VMware vCenter – Create Datacenter



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4. In vSphere client, choose Home > Inventory > Hosts and Clusters, select the datacenter you created in step 3 and click Add a host.



#### Figure 60

VMware vCenter – Add a Host

5. In the Add Host Wizard window, enter host name or IP address and the credentials. Click Next.

Ø	Add Host	Wizard		_		x
Specify Connection Settings Type in the information used to conne	ct to this host.					
Connection Settings Host Summary Virtual Machine Location Ready to Complete	Connection Enter the name or Host: 10 Authorization Enter the administr use this informatio account for its ope Username: ro Password: ++	IP address of the host .104.252.90 ative account informa n to connect to the ho rations.	to add to vCenter. iion for the host. v3 st and establish a p	5phere Clie ermanent	nt will	
Help			< Back Ne	×t >	Cano	el

- 6. A Security Alert window pops up. Click Yes to proceed.
- 7. Click Next after reviewing the host information in the Host Summary.

Ø	Add Ho	st Wizard	X
Host Information Review the product information	for the specified host.		
Connection Settings	You have chosen	to add the following host to vCenter:	
Host Summary Assign License Lockdown Mode Virtual Machine Location Ready to Complete	Name: Vendor: Model: Version: Virtual Machines	10.104.252.90 Clisco Systems Inc UCSC-C220-M35 VMware ESX 5.1.0 build-799733 :	
	<	ш	>
Help		< Back Ne	xt > Cancel

### Figure 62 Add Host Wizard – Host Summary

**8.** Enter the license key for Assign License and click **Next**. You can choose Evaluation Mode to assign the license key later also.

Figure 63	Add Host Wizard –Assign License

Assign License Assign an existing or a new lice	ense key to this host.		
Connection Settings Host Summary	<ul> <li>Assign an existing license</li> </ul>	e key to this host	
Assign License Lockdown Mode Virtual Machine Location	Product Evaluation Mode (No License Vi	w)	Available
	C Assign a new license key	to this host	

I

- **9.** In the next screen, per your security policies, you can check the check box Enable Lockdown Mode or keep it unchecked.
- 10. Click Finish in the Ready to Complete Page after reviewing the options you have selected.

Ø	Add Host Wizard	_ <b>_</b> ×
Ready to Complete Review the options you have se	ected and click Finish to add the host.	
Softward Each and Softward Sof	Review this summary and click Finish. Host: 10.104.252.90 Version: VMware ESXI 5.1.0 build-799733 Networks: VMComm VM Network Datastores: datastore1 Lockdown Mode: Disabled	3
Help	< Back	Finish Cancel

Figure 64 Add Host Wizard –Ready to Complete

**11.** Repeat the steps 5 to10 to add the other two ESXi hosts to the vCenter. Once they are added successfully you should see them in the vCenter under the datacenter created as shown in the below figure.





### **Configure ESXi Networking**

This section instructs how to configure the networking for ESXi hosts using the vCenter server. In this document we will be using four virtual standard switches (vSS). vSwitches used for management and vMotion traffic would have two vmnics, one on each fabric for load balancing and high-availability. The other two vSwitches used for iSCSI storage will have each with a single vmnic uplink and a single vmk port, bound to the iSCSI adapter. The VSPEX solution recommends an MTU set at 9000 (jumbo frames) for efficient storage and migration traffic. The below table can be used as a reference for creating and configuring virtual switch on ESXi hosts.

vSwitch Name	Traffic Type	NIC Teaming Policy	Load Balancing Algorithm	Port Groups	Uplink Adapters (NICs)
vSwitch0 (Default)	Mgmt and Virtual Machine	Active/Active	IP Hash	1 VMkernel and 1 Virtual Machine	2 Intel mLoM
vSwitch1	vMotion	Active/Active	IP Hash	1 VMkernel	2 Broadcom NICs
vSwitch2	iSCSI	-	-	1 VMkernel	1 Broadcom NIC
vSwitch3	iSCSI	-	-	1 VMkernel	1 Broadcom NIC

Table 8 ESXi vSwitch reference table for VSPEX V50 solution

### **Configuring vSwitch for Management and VM traffic**

During the installation of VMware ESXi, a virtual standard switch (vSS) will be created. By default, ESXi chooses only one physical NIC as a virtual switch uplink. This section describes the steps to add a redundant link and configure the load balancing for the default vSwitch0. Policies set at the standard switch apply to all of the port groups on the standard switch. The exceptions are the configuration options that are overwritten at the standard port group. The vSwitch for management and VM port group uses the same policy settings configured on the standard vSwitch properties.

- 1. Connect to the vCenter server using vSphere client.
- Select an ESXi host on the left pane of Hosts and Clusters window. Click Configuration > Networking > vSwitch0 Properties on the right pane of the window.



3. Click the Network Adapters tab and click Add in the vSwitch0 Properties window.

I

Network Adapter	Speed	Observed IP ranges	Adapter Details Intel Corporation I350 Gigabit	Network Connection
-			Name: Location: Driver: Status Link Status: Configured Speed, Duplex: Actual Speed, Duplex: ISCSI Port Binding: Networks: ⊡-10.65.121	vmnic0 PCI 01:00.0 igb Connected Auto negotiate 1000 Mb, Full Duplex Disabled .1-10.65.121.127 (VLAN 602 )
Add		Edit Remove	]	

Γ

Figure 67 Management vSwitch Properties

**4.** Select the appropriate vmnic and click **Next**. In this configuration, vmnic0 and vmnic1 connect to Cisco Nexus Switch A and Switch B respectively, which were configured as virtual port channels.

Figure 68

-				
2	Ado	Adapter Wiza	rd	
Adapter Selection New adapters m vSphere standa	ay be taken from a pool ol rd switch.	f unused ones, or tra	ansferred from an exis	iting
Adapter NIC Order Summary	Select one or more add attached to another v standard switch and a	apters from the follo 5phere standard swi dded to this one.	wing list. If you select tch, it will be removed	an adapter that is from that vSphere
	Name	Speed	Network	
	Unclaimed Adapter	5		
	Broadcom Corpor	ation Broadcom N	etXtreme II BCM57	709 1000Base-T
	🗖 🔛 vmnic4	1000 Full	None	
	vmnic5	1000 Full	None	
	🗖 💀 vmnic6	1000 Full	10.104.252.1-	10.104.252.127(
	vmnic7	1000 Full	None	
	Intel Corporation	1350 Gigabit Netv	vork Connection	
	🗹 🛄 vmnic1	1000 Full	None	
Help			< Back	ext > Cancel

5. Set the NIC Order in the Add Adapter Wizard as per your requirement and click Next.

Management vSwitch – Add Adapter Wizard

- 6. In the Summary page review and click Finish.
- 7. In the vSwitch0 Properties, click **Ports** tab and select **vSwitch**. Click **Edit** to make the required changes.

1

Configuration Summary	VSphere Standard Switch Propertie	5	
vSwitch 120 Ports	Number of Ports:	120	
VMComm Virtual Machine			
Management Net vMotion and IP	Advanced Properties		
	MTU:	1500	
	Default Policies		
	Security		
	Promiscuous Mode:	Reject	
-	MAC Address Changes:	Accept	
	Forged Transmits:	Accept	
	Traffic Shaping		
	Average Bandwidth:	-	
	Peak Bandwidth:	-	
	Burst Size:		
	Failover and Load Balancing		
•	Load Balancing:	IP Hash	
	Network Failure Detection:	Link status only	
	Notify Switches:	Yes	
	Failback:	Yes	
Add Edit Remove	Active Adapters:	vmnic0, vmnic1	

### Figure 69 Management vSwitch – Ports Edit

**8.** Click **NIC Teaming** tab, for Load Balancing choose Route based on IP hash from the drop-down list. Both vmnics should be listed under Active Adapters.

Figure 70	Management vSwitch – NIC Teaming
-----------	----------------------------------

eneral   Security	Traffic Chaning	VSwitch0 Properties	
Policy Exception Load Balancing Network Failov Notify Switche	ns	Route based on IP hash Link status only Yes	
Failback:		Yes	
Select active a adapters active	nd standby adapter ate in the order sp Speed	rs for this port group. In a failover situation ecified below. Networks	n, standby Move Up
Active Adap	ters 1000 Full 1000 Full	10.104.252.1-10.104.252.127(VL None	Move Down
Lipused Ada	nters		

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# <u>Note</u>

When IP-hash load balancing is used, do not use beacon probing and do not configure standby uplinks.

Since we are using Ether channel for link aggregation on the Cisco Nexus switches, the supported vSwitch NIC teaming mode is IP hash. For more details, see the VMware KB articles at:

http://kb.vmware.com/selfservice/microsites/search.do?cmd=displayKC&externalId=1004048

http://kb.vmware.com/selfservice/microsites/search.do?cmd=displayKC&externalId=1001938

**9.** Edit VM Network port group by providing a Network Label and VLAN ID. Management Network and VM Network will use the same standard vSwitch NIC Teaming Load Balancing policy configured in step 8.

Figure 71 Management vSwitch – VM Network VLAN Settings

0	Ø	VM Network Properties	×
Ports       Network Adapters         Configuration       Summary         If       vSwitch       120 Ports         Imagement Network       Witoion and IP         Imagement Network       Virtual Machine	General Security Traffic Sh Port Group Properties Network Label: VLAN ID (Optional):	VM Network Properties          aping       NIC Teaming         VM Network       [23]	
Add Edt Remove			

#### vSphere Standard Switch vSphere Distributed Switch View: Networking Refresh Add Networking... Properties... Remove... Properties. Standard Switch: vSwitch0 -Virtual Machine Port Group Physical Adapters VMComm 0 😨 vmnic1 1000 Full P 🛛 📴 vmnic0 🛛 1000 Full 1 virtual machine(s) | VLAN ID: 23 VSPEX-Win2012-DC ć1 VMkernel Port 🖵 Management Network × Management Network Properties Network Label: Management Network VLAN ID: 613 perties... S Security = Promiscuous Mode: Reject MAC Address Changes: Full Accept Forged Transmits: Accept Full P Traffic Shaping Average Bandwidth: ---Peak Bandwidth: -perties... s Burst Size: Failover and Load Balancing Full IP Hash Load Balancing: P ull Network Failure Detection: Link status only Notify Switches: Yes Fallback: Yes Active Adapters: vmnic0, vmnic1 Standby Adapters: None Unused Adapters: None NIC Settings Clear MAC Address: 44:03:a7:49:ed:d8 MTU: 1500 Server Reque:

### Figure 72 Management VMkernel Port-Group

**10.** Repeat all the steps in this section on the other two ESXi hosts.

### Create and Configure vSwitch for vMotion

In this section we will create a new vSwitch for vMotion, add two uplink active adapters and set the load balancing policy to route based on IP hash. The MTU on this vSwitch will be set to 9000 (jumbo frames)

- 1. Connect to the vCenter server using vSphere client.
- Select an ESXi host on the left pane of Hosts and Clusters window. Click Configuration > Networking > vSwitch0 Properties on the right pane of the window.

Ø	VSPEX - vSphere Client	_ <b>_</b> ×
File Edit View Inventory Administration	Plug-ins Help	🔊 - Search Inventory 🔍
त क अर		
VSPEX         10.104.252.90 VI           VS0         Getting Started           10.104.252.91         Hardware           10.104.252.92         Processors           Memory         Storage	Iware ESXi, 5.1.0, 799733 Summary Virtual Machines Resource Allocation Performance View: vSphere Standard Switch vSphere Networking Standard Switch: vSwitch0	re Distributed Switch Refresh Add Networking Properties
Networking Storage Adap Network Aday Advanced Sel Power Manag Software	vmk0 : 10.104.252.90   VLAN ID: 613 virtual Machine Port Group vmk0 : 10.104.252.90   VLAN ID: 613 virtual Machine Port Group vM Network vLAN ID: 23	Physical Adapters

#### Figure 73 VMware vCenter – Add Networking

3. Select VMkernel under Connection Types and click Next.

### Figure 74

Add Network Wizard – Connection Type

Ø	Add Network Wizard
Connection Type Networking hardware c	an be partitioned to accommodate each service that requires connectivity.
Connection Type Network Access Connection Settings Summary	Connection Types          Virtual Machine         Add a labeled network to handle virtual machine network traffic.         VMkernel         The VMkernel TCP/IP stack handles traffic for the following ESXi services: vSphere vMotion, ISCSI, NF5, and host management.

**4.** In the Network Access section select Create a vSphere standard switch and select the two vmnics configured for vMotion VLAN.

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Ø	Add Network Wizard						
VMkernel - Network Ad The VMkernel reache	ccess s networks through uplink adapters attached to vSpher	e standard sv	vitches.				
Connection Type Network Access	Select which vSphere standard switch will handle vSphere standard switch using the unclaimed net	the network t work adapter	raffic for this connection. You may also create a new s listed below.				
<ul> <li>Connection Settings</li> <li>Summary</li> </ul>	Create a vSphere standard switch	Speed	Networks	^			
, souther y	Broadcom Corporation Broadcom N	etXtreme II	BCM5709 1000Base-T				
	🖂 📟 vmnic4	1000 Full	None				
	🖂 📟 vmnic5	1000 Full	None				
	Vmnic6	1000 Full	€-10.104.252.1-10.104.252.127 (VLAN 613)				
	🔽 📟 vmnic7	1000 Full	None	=			
	C Use vSwitch0	Speed	Networks				
	Intel Corporation I350 Gigabit Network Connection						
	🖂 📟 vmnic0	1000 Full					
	🖂 🛂 vmnic1	1000 Full	None	~			
	Preview:						
	VMkernel Q	Physical Adapte 	rs 6 7				

### Figure 75 Add Network Wizard – Network Access

**5.** In the Connection Settings page, provide a Name for Network Label, a VLAN ID and select Use this port group for vMotion.

### Figure 76 Add Network Wizard – Connection Settings

Ø	Add Network Wizard					
VMkernel - Connection Se Use network labels to ide	ettings entify VMkernel connections while managing your hosts and datacenters.					
Connection Type Network Access Connection Settings IP Settings Summary	Port Group Properties Network Label: VLAN ID (Optional): 22 VLAN ID (Optional): Use this port group for vMotion Use this port group for Fault Tolerance logging Use this port group for management traffic	1				
	Network Type:     IP (Default)       Preview:       VMkemel Port       VMotion       VLAN ID: 22					

ſ

6. In the IP Settings screen enter an IP Address, Subnet Mask and click Next.

Figure 77

Figure 78

Ø	Add Netw	vork Wizard	D X
YMkernel - IP Connect Specify VMkernel IP s	ion Settings ettings		
Connection Type Network Access Connection Settings IP Settings Summary	C Obtain IP settings automatically C Use the following IP settings: IP Address: Subnet Mask: VMIkernel Default Gateway: Preview: VMIkernel Port VMIkernel Port I0.10.22.21   VLAN ID: 22	10 , 10 , 22 , 21         255 , 255 , 255 , 0         10 , 104 , 252 , 1         Edit         Physical Adapters         9 vmnic6         9 vmnic7	

Add Network Wizard – VMkernel IP Settings

7. In the Summary page click **Finish**. The created vSwitch for vMotion gets listed in the vSwitch1area as shown in Figure 78.

1

1

	VCDEV	 			
<b>J</b>		 	 -	 <b>J</b>	

VMware vCenter – Network Configuration

Ø	VSF	PEX - vSphere Client	_ <b>_</b> X				
File Edit View Inventory Administration Plug-ins Help							
🖸 🔝 🏠 Home 🎙 💑	Inventory 🕨 🛅 Hosts and Clusters		👸 🗸 Search Inventory 🔍				
8 Ø 88							
VSPEX 10.1 V50 10.104.252.90 10.104.252.91 10.104.252.92 Ha	104.252.90 VMware ESXi, S.1.0, 799733 Itting Started Summary Virtual Machine ardware	Resource Allocation Performance Configure View: vSphere Standard Switch vSphere Distri	ation Tasks & Events Alarms Permis I b				
,	Processors Memory Storage Networking Storage Adapters Network Adapters Advanced Settings Power Management Idensed Features Time Configuration DNS and Routing Authentication Services Power Management	Networking Standard Switch: vSwitch0 VVII VII Machine Port Group VVII Network VII AN ID: 23 VVII AN ID: 22 VVII AN ID: 23 VVII AN ID: 22 VVII AN ID: 2	Refresh Add Networking Properties Remove Properties Physical Adapters Total Adapters Remove Properties dcal Adapters Total				

8. In the vSwitch1 area, click Properties and under the General tab set the MTU size to 9000.
| Figu   | re 79 vSwitch Properties - MTU   |
|--|--|
| Ø  | vSwitch1 Properties  |
| General Security Traffic S<br>vSphere Standard Switch<br>Number of Ports:<br>Changes will not take | haping NIC Teaming Properties          120         effect until the system is restarted. |
| Advanced Properties  | 9000   |

**9.** Click the **NIC Teaming** tab and for Load Balancing policy, choose Route based on IP hash option from the drop-down list. Both vmnics should be listed under Active Adapters.

Policy Exception Load Balancing: Network Eailow	ns ()	Route based on IP hash
Notifu Switcher		Link status only
	•	Yes
Fallback;		Yes
Failover Order:		
Failover Order: Select active an adapters activa	nd standby adapt ite in the order s	ers for this port group. In a failover situation, standby pecified below.
Failover Order: Select active an adapters activa Name	id standby adapt ite in the order s	ers for this port group. In a failover situation, standby pecified below. Networks Move Up
Failover Order: Select active ar adapters activa Name Active Adapt	nd standby adapt ite in the order s Speed e <b>rs</b>	ers for this port group. In a failover situation, standby pecified below.           Networks         Move Up
Failover Order: Select active ar adapters activa Name Active Adapt	nd standby adapt te in the order s Speed ters 1000 Full	ers for this port group. In a failover situation, standby pecified below. Networks 0.0.0.1-255.255.255.254 (VLAN 6

Figure 80 vSwitch Properties – NIC Teaming Policy

10. Repeat all the steps in this section on the other two ESXi hosts.

### Create and Configure vSwitch for iSCSI

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The iSCSI adapter and physical NIC connect through a virtual VMkernel adapter, also called virtual network adapter or VMkernel port. You create a VMkernel adapter (vmk) on a vSphere switch (vSwitch) using 1:1 mapping between each virtual and physical network adapter.

One way to achieve the 1:1 mapping when you have multiple NICs, is to designate a separate vSphere switch for each virtual-to-physical adapter pair as shown in the below figure.





Note

If you use separate vSphere switches, you must connect them to different IP subnets. Otherwise, VMkernel adapters might experience connectivity problems and the host will fail to discover iSCSI LUNs.

In this section we will be creating two vSwitches, each with a single vmnic uplink and a single VMkernel port, bound to the iSCSI adapter. A MTU size of 9000 will also be set on the vSwitches and VMkernal ports to enable jumbo frames. Follow these steps to create vSwitch:

- 1. Connect to the vCenter server using vSphere client.
- Select an ESXi host on the left pane of Hosts and Clusters window. Click Configuration > Networking > Add Networking on the right pane of the window.

0	VSPEX - vSphere Client	
File Edit View Inventory Administration  File Edit View Inventory  Home  File Edit View Inventory  File View Inven	Plug-ins Help     Mosts and Clusters	Search Inventory
I0.104.252.90       Getting Started         I0.104.252.91       Hardware         Processors       Memory         Storage       Networking         Storage Ad       Network Ad         Advanced S       Power Man         Software       Licensed Fe         Time Config       DNS and Ro         Authentical       Power Man	Summary     Virtual Machines     Resource Allocation     Performance       Summary     View:     vSphere Standard Sw       apters     Standard Switch: vSwitch0     View:     View:       apters     Standard Switch: vSwitch0     Viework       ustantian     View:     Viework       view:     View:     vSphere Standard Sw       apters     Standard Switch: vSwitch0     Viework       VLAN ID: 23     VMIcemel Port     VMIcemel Port       values     VMicemel Port     VMicemel Port       values     Standard Switch: vSwitch1     VMicemel Port       vining     VMicemel Port     VMicemel Port       vining     vmkice     vmicemel Port       vinition     vmicemel Port     VMicemel Port       vinition     vmkice     vmicemel Port       visiting     vmicemel Port     VMicemel Port       visiting     vmicemel Port     VMicemel Port       visiting     vmicemel Port     VMicemel Port       visiting     vmice     vmicemel Port       visiting     vmicemel Port     VMicemel Port	Configuration       Tasks & Events       Alarms       Perr         witch       vSphere Distributed Switch       Refresh       Add Networking       Properties         Remove       Properties       Physical Adapters       000       Full       Pill         Physical Adapters       wmnic0       1000       Full       Pill       Pill         Remove       Properties       Properties       Properties       Pill       Pill         N ID: 22       wmnic6       1000       Full       Pill       Pill

#### Figure 82 VMware vCenter – Add Networking

3. Select VMkernel under Connection Types and click Next.

Figure 83

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Add Network Wizard – Connection Type



**4.** In the Network Access section select Create a vSphere standard switch and select the appropriate vmnic.

#### Figure 84 Add Network Wizard – Network Access

Ø	Add Network \	Nizard		x
VMkernel - Network A The VMkernel reache	ccess is networks through uplink adapters attached to vSpher	re standard sw	vitches.	
Connection Type Network Access	Select which vSphere standard switch will handle vSphere standard switch using the unclaimed net	the network t work adapter:	raffic for this connection. You may also create a new s listed below.	
Connection Settings     Summary	Create a vSphere standard switch	Speed	Networks	^
	Broadcom Corporation Broadcom Ne	etXtreme II	BCM5709 1000Base-T	
	Vmnic4	1000 Full	None	_
	O Use vSwitch0	Speed	Networks	-
	Intel Corporation I350 Gigabit Netw	ork Connect	tion	
	🔲 📟 vmnic1	1000 Full	0.0.0.1-255.255.255.254 ( VLAN 23 )	
	🖂 📟 vmnic0	1000 Full	Image: Text and the second	
	C Use vSwitch1	Speed	Networks	
	Broadcom Corporation Broadcom Ne	etXtreme II	BCM5709 1000Base-T	~
	Preview:			
	VMkernel Port	Physical Adapter	rs 4	

**5.** In the Connection Settings window, provide a Name for the Network Label. Leave the VLAN ID to None because the corresponding switch port at the other end is configured as vlan access port.

1

Figure 85 Add Network Wizard – Connection Settings

Ø	A	dd Network Wizard	_ 🗆 X
VMkernel - Connection 9 Use network labels to i	Settings dentify VMkernel connections while r	managing your hosts and datacenters.	
Connection Type Network Access Connection Settings IP Settings Summary	Port Group Properties Network Label: VLAN ID (Optional):	ISCSI-A None (0) Use this port group for vMotion Use this port group for Fault Tolerance logging Use this port group for management traffic	
	Network Type: Preview:	IP (Default)	]
	iSCSI-A	vmnic4     vmnic5	

**6.** In the IP Settings screen enter an IP Address, Subnet Mask and click **Next**. This IP address range is from the iSCSI-A vlan.

p.	Add Net	work Wizard	_	<b>-</b> X
VMkernel - IP Connect Specify VMkernel IP	tion Settings settings			
Connection Type Network Access	C Obtain IP settings automatically			
[IP Settings] Summary	IP Address: Subnet Mask:	10 , 10 , 20 , 21 255 , 255 , 255 , 0	]	
	VMkernel Default Gateway:	10 , 104 , 252 , 1	Edit	
	Preview:	Physical Adapters		

#### Figure 86 Add Network Wizard – VMkernel IP Settings

7. In the Summary page click Finish. You should now be able to see the vSwitch for iSCSI-A created.

Figure 87

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iSCSI vSwitch - Properties

Standard Switch: vSwitch2	Remove	Properties
VMkernel Port iSCSI-A vmk2 : 10.10.20.21	Physical Adapters	00 Full 🖵

**8.** In the vSwitch2 Properties, select the vSwitch under **Ports** tab and click **Edit**. Set the MTU size to 9000 under the **General** tab to enable jumbo frames.

Ø	VSwitch2 Properties	X
Ports Network Adapters	General       Security       Traffic Shaping       NIC Teaming         vSphere Standard Switch Properties       Number of Ports:       120       •	

#### Figure 88 iSCSI vSwitch Properties - Edit

9. Set the MTU size to 9000 for the iSCSI-A VMkernel.

Figure 89

iSCSI vSwitch Properties - MTU

Ø	0	iSCSI-A Properties		x
Ports       Network Adapters         Configuration       Summary         120 Ports       VSwitch         120 Forts       VSWItch	General IP Settings Security Port Properties Network Label: VLAN ID (Optional): vMotion: Fault Tolerance Logging: Management Traffic: iSCSI Port Binding: NIC Settings MTU:	Traffic Shaping       NIC Teaming         ISCSI-A       None (0)         Enabled       Enabled         Enabled       Enabled         Enabled       Enabled         Image: Second Seco	×	

 Repeat the steps 2 to 9 to create another vSwitch with Network label as iSCSI-B. Select the appropriate vmnic uplink adapter and assign IP address from the iSCSI-B VLAN range as shown in Figure 90.

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#### Figure 90 iSCSI vSwitches vCenter view

### Configuring Software iSCSI Adapter (vmhba)

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The software iSCSI adapter (vmbha) uses standard NICs to connect your host to a remote iSCSI target on the IP network. The software iSCSI adapter that is built into ESXi facilitates this connection by communicating with the physical NICs through the network stack. Before you can use the software iSCSI adapter, you must set up networking (this is completed in the previous section - Create and Configure vSwitch2 for iSCSI), activate the adapter, and configure parameters such as discovery addresses and CHAP. This section describes these steps to configure the software iSCSI storage adapter to access the remote storage configured on the VNXe3150 storage array.

- 1. Login to the vSphere Client, and select a host from the inventory panel.
- 2. Click the Configuration tab and click Storage Adapters in the Hardware panel.
- 3. Select and right click vmhba under the iSCSI Software Adapter and click Properties. If you do not see the software iSCSI adapter, then click Add and select Software iSCSI Adapter.



iSCSI Software Adapter



4. In the General tab, click Configure.



iSCSI Software Adapter Properties

Ø 🚺	CSI Initiator (vmhba36) Properties	L	-	•	×
General Network Configuration	Dynamic Discovery Static Discovery				1
Name: Alias:	iqn.1998-01.com.vmware:localhost-7bee192b				
Target discovery methods:	Send Targets, Static Target				
Software Initiator Properties					
Status:	Disabled				
CHAP Advanced		J	Con	figure	
		Close		He	lp

5. Make sure that the adapter is enabled and click **OK**. After enabling the adapter, the host assigns the default iSCSI name to it. If you change the default name, follow iSCSI naming conventions.

Figure 93 iSCSI Software Adapter - Enable

Ø	General Properties	x
iSCSI Properties iSCSI Name: iSCSI Alias:	iqn.1998-01.com.vmware:localhost-7bee192t	
Status		
	OK Cancel Help	

I

5. Click the Network Configuration tab and click Add.

#### Figure 94 iSCSI Software Adapter Properties – Network Configuration

4kernel Port Binding: Port Group	S:	Port Group Policy	Path Status
		1. or a cap toney	
	Ш		
		Add	Remove
	Debater		

**6.** Select both the VMkernel adapters (vmk2 and vmk3) one at a time and click **OK** to bind it with the iSCSI adapter.

Figure 95

adapters are listed.         If a targeted VMkernel adapter offective teaming policy.         Select VMkernel adapter to bind w         Port Group         ISCSI-A (vSwitch2)         ISCSI-B (vSwitch3)         ISCSI-B (vSwitch3)         ISCSI-B (vSwitch3)         Virtual Network Adapter         VMkernel:       v         Switch:       v	oter is not listed, go to Host with the iSCSI adapter: VMkernel Adapte vmk2 vmk3   III	> Configuratio r Ph	n > Networki nysical Adapte vmnic4 (1 vmnic5 (1	ng to update ar 000, Full) 000, Full)	its
If a targeted WMkernel adap effective teaming policy. Select VMkernel adapter to bind w Port Group Select VMkernel adapter to bind w Port Group Select VMkernel adapter VMkernel: v Switch: v	oter is not listed, go to Host with the iSCSI adapter: VMkernel Adapte vmk2 vmk3   III	> Configuratio	n > Networki nysical Adapte vmnic4 (1 vmnic5 (1	ng to update ar 000, Full) 000, Full)	its ^ =
Select VMkernel adapter to bind w Port Group SCSI-A (vSwitch2) SCSI-B (vSwitch3)    Vetwork Adapters Details: Virtual Network Adapter VMkernel: vi Switch: vi	vith the iSCSI adapter: VMkernel Adapte vmk2 vmk3   III	er Ph Que	vmnic4 (1 vmnic5 (1	er 000, Full) 000, Full)	^ =
Port Group SCSI-A (vSwitch2) SiccSI-B (vSwitch3)    Vetwork Adapters Details: Virtual Network Adapter VMkernel: vi Switch: vi	VMkernel Adapte vmk2 vmk3   III	er Ph Quantum	vmnic4 (1 vmnic4 (1 vmnic5 (1	er 000, Full) 000, Full)	- =
	vmk2 vmk3   III		<ul> <li>vmnic4 (1</li> <li>vmnic5 (1</li> <li>vmnic6 (1</li> </ul>	000, Full) 000, Full)	Ξ
iSCSI-B (vSwitch3) Vetwork Adapters Details: Virtual Network Adapter VMkernel: vi Switch: vi			vmnic5 (1 vmnic6 (1	000, Full)	
  Vetwork Adapters Details: Virtual Network Adapter VMkernel: vi Switch: vi			vmnic6 (1		
Vetwork Adapters Details:           Virtual Network Adapter           VMkernel:         virtual           Switch:         virtual				000, Full)	~
Network Adapters Details: Virtual Network Adapter VMkernel: vi Switch: vi			vmnic7 (1	000, Full)	>
Switch: V	mk2				
Switch: V	-10				
	Switch2				
Port Group: iS	SCSI-A				
IP Address: 1	0.10.20.21				
Subnet Mask: 2	55.255.255.0				
IPv6 Address: fe	e80::250:56ff:fe66:47c5/64				
Physical Network Adapter					
Name: vi	mnic4				
Device: B	roadcom Corporation Broado	com NetXtreme	II BCM5709	1000	
Link Status: C	onnected				
Configured Speed: 1	000 Mbps (Full Duplex)				

The network connection appears on the list of VMkernel port bindings for the iSCSI adapter as shown in Figure 96.

iSCSI Software Adapter Properties – Bind VMkernel

1

Akernel Port Bindings:					
ort Group	VMkernel Adap	ter Port	Group Policy	Path S	tatus
iscsI-A (vswitch2)	vmk2	0	Compliant	🔷 4	Active
iSCSI-B (vSwitch3)	vmk3	0	Compliant	<u>م</u>	Active
	ш				3
			Add		Remove
Virtual Network Adapt	er				
VMkernel: Switch:	vmk2 vSwitch2				
VMkernel: Switch: Port Group:	vmk2 vSwitch2 iSCSI-A				
VMkernel: Switch: Port Group: Port Group Policy:	vmk2 vSwitch2 iSCSI-A S Compliant				
VMkernel: Switch: Port Group: Port Group Policy: IP Address:	vmk2 vSwitch2 ISCSI-A Compliant 10.10.20.21				
VMkernel: Switch: Port Group: Port Group Policy: IP Address: Subnet Mask:	vmk2 vSwitch2 iSCSI-A © Compliant 10.10.20.21 255.255.255.0				
VMkernel: Switch: Port Group: Port Group Policy: IP Address: Subnet Mask: IPv6 Address:	vmk2 vSwitch2 iSCSI-A Compliant 10.10.20.21 255.255.255.0 fe80::250:56ff:fe6	6:47c5/64			
VMkernel: Switch: Port Group: Port Group Policy: IP Address: Subnet Mask: IPv6 Address: Physical Network Ada	vmk2 vSwitch2 iSCSI-A ♂ Compliant 10.10.20.21 255.255.255.0 fe80::250:56ff:fe6 pter	6:47c5/64			
VMkernel: Switch: Port Group: Port Group Policy: IP Address: Subnet Mask: IPv6 Address: Physical Network Aday Name:	vmk2 vSwitch2 iSCSI-A Compliant 10.10.20.21 255.255.255.0 fe80::250:56ff:fe6 pter vmnic4	6:47c5/64			
VMkernel: Switch: Port Group: IP Address: Subnet Mask: IPv6 Address: Physical Network Aday Name: Device:	vmk2 vSwitch2 iSCSI-A Compliant 10.10.20.21 255.255.255.0 fe80::250:56ff:fe6 pter vmnic4 Broadcom Corporal	6:47c5/64 tion Broadcor	n NetXtreme II E	0CM5709	1000
VMkernel: Switch: Port Group: Port Group Policy: IP Address: Subnet Mask: IPv6 Address: Physical Network Aday Name: Device: Link Status:	vmk2 vSwitch2 iSCSI-A Compliant 10.10.20.21 255.255.255.0 fe80::250:56ff:fe6 pter vmnic4 Broadcom Corporal Connected	6:47c5/64 tion Broadcor	n NetXtreme II E	CM5709	1000

#### Figure 96 iSCSI Software Adapter Properties – Network Configuration

# Prepare the EMC VNXe3150 Storage

Figure 97 shows the steps involved in deploying VMware environments by using VNXe storage.

Figure 97

VNXe VMware vSphere storage provisioning flowchart



### **Initial Setup of VNXe**

ſ

1. Connect the Ethernet cables from the management and data ports to the network as shown in the cabling guide.

2. Assign an IP address to the management interface or Download and run the Connection Utility to establish an IP address for managing the VNXe storage system. The Connection Utility can be downloaded directly from the product support page.

http://www.emc.com/support-training/support/emc-powerlink.htm

- 3. Complete the installation/upgradation of the software and activate the licenses.
- 4. Connect to the VNXe system from a web browser using the management IP address.

#### Figure 98 EMC Unisphere - Dashboard Page

EMC Unisphere - Windows 3	internet Explorer
🗿 🕘 👻 🙋 https://10.29.	150.135/#id=HOME 🔽 😧 Certificate Error
🍃 🕸 🏾 🏉 EMC Unisphere	🟠 👻 🖶 👻 🔂 🗸 👘 🔹 🚱 Page 👻 🎯 Tools 👻
EMC Unisphere	🍹 🔍-
Dashboard	System Storage Storage Settings Ibots Support
SPEX3300 > Dashbo	ard
Welcome 🧿	Common Tasks
<ul> <li>Free space available</li> <li>Generic Storage</li> <li>Shared FolderMore</li> </ul> System Alerts (2) <ul> <li>Dat Message (1)</li> <li>Dat Message (2)</li> </ul>	Common storage tasks       Create storage for Microsoft Exchange       Image: Create a shared folder         Image: Create storage for VMware       Image: Create storage for generic iSCSI         Image: Create storage for Hyper-V       Image: Create storage for Hyper-V
0 Storage Servers	Common system tasks
Configured for SPA have stopped and will be	View system capacity details Change management settings
Show All >>	View system health I Manage user roles
-	
Note	The SP A and SP B network data ports must be connected to the same subnet. In general,
	have mirrored configurations for all front-end cabling (including VLANs) in order to p

### **iSCSI** Server Configuration

The iSCSI Storage Server is the portal through which storage will be accessed by the hosts within the Fast Track configuration. The goal of the proposed iSCSI server configuration is to provide redundancy, multi-pathing and balanced access across all 1 GigE connections and both storage processors. Each 1 GigE module will have 2 ports, referred to as eth10 and eth11. Considering there is an I/O module for each storage processor, both SPA and SPB will have eth10 and eth11 connections.

iSCSI servers will run on either SPA or SPB. This means storage assigned to a given iSCSI server will only be available to one SP at a given time. To utilize both SPA and SPB concurrently, two iSCSI servers will be created.

With respect to iSCSI server high availability, the eth10 and eth11 connections are paired across the storage processors. If an iSCSI server running with an IP address dedicated to eth10 on SP A needs to move to SP B, for maintenance as an example, the IP address will move to the corresponding eth10 port on SPB. Therefore subnet connectivity will need to be the same for the associated eth10 and eth11 connections across the storage processors. Figure 99 shows a logical example of the connections.



Figure 99 VNXe Array Logical Network Connections

Table 9 Sample IP Configuration
---------------------------------

iSCSI Server A	iSCSI Server B
IP Address Eth10 Subnet A (10.10.20.10/24)	IP Address Eth10 Subnet A (10.10.20.11/24)
IP Address Eth11 Subnet B (10.10.20.10/24)	IP Address Eth11 Subnet B (10.10.21.11/24)

### **Configure iSCSI Storage Servers**

- 1. In the EMC Unisphere home page, choose Settings > iSCSI Server Settings > Add iSCSI Server.
- 2. Enter the desired Server Name, IP address, and Subnet Mask (default gateway is not required as the connection from the servers is on the same subnet). Click **Show Advanced** and select the appropriate storage processor (SPA) and Ethernet Port (eth10) as shown in Figure 100.

Specify the Network Interface for the new iSCSI Server:	?>
Server Name: * iSCSIServerA IP Address: * 10.10.20.10 Subnet Mask/Prefix Length: * 255.255.0 Gateway:	
Hide advanced Storage Processor: SP A V Ethernet Port: eth10 (Link Up) VLAN ID: 0 <click edit="" to=""></click>	
< Back Next > Finish	Cancel Help

#### Figure 100 EMC Unisphere - iSCSI Server SP-A eth10

1

**3.** Repeat the steps 1 and 2 to create a second iSCSI server on SP-B and eth10.

Step 1 of 3	<ul> <li>&gt;&gt;</li> </ul>
Specify the Network Interface for the new iSCSI Server:	
Server Name: * iSCSIServerB IP Address: * 10.10.20.11	
Subnet Mask/Prefix Length: * 255.255.255.0	
Gateway:	
Hide advanced	
Storage Processor: SP B	
Ethernet Port: eth10 (Link Up)	
VLAN ID: 0 <click edit="" to=""></click>	
< Back Next > Finish Can	icel Help

#### Figure 101 EMC Unisphere - iSCSI Server SP-B eth10

4. Select the previously created iSCSI server and select **Details**.

Figure 102 EMC Unisphere - iSCSI Server Settings

EMC Unispher	e							1
Dashboa	ord 🗾	System	Stora	ge	Hosts	Setting	gs 👩 Su	ipport
VNXe > Settings	> iSCSI Ser	ver Settings						
iscsi server set	ungs vers ———							<b>∀</b> <₊ 🗈
Name	IP Addr	Target			1.	Storage Processor	Ethernet Port	Status
iSCSIServerA	10.10.20.10	iqn.1992-05.c	om.emc:apm0012	37028350000-3	3-vnxe	SP A	eth10, eth11	Ok
iSCSIServerB	10.10.20.11	iqn.1992-05.c	om.emc:apm0012	37028350000-8	8-vnxe	SP B	eth10, eth11	Ok
Add iSCSI Ser	ver Detai	ls Remove						2 items

Γ

- 5. In the iSCSI Server Details window, click Add Network Interface.
- 6. Enter the appropriate IP Address, Subnet Mask and Gateway information.

1

	IP Address: ∗	10.10.21.10		
Subnet Mask/Pr	efixLength: 🌸	255.255.255.0		
	Gateway:			
ide advanced				
Ethernet Port:	eth11 (Link	Up) 🖌		
VLAN ID:	0 <click ea<="" td="" to=""><td>dit&gt;</td><td></td><td></td></click>	dit>		
			Ad	id Cance

#### Figure 103 EMC Unisphere - iSCSI Server SP-A eth11

7. Repeat the steps 4,5, and 6 for the iSCSI Server instance assigned to the other storage processor, SP-B.

#### Figure 104 EMC Unisphere - iSCSI Server SP-B eth11

Add network interface	
IP Address: * Subnet Mask/Prefix Length: * Gateway:	10.10.21.11 255.255.255.0
Hide advanced	
Ethernet Port: eth11 (Link	Up) 💙
VLAN ID: 0 <click ea<="" td="" to=""><td>dit&gt;</td></click>	dit>
	Add Cancel

# <u>Note</u>

I

In VNXe storage systems, for fail safe networking (FSN) and high availability features to work, the peer ports on both storage processors must belong to the same subnet. For more information about high availability in VNXe storage systems is available in the below URL.

http://www.emc.com/collateral/hardware/white-papers/h8178-vnxe-storage-systems-wp.pdf

Figure 105	EMC Unisphere -	iSCSI Server	Settings
------------	-----------------	--------------	----------

and omsphere	C			_				-
Dashbo	ard System	Storage	Hosts	S.	Settings	0	Support	
VNXe > Setting	s > iSCSI Server Settings							
SCSI Server Set	tings							
— 😪 iSCSI Sei	rvers							
-								74.
Name	IP Address	Target		1.	Storage Pro	cessor	Ethernet P	Status
iSCSIServerA	10.10.20.10, 10.10.21.10	iqn.1992-05.com.em	apm001237028350	00-3-vnxe	SP A		eth10, eth11	Ok
iSCSIServerB	10.10.20.11, 10.10.21.11	ign.1992-05.com.em	:apm0012370283500	00-8-vnxe	SP B		eth10, eth11	Ok
iSCSIServerB	10.10.20.11, 10.10.21.11	iqn.1992-05.com.emo	::apm0012370283500	00-8-vnxe	SP B		eth10, eth11	Ok
								2 ite
			1111					1000

## Add VMware Hosts to EMC VNXe Storage

To integrate virtual infrastructure with VNXe for storage provisioning, follow these steps:

1. In Unisphere, choose Hosts > VMware. The VMware page appears.

EMC Unisphere					] ?
Dashboard	l System	Storage	Hosts	Settings	> ~
VNXe > Hosts	Hosts View and manage all hosts known to the system.		Vi I vm	Mware ew and manage all VMwa osts known to the system	are I.
-2	Replication Conn. Manage system-to-system connections for replication	••			

Figure 106 EMC Unisphere – Hosts

2. Click Find ESX Hosts.

Figure 107	EMC Unisphere –	Find ESX Hosts
------------	-----------------	----------------

MC Unisph	ere					] (
Dash	board	Sys	stem 🗊 Storage	Hosts	Settings	· · ·
/NXe > Host	s > VM	lware				
irtualization	Hosts					
Virtualization	n Hosts:					•
						74.
Name	1.	Туре	Operating System	Status	Associated Dat	Capacity
0 Selected						0 item
Find ESX H	losts	Details Refr	resh Delete			

**3.** In the Find ESX Hosts window, click the radio button **Other (vCenter or ESX Host)** and enter the IP address of the VMware vCenter server.

1

Find ESX Hosts	
Find ESX Hosts	<u>@</u> >>
To find ESX Hosts that are associated with a vCenter, click and enter the vCenter's management IP address or networ vCenter, click Other and enter its management IP address	vCenters and select a vCenter from the list, or click Other rk name. To find an ESX Host which is not managed by a or network name. When finished, click Find.
0 vCenters	*
Other (vCenter or ESX Host)	10.104.252.107
Find	
Select the vCenter and ESX Hosts to add:	
Name	Туре
	< Back Next > Finish Cancel Help

**4.** Click **Find** and in the Enter Credentials for vCenter/ESX Host window, enter the Username and Password for the vCenter server. Click **OK**.

Enter Credentials for vCenter	/ESX Host
Enter the login credentials for th	e vCenter/ESX Host:
Network Name or Address: *	10.104.252.107
User Name: ∗	administrator
Password: *	*****

Figure 109

5. Select the vCenter and ESX hosts to add by checking the check boxes against each of the ESX hosts and click Next.

Find ESX Hosts	
Find ESX Hosts	>>
To find ESX Hosts that are associated with a vCenter, click and enter the vCenter's management IP address or netwo vCenter, click Other and enter its management IP address	vCenters and select a vCenter from the list, or click Other rk name. To find an ESX Host which is not managed by a s or network name. When finished, click Find.
Other (vCenter or ESX Host)	×
Select the vCenter and ESX Hosts to add:	
Name	Туре
▼ 10.104.252.107	VMware vCenter 5.1.0
✓ localhost	VMware ESX
✓ localhost	VMware ESX
✓ localhost	VMware ESX

Figure 110 EMC Unisphere – Find ESX Hosts Selection

EMC Unisphere – vCenter Credentials

6. In the Summary page, confirm the selected ESX hosts and click Finish.

## **Create Storage Pools for VMware**

A storage pool is an aggregation of storage disk resources that are configured with a particular storage profile. The storage profile defines the type of disks that are used to provide storage and the RAID configuration of the component disks. The storage pool configuration defines the number of disks and the quantity of storage associated with the pool.

Create a pool with the appropriate number of disks as suggested in the storage layout figure.

- 1. In the EMC Unisphere home page, choose **System > Storage Pools**.
- 2. In the Storage Pools window, click **Configure Disks**.

EMC	Jnisphere							?.
	Dashboard	📁 System	Storage	Hosts	Settings	👩 Supp	oort	
VNXe	> System > Storage P	ools						
Storag	je Pools							0
Stora	ge Pools:							*
							Y 4.	
1.	Name	Total Space	Current Allo	Percent Used	Remaining	Subscription	Disks	
1	TestPool	6 272 TR	6.177 TB	98%	97.510 GB	95%	15 used / 0 unuse	:d
0	Hot Spare Pool	Nocmppiicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	1	
0	Unconfigured Disk Pool	Not Applicable	32					
1 Sele	ected nt Allocation: Re	maining Space:	Alert Thresho	old:			3 ite	ms
Cor	nfigure Disks Details	Recycle Disks	Refresh					

Figure 111 EMC Unisphere – Storage Pools Configure Disks

1

- **3.** For Disk Configuration Mode, click the radio button **Manually create a new pool**.
- **4.** For creating a new pool by disk type, choose Pool created for VMFS VMware Storage Datastore from the drop-down list.

Figure 112 EMC Unisphere – Disk Configuration	n Wizard, Select Mode
Disk Configuration Wizard	
Select Configuration Mode	<b>(</b> ) >>
Select the disk configuration mode: Automatically configure pools Configure disks into the system's pools and hot spares Manually create a new pool Create a new pool by disk type or for a specific application	
* Pool created for VMFS VMware Storage - Datastore.	
Manually add disks to an existing pool	
Add unconfigured disks to the selected pool	
Select pool 🔽	

5. Specify Pool Name.

ſ

#### Figure 113 EMC Unisphere – Disk Configuration Wizard, Specify Pool Name

Disk Configuration Wizard				
Specify Pool Name Step 2 of 6	>>			
Specify a name and optional description.				
Description:				

**6.** Select Balanced Perf/Capacity in the Select Storage Type window. The validated configuration uses a single pool with 45 drives.

Figure 114 E	EMC Unisphere –	Disk Configuration	Wizard, Selec	t Storage Type
--------------	-----------------	--------------------	---------------	----------------

1

)isk Configu	ration Wizard		
	Select Storag	је Туре	>>
Please select	the type of disks you war	nt to use for this new pool.	
The disks and application / u	their storage types have isage.	e been rated according to the	ir suitability to the selected
Rating	Disk Type	Max Capacity	Storage Profile
***	SAS	12.581 TB	Balanced Perf/Capacity
<b>मे</b> मे	SAS	12.581 TB	Balanced Perf/Capacity
<b>\$</b>	SAS	7.863 TB	High Performance
Show adva Uses SAS dia does not offe databases w VMware SAS	nced sks to provide a balanced er performance as high a ith low-to-average perfo S storage pool using RAIC	d level of storage performanc s High Performance pools, bu rmance requirements. 9 5(4+1).	e and capacity. This pool type ut it can be adequate for

7. In the Select Amount of Storage window, for the field 600GB SAS (15000 RPM) Disks, choose Use 45 disks of 47 disks from the drop-down list and click **Next**.

#### Figure 115 EMC Unisphere – Disk Configuration Wizard, Select Amount of Storage

Disk Configuration Wizard		
Select Amo Step 4 of 6	unt of Storage	<b>(2)</b> >>
Select the amount of storage to conf 600GB SAS (15000 RPM) Disks:	igure.	
Total Disks to Configure:	Use none of these disks Use 5 of 17 Disks Use 10 of 17 Disks	

8. Review the summary and click Finish.



You should also create your Hot Spare disks at this point. As a performance best practice, all of the drives in the pool should be of the same size.

### **Configure Jumbo Frames**

The Cisco networking environment will have a Maximum Transmission Unit (MTU) size of 9000 for the iSCSI connections to the VNXe. To match the configured MTU size via EMC Unisphere, follow these steps:

- 1. In the EMC Unisphere home page, choose Settings > More Configuration > Advanced Configuration.
- 2. Select eth10 and set the MTU size to 9000.
- 3. Select eth11 and set the MTU size to 9000.

#### - -X 🔎 = 💈 Certif... 🗟 🖒 //10.29.130.93/index a EMC Unisphere File Edit View Favorites Tools Help **EMC Unisphere** J 2. Settings Dashboard System Storage Hosts VNXe > Settings > More configuration... > Advanced Configuration Advanced Configuration **IO Modules** Ethernet Port ▼ IO Module 0 Port Name: eth10 eth10 Maximum Transmission Unit (MTU) Size: 9000 v eth11 1 Gbps Port Speed: Base Ports Link State: SP A (Link Up), SP B (Link Up) Network Addresses: Apply Changes Cancel Changes

### Figure 116 EMC Unisphere – Advanced Configuration Jumbo Frames

### **Create VMware Datastores**

There are two options to create datastores in the EMC VNXe storage array. We have used generic iSCSI storage option to create the virtual disks and present them to the ESXi hosts. However, you can create VMware/VMFS datastores using VMware option in the storage section of EMC Unisphere.

Note

Depending on the VNXe code revision, the datastores created by the VNXe vSphere engine may create the datastores as VMFS version 3.x, instead of VMFS version 5.x.

To create an iSCSI Virtual disk on iSCSI storage on a VNXe platform, follow these steps:

1. In the EMC Unisphere home page, choose **Storage** > **Generic iSCSI Storage**.

	Figure 117 EIVIC OI	ispnere – Generic ISCSI Sto	rage
EMC Unisphere			3 3.
Dashboard	System Storage	🔰 Hosts   Settings 🤞	Support
VNXe > Storage			Ŀ
	Microsoft Exchange Create, configure, and manage storage for Microsoft Exchange servers.	Shared Folder Create, configure, ar network shares on W Linux/UNIX hosts.	'S Id manage storage for /indows and
vm	VMware Create, configure, and manage storage for VMware virtual machines.	Create, configure, ar virtual disk storage a hosts.	I Storage rd manage ISCSI rccessible to specific

2. Click Create in the Generic iSCSI Storage window.



EMC Unisphere	3 3.
Dashboard System Storage Hosts 🐝 Settings	-> v
VNXe > Storage > Generic ISCSI Storage	
Generic iSCSI Storage	0
Allocated Generic iSCSI Storage:	··· 🖌
Create a Replication Destination Details Refresh Delete	

3. In the Generic iSCSI Storage, enter a Name for the generic storage resource and click Next.

1

Figure 119 EMC Unisphere – Generic iSCSI Storage Wizard, Specify Name

Generic iSCSI Storage Wizard	
Specify Name Step 1 of 7	<b>(2)</b> >>
Enter a name for the generic storage resource.	
Name: * V50-DS01	
Description:	

**4.** For Storage Server field, choose iSCSIServerA (SPA) and enter the required storage size in the Size field.

Generic iSCSI Sto	Generic iSCSI Storage Wizard						
Step	nfigure Stora 2 of 7	nge				>>	٧
Configure the stora Select a storage po Storage Server:	Configure the storage for the first virtual disk: Select a storage pool with available space on the selected iSCSI server. Storage Server: [ISCSIServerA (SP A)] V More information						
Type 1	Pool	Available	Percent Used		Subscription		
vm	TestPool	97.505 GB		98%	31%		
<u></u>	VSPEX-V50	12.356 TB		0%	0%		
		1	Percent Available:	Perce	ent Used:	Alert Threshold:	
Size: * 1.999	ТВ 🛩						

Figure 120 EMC Unisphere – Generic iSCSI Storage Wizard, Configure Storage

**5.** Change protection by clicking the radio button **Do not configure protection storage for this storage resource**. If you need additional protection, then additional storage is required. For more details on opting additional storage, see *EMC VNXe Storage Configuration Guide*.

Figure 121 EM	C Unisphere – Gene	ric iSCSI Storage	Wizard, Confi	gure Protection
---------------	--------------------	-------------------	---------------	-----------------

Generic iSCSI Storage Wizard	
Step 3 of 7	<u>@</u> >>
Configure protection storage for replication and snapshots:	later time. schedule. Default Protection
This schedule will create snapshots Every day at 13:30, keep for 2 days Note: Times are displayed in Local Time (UTC+0530) in 24-hour format	

ſ

**6.** In the Configure Host Access window, for Access, choose Virtual Disk from the drop-down list. This is required because only the access level can permit the host to access the storage and not the snapshots. VNXe provides four levels of access for generic iSCSI storage as shown in Figure 122.

	onfigure Host	Access	<u>@</u> >>
nfigure which h	osts will access this storag	je:	
Y Filter for			
Name 1	Network Address	IQN	Access
Iocalhost	(4)	(5)	Virtual Disk
Iocalhost	(4)	(5)	Virtual Disk
localhost	(4)	ign.1998-01.com.vmware:localhost-3d8	Virtual Disk
			No Access
			Virtual Disk
			Snapshot
			Virtual Disk and Snanshot

Figure 122 EMC Unisphere – Generic iSCSI Storage Wizard, Configure Host Access

- 7. Click Next and Click Finish in the Summary window after verifying the details.
- 8. In the Results page, click Add virtual Disk radio button to create more iSCSI virtual disks or click None radio button to exit.

#### Figure 123 EMC Unisphere – Generic iSCSI Storage Wizard, Results



### **Configuring Discover Addresses for iSCSI Adapters**

We now have to setup target discovery addresses so that the iSCSI adapter can determine the shared storage resources configured and made available for access to the ESXi hosts on the VNXe3150 storage array in the above section. The ESXi system supports Dynamic and Static Discovery methods. With dynamic discovery, all targets associated with an IP address or host name and the iSCSI name are discovered. With static discovery, you must specify the IP address or host name and the iSCSI name of the target you want to access. The iSCSI HBA must be in the same VLAN as both ports of the iSCSI array.

- 1. Login to the vSphere Client, and select a host from the inventory panel.
- 2. Click the Configuration tab and click Storage Adapters in the Hardware panel.
- 3. Select and right-click vmhba under the iSCSI Software Adapter and click Properties.



#### Figure 124 VMware vCenter – Storage Adapter Configuration

4. Click the **Dynamic Discovery** tab.

I

5. To add an address for the Send Targets discovery, click Add.

ScSI Initiator (vmhba32) Properties	- <b>D</b> X
General Network Configuration Dynamic Discovery Static Discovery	
Send Targets	
Discover iSCSI targets dynamically from the following locations (IPv4, IPv6, host name):	
ISCSI Server Location	
Add Remove	Settings
Close	Help

Figure 125 iSCSI Initiator Properties

**6.** Enter the IP Address of the iSCSI Server (VNXe SP-A eth10) in the Add Send Target Server window. Leave the port number to default 3260 and click **OK**.

1

1

0	Add Send Target Server	×
iSCSI Server:	10.10.20.10	
Port:	3260	
Parent:		
Authentic be establi	ation may need to be configured before a session ished with any discovered targets.	can
	CHAP Advan	ced

Figure 126 Add Send Target Server

**7.** Repeat the steps 4 and 5 to add all the other Send Target portal IP addresses of the VNXe storage array.



8. After your host establishes the Send Targets session with this system, any newly discovered targets appear in the Static Discovery list.

#### Figure 128 iSCSI Initiator Properties – Static Discovery

L	SCSI Initiator (vmhba32) Properties 🛛 📃 🗖
ieneral   Network Configu	uration Dynamic Discovery Static Discovery
Discovered or manually e	ntered iSCSI targets:
iSCSI Server Location	Target Name
iSCSI Server Location 10.10.20.10:3260	Target Name iqn.1992-05.com.emc:apm001237028340000-1-vnxe
iSCSI Server Location 10.10.20.10:3260 10.10.21.10:3260	Target Name iqn.1992-05.com.emc:apm001237028340000-1-vnxe iqn.1992-05.com.emc:apm001237028340000-1-vnxe
iSCSI Server Location 10.10.20.10:3260 10.10.21.10:3260 10.10.20.11:3260	Target Name iqn.1992-05.com.emc:apm001237028340000-1-vnxe iqn.1992-05.com.emc:apm001237028340000-1-vnxe iqn.1992-05.com.emc:apm001237028340000-2-vnxe

I

- 9. After configuring Dynamic Discovery for your iSCSI adapter, rescan the adapter.
- 10. Select a host in the inventory panel and click Configuration > Storage > Add Storage.

Ø			VSPEX - vSphere Client			_ 🗆 X
File	Edit View Inventor	y Administration Plug-ins Help				
	🖾 🛕 Home	🕨 🛃 Inventory 🌓 🛐 Hosts and Clusters			🔊 - Search Inven	itory 🔍
6	e 85					
₽ <b>62</b> ■	VSPEX 10.104.252.90 VMware ESXI, 5.1.0, 799733				s & Events Alarms	Permissions Map 🛯
	Hardware     View:     Datastores     Devices       Datastores     Refresh     10.104.252.92			Delete Add Storage	Rescan Al	
		Memory	Identification / Status	Device D	vrive Type C	apacity Fre
		Storage     Networking     Storage Adapters     Network Adapters     Advanced Settings     Power Management	🗊 datastore1 🥏 Nor	mal Local LSI Disk (n N	lon-550 27:	3.50 GB 269.11 (

#### Figure 129 VMware vCenter – Add Storage

11. In the Add Storage wizard, click the radio button Disk/LUN in the Storage Type area and click Next.

1

1

Figure 130 Add Storage – Disk/LUI
-----------------------------------

Ø	Add Storage
Select Storage Type Specify if you want to for	mat a new volume or use a shared folder over the network.
Disk/LUN Select Disk/LUN File System Version Current Disk Layout Properties Formatting Ready to Complete	Storage Type
	Adding a datastore on Fibre Channel or iSCSI will add this datastore to all hosts that have access to the storage media.
12.	Select a LUN from the list to create a datastore and click <b>Next</b> .

#### Figure 131 Add Storage – Select Disk/LUN

Ø		Add S	Storage		-	D X
Select Disk/LUN Select a LUN to create a	datastore or expand the current one					
E Disk/LUN Select Disk/LUN	N	ame, Identifier,	Path ID, LUN, Capacity, Expandable or VMPS Label contr	ains: •		Clear
File System Version	Name	Identifier	Path ID	LUN /	Drive Type	Capacity
Current Disk Layout	EMC ISCSI Disk (naa.6006048cae7c	naa.60060	ign.1992-05.com.emc:apm001237028340000-2-vnxe	0	Non-SSD	1.99 TB
Properties	EMC ISCSI Disk (naa.6006048cd55f	naa.60060	ign.1992-05.com.emc:apm001237028340000-1-vnxe	0	Non-SSD	1.99 TB
Pormatting Ready to Complete	EMC ISCSI Disk (naa.6006048c46ab	naa.60060	ign.1992-05.com.emc:apm001237028340000-1-vnxe	1	Non-SSD	2.00 TB
Newy to sumption	EMC ISCSI Disk (naa.6006048c8441	naa.60060	ign.1992-05.com.emc:apm001237028340000-2-vnxe	1	Non-SSD	2.00 TB

13. Next select VMFS-5 as the File System Version in the Add Storage wizard and click Next.

Figure 132 Add Storage – File System Version

Ø	Add Storage	-	•	x
File Sy St	stem Version scify the version of the VMFS for the datastore			
Disk/LU Sek File Cur Pro For Ready I	t Disk/LUN         System Version         ent Disk Layout erties latting b Complete    File System Version Select this option to enable additional capabilities, such as 2TB+ support. WMFS-5 is not supported by hosts with an ESX version older than 5.0. VMFS-3 Select this option if the datastore will be accessed by legacy hosts.			

14. Review the current disk layout and click **Next** to create a partition.



Ø	Add Storage						
Current Disk Layout You can partition and format the entire device, all free space, or a single block of free space.							
E Disk/LUN	Review the current disk layout:						
Select Disk/LUN File System Version Current Disk Layout Properties Formatting Ready to Complete	Device EMC ISCSI Disk (naa.6006048 Location /vmfs/devices/disks/naa.6006048 Partition Format Unknown	Drive Type Non-SSD 3cae7c9c0bf98e6 The hard disk i	Capacity 1.99 TB 58c7a90ee189 s blank.	Available 1.99 TB	LUN O		
	There is only one layout configuration available. Use the Next button to proceed with the other wizard pages. A partition will be created and used						

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15. In the Properties window of the Add Storage wizard, enter a name for the datastore and click Next.

#### Figure 134

#### Add Storage – Properties

Ø	Add Storage	_ <b>_</b> ×
Properties Specify the properties for t	he datatore	
<ul> <li>Disk/LUN</li> <li>Select Disk/LUN</li> <li>File System Version</li> <li>Current Disk Layout</li> <li>Properties</li> <li>Formatting</li> <li>Ready to Complete</li> </ul>	Enter a datastore name	

**16.** In the Formatting window of Add Storage wizard, specify the file size and capacity of the datastore for formatting and click **Next**.

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Ø	Add Storage	_ <b>D</b> X
Disk,	LUN - Formatting pecify the maximum file size and capacity of the datastore	
Disk/L Se Fil C Pr Ready	N     Capacity       System Version        • Maximum available space       • Custom space setting       perties       • matting       to Complete	

**17.** In the Ready to Complete window of Add Storage wizard review the disk layout and click **Finish** to add storage.

Ø	Add Stora	ge		×
Ready to Complete Review the disk layout a	and click Finish to add storage			
Disk/LUN     Deschute Complete	Disk layout:			
ready to complete	Device           EMC iSCSI Disk (naa.6006048ca           Location           /vmfs/devices/disks/naa.6006048ca           Partition Format           GPT           Primary Partitions           VMFS (EMC iSCSI Disk (naa.600600)	Drive Type Non-SSD e7c9c0bf98e68c7 Cape 1.99	Capacity 1.99 TB 7a90ee189 city 9 TB	LUN O
	File system: Properties Datastore name: V50-DS01 Formatting File system: vmfs-5			
Help	BIOCK SIZE: 1 MB Maximum file size: 2.00 TB		< Back Fi	nish Cancel

#### Figure 136 Add Storage – Ready to Complete

**18.** Repeat the steps 8 to 15 to add other Disk/LUNs.

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#### Figure 137 VMware vCenter – Storage View

### **Configuring vSphere HA and DRS**

vSphere High Availability (HA) and Distributed Resource Scheduler (DRS) provide protection for virtual machines (VMs) running on ESXi hosts, as well as optimize resources and performance and simplify VM management. The HA feature continuously monitors all ESX Server hosts in a cluster and detects failures, and will automatically restart VMs on other host servers in an ESX cluster in case of a host failure. DRS aggregates vSphere host resources into clusters and automatically distributes these resources to virtual machines by monitoring utilization and continuously optimizing virtual machine distribution across vSphere hosts. vCenter Server is required for the use of this feature.

The section explains steps to create cluster and configure HA and DRS for the VSPEX V50 solution:

- 1. Login to the vCenter using vSphere Client, and choose Datacenter from the inventory panel.
- 2. 2. Right-click and choose New Cluster to launch the New Cluster Wizard.

Ø			VSPEX - vSphere
File Edit View Inv	ventory Administration Plug-ins	Help	
🖸 🖸 🛕 H	lome 🕨 👸 Inventory 🕨 🗊 Hos	ts and Cluste	rs
📁 🕸 🖬 🕯	≓ ₩		
	¥50		
	New Folder	Ctrl+F	achines Hosts IP Pools
	New Cluster	Ctrl+L	
🔀 1 🐨	New Datastore Cluster		l a host 🛛 🕄 Add a virtu:
	Add Host	Ctrl+H	
5	New Virtual Machine	Ctrl+N	iter.
<u></u>	New vSphere Distributed Switch	Ctrl+K	al machine to the host. T
Add Datastore			elect the host.
	Rescan for Datastores		

VMware vCenter – New Cluster

Figure 138

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3. In the Cluster Features window, select Turn ON vSphere HA and Turn On vSphere DRS.



4. Click **Next** and in the subsequent steps choose the options suitable for your environment to complete the configuration of HA and DRS.

### Figure 139 New Cluster Wizard – Cluster Features
New Cluster Wizard				
Ready to Complete Review the selected options for this cluster and click Finish.				
Cluster Features vSphere DRS vSphere HA VMware EVC VM Swapfile Location Ready to Complete	The cluster will be created with the Cluster Name: vSphere DRS: vSphere DRS Automation Level: vSphere DRS Migration Threshold: vSphere HA Host Monitoring: Admission Control Policy: Host Failures Allowed: VM Restart Priority: Host Isolation Response: vSphere HA VM Monitoring: Monitoring Sensitivity: VMware EVC Mode: Virtual Machine Swapfile Location:	following options: VSPEX-VS0 Enabled Fully Automated Apply priority 1, priority 2, and priority 3 recommendations. Running Enabled Number of host failures cluster tolerates 1 Medium Leave powered on Disabled High Disabled Same directory as the virtual machine		
Help		< Back Finish Cancel		

### Figure 140 New Cluster Wizard – Ready to Complete

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5. Right-click the Cluster and choose Add Hosts.

Ø			VSPEX - vSphere Client
File Edit View Inventory	Administration Plug-ins H	elp	
🖸 🔝 🛕 Home 🕨	😽 Inventory 🕨 🎁 Hosts a	and Clusters	
<b>f</b> 4 4 3			
VSPEX	VSPEX-V50		
1 VSPEX-V50	Getting Started Summary	Virtual Machi	nes Hosts DRS Resource Alloca
10.104.252.	Add Host	Ctrl+H	
🔀 10.104.252. 📑	New Virtual Machine	Ctrl+N	
10.104.252.	New Resource Pool	Ctrl+O	way add a baat to a
38	New vApp	Ctrl+A	he part of the cluster's
	Rescan for Datastores		e resources of all hosts
	Host Profile	,	
	Add Permission	Ctrl+P	Availability (HA) and eduler (DRS) solutions.

### Figure 141 VMware vCenter – Add Host to Cluster

6. In Specify Connection Settings enter the name or IP address of the host to add to the cluster.

Ø	Add Host Wizard	x
Specify Connection Settings Type in the information used	o connect to this host.	
Connection Settings Host Summary Choose Resource Pool Ready to Complete	Connection Enter the name or IP address of the host to add to vCenter. Host: 10.104.252.90	
	Authorization Enter the administrative account information for the host. vSphere Client will use this information to connect to the host and establish a permanent account for its operations.	
	Username: root Password: *****	
Help	< Back Next > Cancel	

Figure 142 Add Host Wizard – Connection Settings

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- 7. In the Security Alert dialog box click Yes to continue.
- 8. In the Host Summary page review the information and click Next.

Figure 143

Ø		Add Ho	ost Wizard	-		x
Hos	st Information Review the product information (	for the specified host.				
Con	nection Settings	You have chose	n to add the following host to vCenter:			
Hos Ass Locl Cho Rea	st Summary ign License kdown Mode nose Resource Pool ndy to Complete	Name: Vendor: Model: Version: Virtual Machine	10.104.252.90 Cisco Systems Inc UCSC-C220-M35 VMware ESXI 5.1.0 build-799733			
		<	Ш			>
ŀ	Help		< Back Ne	xt >	Can	

Add Host Wizard – Host Summary

9. Assign an existing or a new key to the host in the Assign License page. You can choose evaluation and assign the key at a later stage.

Ø	Add Host Wizard	_ <b>_</b> ×
Assign License Assign an existing or a new licen	se key to this host.	
Connection Settings Host Summary	<ul> <li>Assign an existing license</li> </ul>	key to this host
Assign License	Product	Available
Choose Resource Pool	<ul> <li>Evaluation Mode</li> </ul>	
Ready to Complete	O (No License Ke	ey)
	WMware ∨Sphere 5	Enterprise Plus (unlimited 56 CPUs
	C Assign a new license key	to this host
	Enter Veu	
	Product: Capacity: Available: vRAM per CPU entitlement: Expires: Label:	VMware vSphere 5 Enterprise Plus (unlimited cor 64 CPUs 56 CPUs 96 GB 5/24/2013
Help		< Back Next > Cancel

Figure 144 Add Host Wizard – Assign License

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10. In the Lockdown Mode section you can specify whether to Enable Lockdown Mode for this host.

Figure 145

Ø	Add Host Wizard
Configure Lockdown Mode Specify whether lockdown mode	is to be enabled for this host.
Connection Settings Host Summary Assign License Lockdown Mode Choose Resource Pool Ready to Complete	Lockdown Mode         When enabled, lockdown mode prevents remote users from logging directly into this host. The host will only be accessible through local console or an authorized centralized management application.         If you are unsure what to do, leave this box unchecked. You can configure lockdown mode later by navigating to the host's Configuration tab and editing its Security Profile.         Enable Lockdown Mode
Help	< Back Next > Cancel

Add Host Wizard – Lockdown Mode

**11.** In the next window choose where to place this host's virtual machines in the resource pool hierarchy and click **Next**.

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Ø	Add Host Wizard
Choose the Destination Resource Choose where to place this host's v	Pool irtual machines in the resource pool hierarchy.
Connection Settings Host Summary Assign License Lockdown Mode Choose Resource Pool Ready to Complete	Virtual Machine Resources What would you like to do with the virtual machines and resource pools for this host? Put all of this host's virtual machines in the cluster's root resource pool. Resource pools currently present on the host will be deleted. C create a new resource pool for this host's virtual machines and resource pools. This preserves the host's current resource pool hierarchy. Name: Grafted from 10.104.252.90 1
Help	< Back Next > Cancel

Figure 146 Add Host Wizard – Choose Resource Pool

12. In the Ready to Complete window review the summary and click Finish.

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Ø		Add Host Wiza	ard		x
	Ready to Complete Review the options you have selected and Connection Settings Host Summary Assign License Lockdown Mode Choose Resource Pool Ready to Complete	Add Host Wiz: click Finish to add the hose Review this summary an Host: Version: Networks: Datastores:	ard st. d click Finish. 10.104.252.90 VMware ESXi 5.1.0 build-799733 VMComm datastore1 V50-D502 V50-D501		
		Lockdown Mode: Resources Destination:	V50-DS01 V50-DS03 V50-DS04 Temp-DS01 Disabled VSPEX-V50		
	Help		< Back Finis	h Cance	-

Figure 147 Add Host Wizard – Ready to Complete

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**13.** Repeat the steps 5 to 8 to add other ESXi hosts to the cluster.

Ø	VSPEX - vSphere Client
File Edit View Inventory Admir	nistration Plug-ins Help
🖸 🔯 🔥 Home 🕨 👸 In	ventory > 🗊 Hosts and Clusters
🖬 🗗 😂 👫	
♥       VSPEX         ♥       VSPEX-VS0         ♥       VSPEX-VS0         ●       ●	VSPEX-V50         Getting Started       Summary       Virtual Machines       Hosts       DRS       Resource Allocation         What is a Cluster?       A cluster is a group of hosts. When you add a host to a cluster, the host's resources become part of the cluster's resources. The cluster manages the resources of all hosts within it.         Clusters enable the vSphere High Availability (HA) and vSphere Distributed Resource Scheduler (DRS) solutions.

### Figure 148 VMware vCenter – Cluster View

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



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In an environment with established procedures, deploying new application servers can be streamlined, but can still take many hours or days to complete. Not only must 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 Windows by default and must be installed prior to installing the applications. Inevitably, those features require more security updates and patches. By the time all deployment aspects are considered, more time is spent waiting for downloads and installs than is spent 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 of your virtual machines. Depending on how granular you want to make a specific template, the time to deployment can be as little as the time it takes to install, configure, and validate the application. You can use PowerShell tools and VMware vSphere Power CLI to bring the time and manual effort down dramatically.

Make sure to spread VMs across different VM datastores to properly load-balance the storage usage.

### 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 the Configuration tab.

After connecting to the ESXi host through SSH, initiate ping to the iSCSI storage server and to vMotion VMkernel port of other ESXi hosts with large MTU size and set "Do Not Fragment" bit of IP packet to 1. Use the vmkping command as shown in Figure 150.

```
Figure 150 Validation of Jumbo Frames support
```

```
💤 10.104.252.92 - PuTTY
                                                                              - 🗆 ×
 # vmkping -d -s 8972 10.10.22.21
PING 10.10.22.21 (10.10.22.21): 8972 data bytes
3980 bytes from 10.10.22.21: icmp_seq=0 ttl=64 time=0.644 ms
8980 bytes from 10.10.22.21: icmp_seq=1 ttl=64 time=0.472 ms
3980 bytes from 10.10.22.21: icmp_seq=2 ttl=64 time=0.475 ms
 -- 10.10.22.21 ping statistics ---
 packets transmitted, 3 packets received, 0% packet loss
round-trip min/avg/max = 0.472/0.530/0.644 ms
 # vmkping -d -s 8972 10.10.22.22
PING 10.10.22.22 (10.10.22.22): 8972 data bytes
3980 bytes from 10.10.22.22: icmp_seq=0 ttl=64 time=0.770 ms
8980 bytes from 10.10.22.22: icmp_seq=1 ttl=64 time=0.484 ms
8980 bytes from 10.10.22.22: icmp_seq=2 ttl=64 time=0.432 ms
   10.10.22.22 ping statistics ---
3 packets transmitted, 3 packets received, 0% packet loss
round-trip min/avg/max = 0.432/0.562/0.770 ms
~ # vmkping -d -s 8972 10.10.20.10
PING 10.10.20.10 (10.10.20.10): 8972 data bytes
8980 bytes from 10.10.20.10: icmp_seq=0 ttl=255 time=0.650 ms
8980 bytes from 10.10.20.10: icmp_seq=1 ttl=255 time=0.423 ms
3980 bytes from 10.10.20.10: icmp_seq=2 ttl=255 time=0.426 ms
 -- 10.10.20.10 ping statistics ---
 packets transmitted, 3 packets received, 0% packet loss
round-trip min/avg/max = 0.423/0.500/0.650 ms
 # vmkping -d -s 8972 10.10.21.10
PING 10.10.21.10 (10.10.21.10): 8972 data bytes
3980 bytes from 10.10.21.10: icmp_seq=0 ttl=255 time=0.644 ms
8980 bytes from 10.10.21.10: icmp_seq=1 ttl=255 time=4.471 ms
8980 bytes from 10.10.21.10: icmp_seq=2 ttl=255 time=0.453 ms
   10.10.21.10 ping statistics ---
 packets transmitted, 3 packets received, 0% packet loss
 ound-trip min/avg/max = 0.453/1.856/4.471 ms
```

Ensure that the packet size is 8972 due to various L2/L3 overhead. Ping must be successful. If ping is not successful verify that 9000 MTU configured at each of the following steps:

1. 9000 MTU on all the Ethernet interfaces configured for iSCSI server on the VNXe storage device.

- 2. Make sure that a "jumbo-mtu" policy map is created at Nexus 3000 series switches with default class having MTU 9000. Make sure that "jumbo-mtu" policy is applied to system classes on the ingress traffic.
- **3.** Make sure that 9000 MTU is set on the vSwitches as well as the VMkernel ports on them used configured for vMotion and iSCSI networking.

# Validating Cisco Solution for EMC VSPEX with VMware Architectures

This section provides a list of items that should be reviewed once 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 prior to deployment into production:

- On each vSphere server, verify that the vSwitch that hosts the client VLANs has been 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 required virtual machine port-groups have been 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/iSCSI and jumbo MTU.
- Create a test virtual machine that accesses the datastore and is able to do 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, have a continuous ping to default gateway and make sure that 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:

- 1. Administratively shutdown one of the two data links connected to the server. 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 forwarding some data from virtual machines on the Nexus switches.
- **2.** Administratively shutdown one of the two data links connected to the storage array. Make sure that storage is still available from all the ESXi hosts. Upon administratively enabling the shutdown port, the traffic should be rebalanced.
- Reboot one of the two Nexus 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 switches.

- 4. Reboot the active storage processor of the VNXe storage array and make sure that all the iSCSI targets are still accessible during and after the reboot of the storage processor.
- 5. Fully load all the virtual machines of the solution. Shutdown one of the ESXi nodes in the cluster. 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. Note that in 50 virtual machines architectures, 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 Server 2012 to test scaling of the solution in Cisco labs. Figure 150 provides details on the test profile used.

### Table 10 VDBench Details

Profile Characteristics	Value
Number of virtual machines	50
Virtual machine OS	Windows Server 2010
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 machines	25 IOPS
Number of datastores to store virtual machine disks	2
Disk and RAID type for datastores	RAID 5, 600 GB, 15k rpm, 3.5-inch SAS disks

# **Bill of Material**

Table 11 gives details of the components used in the CVD for 50 virtual machines configuration.

Table 11 Component Description

Description	Part #
Cisco UCS C220 M3 rack servers	UCSC-C220-M3S
CPU for Cisco UCS C220 M3 rack servers	UCS-CPU-E5-2650
Memory for Cisco UCS C220 M3 rack servers	UCS-MR-1X082RY-A
RAID local storage for rack servers	UCSC-RAID-11-C220
Broadcom 1Gbps adapter for 50 VMs solution	N2XX-ABPCI03-M3
Cisco Nexus 3048 switches for 50 VMs solution	N3K-C3048TP-1GE
10 Gbps SFP+ multifiber mode	SFP-10G-SR

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For more information on the part numbers and options available for customization, see Cisco C220 M3 server specsheet at:

http://www.cisco.com/en/US/prod/collateral/ps10265/ps10493/C220M3\_SFF\_SpecSheet.pdf

# **Customer Configuration Data Sheet**

Before you start the configuration, gather some customer-specific network and host configuration information. Table 12, Table 13, Table 14, Table 15, Table 16, Table 17 provide information on assembling the required network and host address, numbering, and naming information. This worksheet can also be used as a "leave behind" document for future reference.

#### Table 12 Common Server Information

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

### Table 13 VMware Server Information

Server Name	Purpose	Primary IP	Private Net (storage) addresses		VMkernel IP	vMotion IP
	ESXi					
	Host 1					
	ESXi					
	Host 2					
	ESXi					
	Host 3					

### Table 14 Array Information

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Array name	
Admin account	
Management IP	
Storage pool name	

### Table 14 Array Information (continued)

Array name	
Datastore name	
iSCSI Server IP (SP-A and SP-B)	

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### Table 15 Network Infrastructure Information

Name	Purpose	IP	Subnet Mask	Default Gateway
	Cisco Nexus 3048 Switch A			
	Cisco Nexus 3048 Switch B			

#### Table 16 VLAN Information

Name	Network Purpose	VLAN ID	Allowed Subnets
vlan-mgmt	Virtual Machine Networking		
	ESXi Management		
vlan-iscsi-a	iSCSI Server		
vlan-iscsi-b	iSCSI Server		
vlan-vMotion	vMotion traffic network		
vlan-vmcomm	Data VLAN of customer VMs as		
(multiple)	needed		

### Table 17Service Accounts

Account	Purpose	Password (optional, secure appropriately)
	Microsoft Windows Server administrator	
Root	ESXi root	
	Array administrator	
	vCenter administrator	
	SQL server administrator	
	Nexus 3048 administrator	

# **References**

Cisco UCS:

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

http://www.cisco.com/en/US/products/ps9441/Products\_Sub\_Category\_Home.html

EMC VNXe3xxx series resources:

http://www.emc.com/storage/vnx/vnxe-series.htm#!resource VMware vSphere: http://www.vmware.com/products/vsphere/overview.html VMware vSphere 5.1 documentation: http://pubs.vmware.com/vsphere-51/index.jsp Microsoft SQL Server installation guide http://msdn.microsoft.com/en-us/library/ms143219.aspx

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