

EMC VSPEX END-USER COMPUTING

VMware Horizon View 5.3 and VMware vSphere
for up to 2,000 Virtual Desktops

Enabled by EMC Next-Generation VNX and EMC Powered Backup

EMC VSPEX

Abstract

This Implementation Guide describes the high-level steps required to deploy an EMC® VSPEX® End-User Computing solution for VMware Horizon View and VMware vSphere enabled by EMC next-generation VNX® storage and EMC Powered Backup.

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**EMC VSPEX End-User Computing
VMware Horizon View 5.3 and VMware vSphere for up to 2,000 Virtual Desktops
Enabled by EMC Next-Generation VNX and EMC Powered Backup
Implementation Guide**

Part Number H12639

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Chapter 1 Introduction

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Purpose of this guide

The EMC® VSPEX® End-User Computing architecture provides the customer with a modern system capable of hosting a large number of virtual desktops at a consistent performance level. This VSPEX End-User Computing solution for VMware Horizon View 5.3 runs on a VMware vSphere virtualization layer backed by the highly available EMC VNX® family, which provides the storage. It is designed to be layered on a VSPEX Private Cloud for VMware vSphere Proven Infrastructure.

The compute and network components, which are defined by the VSPEX partners, are designed to be redundant and sufficiently powerful to handle the processing and data needs of a large virtual machine environment. EMC Avamar® backup and recovery solutions provide data protection for VMware Horizon View data and RSA® SecurID® provides optional secure user authentication functionality.

This VSPEX End-User-Computing solution is validated at three different points of scale—500, 1,000, and 2,000 virtual desktops. These validated configurations are based on a reference desktop workload and form the basis for creating cost-effective, custom solutions for individual customers. A smaller 250 virtual desktop environment based on the EMC VNXe®3300 is described in *EMC VSPEX End-User Computing: VMware Horizon View 5.2 and VMware vSphere 5.1 for up to 250 Virtual Desktops Proven Infrastructure Guide*.

An end-user computing or virtual desktop infrastructure is a complex system offering. This Implementation Guide describes how to implement, with best practices, the resources necessary to deploy an end-user computing solution using VMware Horizon View for VMware vSphere enabled by EMC next-generation VNX and EMC Powered Backup.

Business value

Business applications are moving into a consolidated compute, network, and storage environment. This VSPEX End-User Computing solution with VMware reduces the complexity of configuring every component of a traditional deployment model. The solution reduces the complexity of integration management while maintaining application design and implementation options. It also provides unified administration, while enabling adequate control and monitoring of process separation.

The business benefits of the VSPEX End-User Computing solution for VMware Horizon View include:

- An end-to-end virtualization solution to utilize the capabilities of the unified infrastructure components
- Efficient virtualization of up to 2,000 virtual desktops for varied customer use cases
- Reliable, flexible, and scalable reference architectures

Scope

This Implementation Guide describes the high-level steps required to deploy the VSPEX End-User Computing solution for VMware Horizon View 5.3, which is layered on a VSPEX Private Cloud for VMware vSphere Proven Infrastructure . It provides examples of deployments on EMC next-generation VNX5200, VNX5400, and VNX5600 storage arrays. The same principles and guidelines apply to all next-generation VNX models that have been validated as part of the VSPEX program.

EMC Powered Backup solutions for VMware Horizon View data protection are described in a separate document, *EMC Backup and Recovery for VSPEX for End User Computing with VMware Horizon View Design and Implementation Guide*.

The optional RSA SecurID secure user authentication solution for VMware Horizon View is also described in a separate document, *Securing EMC VSPEX End-User Computing with RSA SecurID: VMware Horizon View 5.2 and VMware vSphere 5.1 for up to 2,000 Virtual Desktops Design Guide*.

Audience

This guide is intended for internal EMC personnel and qualified EMC VSPEX Partners. The guide assumes that VSPEX partners who intend to deploy this VSPEX Proven Infrastructure for VMware Horizon View have the necessary training and background to install and configure an end-user computing solution based on Horizon View with VMware vSphere as the hypervisor, VNX series storage systems, and associated infrastructure.

Readers should also be familiar with the infrastructure and database security policies of the customer installation.

This guide provides external references where applicable. EMC recommends that partners implementing this solution are familiar with these documents. For details, refer to [Essential reading](#) and [Chapter 6: Reference Documentation](#).

Terminology

Table 1 lists the terminology used in this guide.

Table 1. Terminology

Term	Definition
Linked clones	Desktops provisioned as linked clones share a common base image within a desktop pool and therefore have a minimal storage footprint.
Reference architecture	The validated architecture that supports this VSPEX end-user-computing solution at a particular point of scale—that is, 500, 1,000, or 2,000 virtual desktops.
Reference workload	For VSPEX end-user computing solutions, the reference workload is defined as a single virtual desktop—the reference virtual desktop—with the workload characteristics indicated in the Design Guide. By comparing the customer’s actual usage to this reference workload, you can extrapolate which reference architecture to choose as the basis for the customer’s VSPEX deployment. Refer to the Design Guide for details.
SP	The storage processor (SP) is the compute component of the storage array. SPs are used for all aspects of data moving into, out of, and between arrays
VDI	Virtual Desktop Infrastructure (VDI) decouples the desktop from the physical machine. In a VDI environment, the desktop operating system (OS) and applications reside inside a virtual machine running on a host computer, with data residing on shared storage. Users access their virtual desktop from any computer or mobile device over a private network or internet connection.

Chapter 2 Before You Start

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Overview

This chapter provides an overview of important information of which you need to be aware, documents with which you need to be familiar, and tasks you need to perform before you start implementing your VSPEX End-User Computing with VMware Horizon View solution.

The Design Guide for this solution—*EMC VSPEX End-User Computing: VMware Horizon View 5.3 and VMware vSphere for up to 2,000 Virtual Desktops*—describes how to design and size your solution, allocate resources following best practices, and use all the benefits that VSPEX offers. The deployment examples in this Implementation Guide are based on the recommendations and examples in the Design Guide.

Pre-deployment tasks

Pre-deployment tasks include procedures that do not directly relate to environment installation and configuration, but you will need the results from these tasks at the time of installation. Examples of pre-deployment tasks are collection of host names, IP addresses, VLAN IDs, license keys, installation media, and so on. You should perform these tasks before the customer visit to reduce the amount of time required on site.

Table 2. Tasks for pre-deployment

Task	Description	Reference
Gather documents	Gather the related documents listed in Essential reading and Reference Documentation . These are used throughout this document to provide details on setup procedures, sizing, and deployment best practices for the various components of the solution.	• Essential reading • Reference Documentation
Gather tools	Gather the required and optional tools for the deployment. Use Table 4 to confirm that all equipment, software, and appropriate licenses are available before the deployment process.	Deployment prerequisites checklist
Gather data	Collect the customer-specific configuration data for networking, arrays, accounts, and so on. Enter this information into the Customer Configuration Worksheet for reference during the deployment process. In addition, for the most comprehensive array-specific information, complete the relevant VNX worksheet. These worksheets are available on EMC Online Support .	• <i>VNX Block Configuration Worksheet</i> • <i>VNX Installation Assistant for File/Unified Worksheet</i> • Customer Configuration Worksheet

Deployment workflow

To design and implement your end-user computing solution, refer to the process flow in Table 3¹.

Table 3. Deployment workflow

Step	Action
1	Use the Customer Sizing Worksheet in the Design Guide to collect customer requirements.
2	Use the EMC VSPEX Sizing Tool to determine the recommended VSPEX reference architecture for your end-user computing solution, based on the user requirements collected in Step 1. For more information about the Sizing Tool, refer to the EMC VSPEX Sizing Tool portal . Note: If the Sizing Tool is not available, you can manually size the application using the guidelines in the Design Guide.
3	Use the Design Guide to determine the final design for your VSPEX solution. Note: Ensure that all resource requirements are considered, not just the requirements for end-user computing.
4	Select and order the right VSPEX reference architecture and Proven Infrastructure. Refer to the VSPEX Proven Infrastructure Guide in Essential reading for guidance on selecting a Private Cloud Proven Infrastructure.
5	Follow this Implementation Guide to deploy and test your VSPEX solution. Note: If you already have a VSPEX Proven Infrastructure environment, you can skip the implementation steps that are already completed.

Essential reading

EMC recommends that you read the following documents, available from the VSPEX space in the [EMC Community Network](#) or from [EMC.com](#) or the [VSPEX Proven Infrastructure partner portal](#).

VSPEX Solution Overview

Refer to the following VSPEX Solution Overview document:

- *EMC VSPEX End User Computing Solutions with VMware vSphere and VMware View*

VSPEX Design Guide

Refer to the following VSPEX Design Guide:

- *EMC VSPEX End-User Computing: VMware Horizon View 5.3 and VMware vSphere for up to 2,000 Virtual Desktops*

¹ If your solution includes backup and recovery components, refer to the *EMC Backup and Recovery for VSPEX for End-User Computing with VMware Horizon View Design and Implementation Guide* for backup and recovery sizing and implementation guidelines.

VSPEX Proven Infrastructure Guide

Refer to the following VSPEX Proven Infrastructure Guide:

- *EMC VSPEX Private Cloud: VMware vSphere 5.5 for up to 1,000 Virtual Machines*

EMC Powered Backup for VSPEX guide

Refer to the following EMC Powered Backup for VSPEX guide:

- *EMC Backup and Recovery for VSPEX for End-User Computing with VMware Horizon View Design and Implementation Guide*

Deployment prerequisites

Table 4 itemizes the hardware, software, and license requirements to configure the solution. Visit [EMC Online Support](#) for more information on these prerequisites.

Table 4. Deployment prerequisites checklist

Requirement	Description
Hardware	• Physical servers with sufficient capacity to host the virtual desktops as recommended in the Design Guide • VMware vSphere servers to host virtual infrastructure servers • Networking switch port capacity and capabilities as required for end-user computing • EMC VNX multiprotocol storage array with the required disk layout Note: These requirements might be covered by existing infrastructure.
Software	• VMware vSphere 5.5 installation media • VMware vCenter Server 5.5 installation media • VMware vShield Manager Open Virtualization Appliance (OVA) file • VMware vCenter Operations Manager OVA file • VMware vCenter Operations Manager for Horizon View Adapter • VMware Horizon View 5.3 installation media • VMware vShield Endpoint partner antivirus solution management server software • VMware vShield Endpoint partner security virtual machine software • EMC Virtual Storage Integrator (VSI) for VMware vSphere Unified Storage Management • EMC VSI for VMware vSphere Storage Viewer • Microsoft Windows Server 2008 R2 installation media (suggested OS for VMware vCenter and VMware View Connection Server) • Microsoft Windows 7 SP1 installation media • Microsoft SQL Server 2008 or later installation media Note: This requirement might be covered in the existing infrastructure.
Software (block variant only)	• EMC PowerPath® Viewer • EMC PowerPath Virtual Edition (PowerPath/VE)

Requirement	Description
Software (file variant only)	VMware Storage APIs for Array Integration (VAAI) Plug-in for VNX for File
Licenses	- VMware vCenter 5.5 license key - VMware vSphere Desktop license keys - VMware Horizon View Premier 5.3 license keys - VMware vShield Endpoint license keys (VMware) - VMware vShield Endpoint license keys (vShield partner) - VMware vCenter Operations Manager - Microsoft Windows Server 2008 R2 Standard Edition (or later) license keys Note: This requirement might be covered by an existing Microsoft Key Management Server (KMS). - Microsoft Windows 7 license keys Note: This requirement might be covered by an existing Microsoft Key Management Server (KMS). - Microsoft SQL Server license key Note: This requirement might be covered by an existing license.
Licenses (block variant only)	EMC PowerPath Virtual Edition license files

Chapter 3 Solution Overview

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Overview

This chapter provides an overview of the VSPEX End-User Computing for VMware Horizon View on VMware vSphere solution and the key technologies used in the solution. The solution has been designed and proven by EMC to provide the desktop virtualization, server, network, storage, and backup resources to support reference architectures at three points of scale: 500, 1000, and 2,000 virtual desktops.

Although the solution is designed to be layered on a VSPEX Private Cloud solution, the reference architectures do not include the configuration details for the underlying proven infrastructure. Refer to the VSPEX Proven Infrastructure Guides listed in [Essential reading](#) for information on configuring the required infrastructure components.

VSPEX Proven Infrastructures

EMC has joined forces with the industry-leading providers of IT infrastructure to create a complete virtualization solution that accelerates the deployment of the private cloud and VMware Horizon View virtual desktops. VSPEX enables customers to accelerate their IT transformation with faster deployment, greater simplicity and choice, higher efficiency, and lower risk, compared to the challenges and complexity of building an IT infrastructure themselves.

VSPEX validation by EMC ensures predictable performance and enables customers to select technology that uses their existing or newly acquired IT infrastructure while eliminating planning, sizing, and configuration burdens. VSPEX provides a virtual infrastructure for customers who want the simplicity that is characteristic of truly converged infrastructures, with more choice in individual stack components.

VSPEX Proven Infrastructures, as shown in Figure 1, are modular, virtualized infrastructures validated by EMC and delivered by EMC VSPEX partners. They include virtualization, server, network, storage, and backup layers. Partners can choose the virtualization, server, and network technologies that best fit a customer's environment, while the highly available EMC VNX family of storage systems and EMC Powered Backup technologies provide the storage and backup layers.

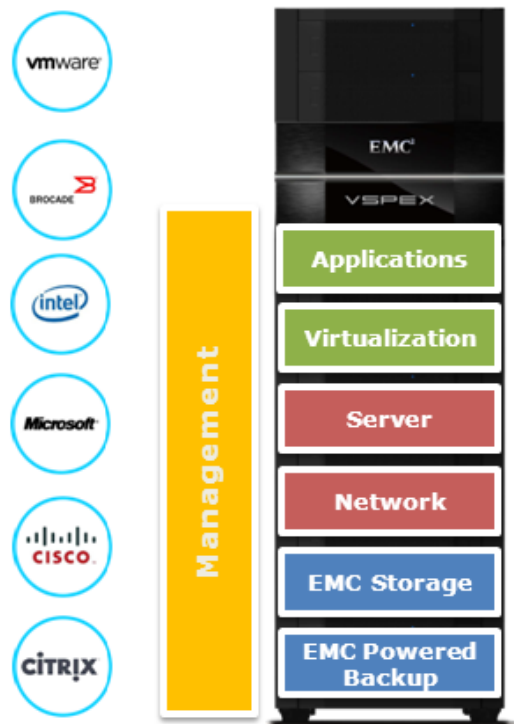


Figure 1. VSPEX Proven Infrastructures

Solution architecture

High-level architecture

The EMC VSPEX End-User Computing for VMware Horizon View solution provides a complete system architecture capable of supporting up to 2,000 virtual desktops and validates the infrastructure at three points of scale—500, 1,000, and 2,000 virtual desktops. The solution supports two storage-type variants: block and file.

Figure 2 shows the high-level architecture of the validated solution.

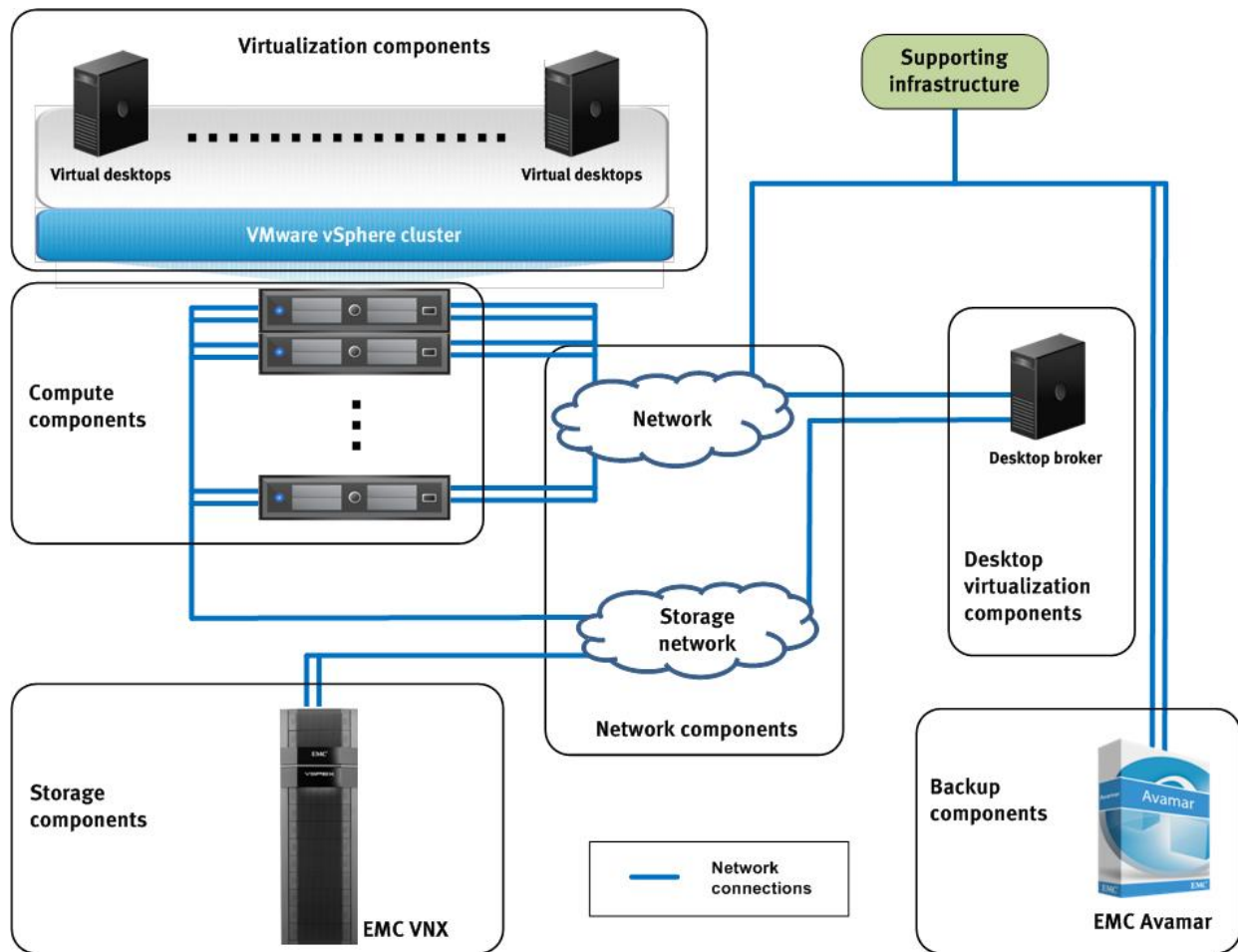


Figure 2. Architecture of the validated solution

The solution uses EMC VNX and VMware vSphere to provide the storage and virtualization platforms for a VMware Horizon View environment of Microsoft Windows 7 virtual desktops provisioned by VMware Horizon View Composer.

For the solution, we² deployed the VNX5200 to support up to 500 virtual desktops, the VNX5400 to support up to 1,000 virtual desktops, and the VNX5600 to support up to 2,000 virtual desktops.

The solution is designed to be layered on a VSPEX Private Cloud solution for VMware vSphere, backed by the highly available EMC VNX family, which provides the storage. The infrastructure services for the solution, as shown in Figure 3, can be provided by existing infrastructure at the customer site, by the VSPEX Private Cloud, or by deploying them as dedicated resources as part of the solution.

Planning and designing the storage infrastructure for a Horizon View environment is critical because the shared storage must be able to absorb large bursts of I/O that occur during a day. These bursts can lead to periods of erratic and unpredictable

² In this guide, "we" refers to the EMC Solutions engineering team that validated the solution.

virtual desktop performance. Users can adapt to slow performance, but unpredictable performance frustrates users and reduces efficiency.

To provide predictable performance for end-user computing solutions, the storage system must be able to handle the peak I/O load from the clients while keeping response time to a minimum. However, deploying many disks to handle brief periods of extreme I/O pressure is expensive to implement. This solution uses EMC FAST™ Cache to reduce the number of disks required.

EMC Powered Backup and recovery solutions enable user data protection and end-user recoverability. This Horizon View solution uses EMC Avamar and its desktop client to achieve this.

Logical architecture

The EMC VSPEX End-User Computing for VMware Horizon View solution includes two storage-type variants: block and file. Figure 3 shows the logical architecture of the solution for both variants.

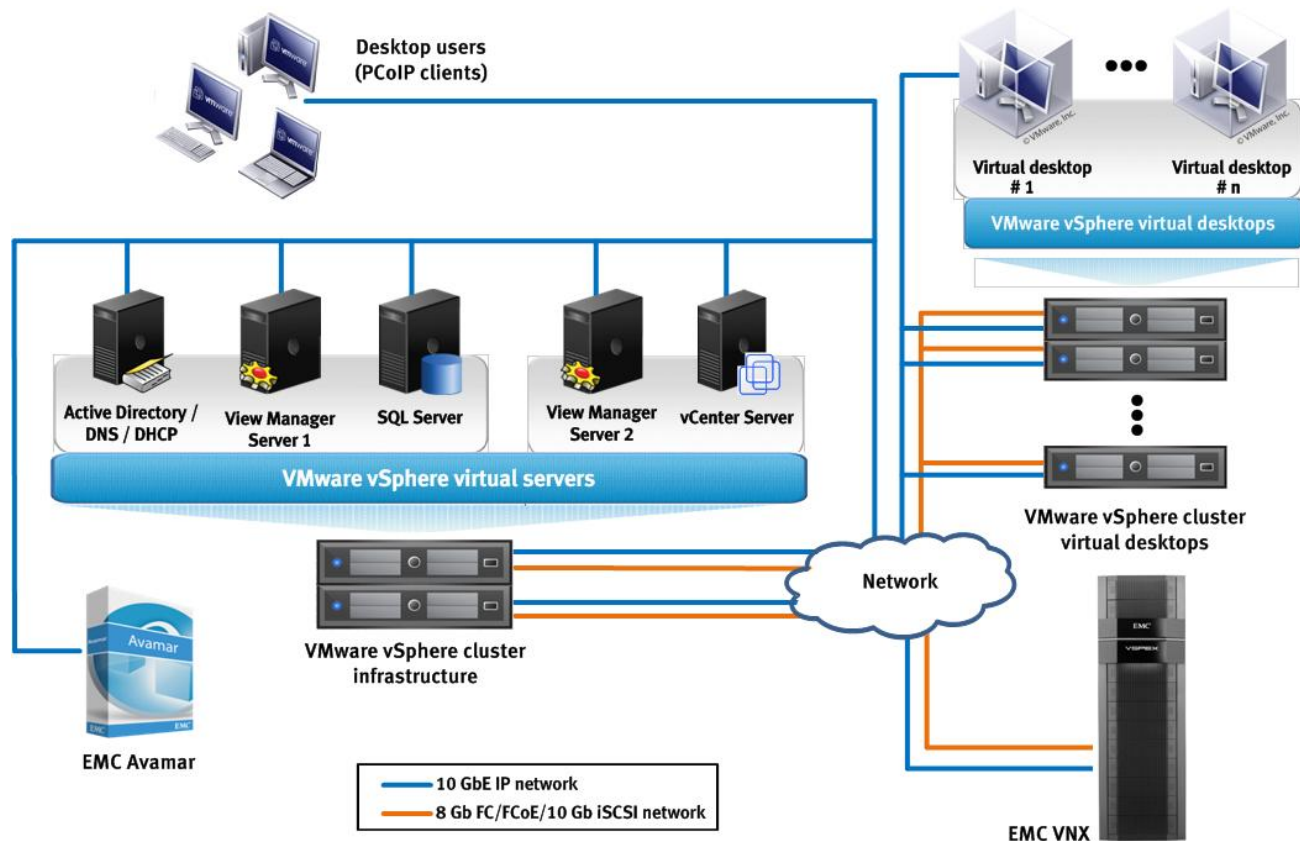


Figure 3. Logical architecture for both block and file storage

The block variant uses two networks: one storage network for carrying virtual desktop and virtual server OS data and one 10 Gb Ethernet network for carrying all other traffic. The storage network uses 8 Gb FC, 10 Gb CEE with FCoE, or 10 Gb Ethernet with iSCSI protocol. The file variant uses a 10 GbE IP network for all traffic.

Note: The solution also supports 1 Gb Ethernet if the bandwidth requirements are met.

Summary of key components

Table 1 summarizes the key technologies used in this solution. The Design Guide provides overviews of the individual components.

Table 1. Solution components

VSPEX layer	Components
Application layer	VMware Horizon View 5.3 desktop virtualization broker with: • View Manager • View Composer • View Persona Management • VMware View Storage Accelerator • VMware vCenter Operations Manager (vCops) for Horizon View • VMware Horizon Workspace
Virtualization layer	VMware vSphere hypervisor with: • VMware vSphere • VMware vCenter Server • VMware vSphere High Availability • vShield Endpoint
Compute layer	VSPEX defines the minimum amount of compute layer resources required but allows the customer to implement the requirements using any server hardware that meets these requirements.
Network layer	VSPEX defines the minimum number of network ports required for the solution and provides general guidance on network architecture, but allows the customer to implement the requirements using any network hardware that meets these requirements.
Storage layer	EMC next-generation VNX series with: • EMC Unisphere Management Suite • EMC Virtual Storage Integrator (VSI) for VMware vSphere • VMware vSphere Storage APIs for Array Integration • VMware vSphere Storage APIs for Storage Awareness • EMC VNX Snapshots • EMC SnapSure™ • EMC VNX Virtual Provisioning • EMC FAST Suite—FAST Cache and Fully Automated Storage Tiering for Virtual Pools (FAST VP)
Backup and recovery layer	EMC Avamar
Security layer	RSA SecurID

Chapter 4 Solution Implementation

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- Provision virtual desktops.....47**
- Set up EMC Avamar48**
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- Set up VMware vCenter Operations Manager for Horizon View.....51**

Overview

This chapter describes how to implement the reference architectures of the end-user computing solution. If you already have a VSPEX Proven Infrastructure environment, you can skip the sections for the implementation steps already completed.

Otherwise, refer to the VSPEX Proven Infrastructure Guide listed in [Essential reading](#) for information on configuring the required infrastructure components.

Note: This solution requires certain infrastructure services, as shown in Figure 3. These can be provided by existing infrastructure at the customer site, by a VSPEX Private Cloud, or by deploying them as dedicated resources as part of this solution.

Table 2 lists the main stages in the solution implementation process, with links to the relevant sections in the chapter.

Table 2. Implementation process overview

Stage	Description	Reference
1	Configure the switches and networks and connect to the customer network.	Network implementation
2	Install and configure the VNX.	Prepare and configure the storage array
3	Configure the virtual machine datastores.	Prepare and configure the storage array
4	Install and configure the servers.	Install and configure the vSphere hosts
5	Set up SQL Server (used by vCenter and Horizon View).	Install and configure the SQL Server database
6	Install and configure vCenter and virtual machine networking.	VMware vCenter Server deployment
7	Set up View Connection Server.	Set up VMware View Connection Server
8	Set up EMC Avamar.	Set up EMC Avamar
9	Set up vShield Endpoint.	Set up VMware vShield Endpoint
10	Set up VMware vCOPS for Horizon View.	Set up VMware vCenter Operations Manager for Horizon View

Network implementation

This section describes the requirements for preparing the network infrastructure required to support this solution. Table 3 summarizes the tasks to be completed, with references for further information.

Table 3. Tasks for switch and network configuration

Task	Description	Reference
Configure the infrastructure network	Configure the storage array and vSphere host infrastructure networking.	Configure the infrastructure network
Configure the VLANs	Configure private and public VLANs as required.	Vendor's switch configuration guide
Configure the storage network (block variant only)	Configure FC/FCoE switch ports and zoning for vSphere hosts and the storage array.	• Configure the storage network (block variant) • Vendor's switch configuration guide
Complete the network cabling	Connect the switch interconnect ports, VNX ports, and vSphere server ports.	Complete the network cabling

Configure the infrastructure network

The infrastructure network requires redundant network links for each vSphere host, the storage array, switch interconnect ports, and switch uplink ports. This configuration provides both redundancy and additional network bandwidth.

This configuration is required regardless of whether the network infrastructure for the solution already exists or is being deployed with other components of the solution.

Figure 4 shows a sample redundant Ethernet infrastructure for this solution. It illustrates the use of redundant switches and links to ensure that no single point of failure exists in network connectivity.

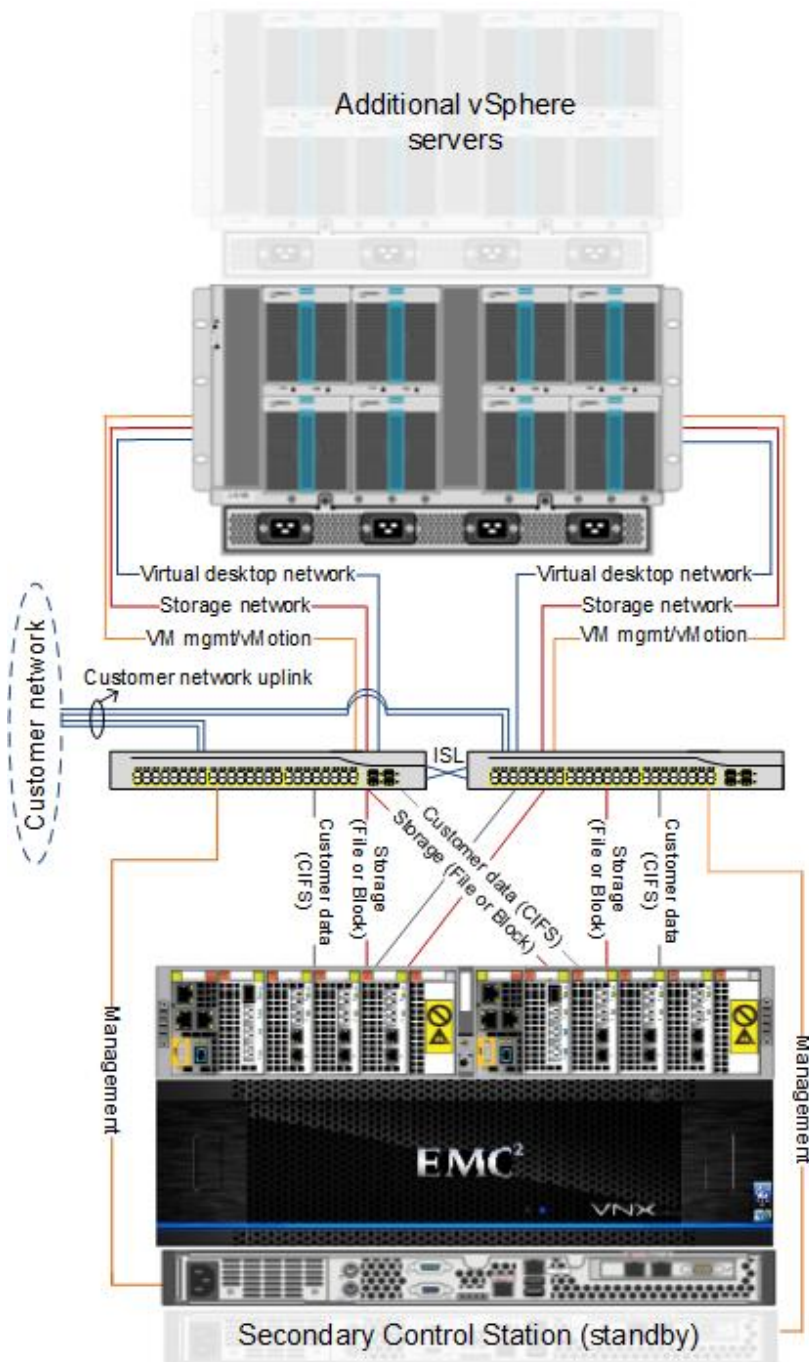


Figure 4. Sample Ethernet network architecture

Configure the VLANs

Ensure that there are adequate switch ports for the storage array and vSphere hosts. EMC recommends that you configure the vSphere hosts with a minimum of three VLANs:

- **Client access network:** Virtual machine networking and CIFS traffic (these are customer-facing networks, which can be separated if needed)
- **Storage network:** NFS/iSCSI/FCoE networking (private network)
- **Management network:** vSphere management and VMware vMotion (private network)

Configure the storage network (block variant)

The block variant of the solution requires a separate storage network. Here, we used a Fibre Channel (FC) network as an example. The infrastructure FC network requires redundant FC switches and links for each vSphere host and the storage array. This configuration provides both redundancy and additional storage network bandwidth. We connected each vSphere host to both FC switches, and each switch to each storage processor on the storage array. We then placed each FC connection between the vSphere host and the storage array in a separate FC zone.

Figure 5 shows the network architecture of this example.

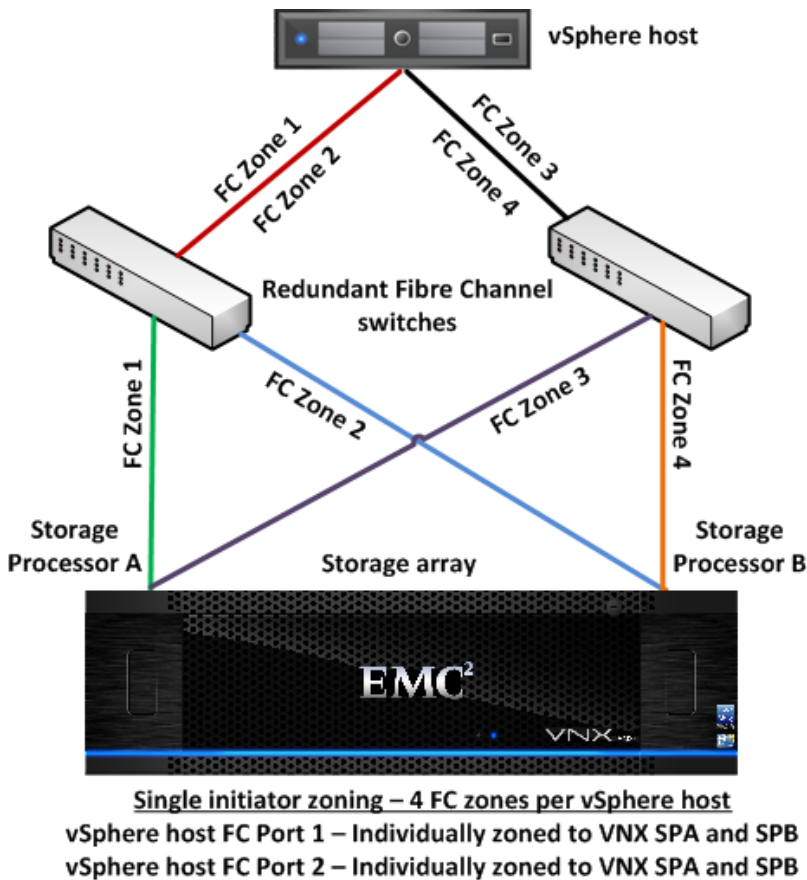


Figure 5. Sample FC network architecture

Complete the network cabling

Ensure that all solution servers, storage arrays, switch interconnects, and switch uplinks have redundant connections and are plugged into separate switching infrastructures. Ensure that there is a complete connection to the existing customer network.

Note: At this point, the new equipment is connected to the existing customer network. Ensure that unforeseen interactions do not cause service issues on the customer network.

Prepare and configure the storage array

This section describes how to configure the VNX storage array. In this solution, VNX provides NFS or VMware Virtual Machine File System (VMFS) data storage for VMware hosts. Table 4 shows the tasks for storage configuration.

Table 4. Tasks for storage configuration

Task	Description	Reference
Prepare the VNX	Install the VNX hardware according to the product documentation.	VSPEX Private Cloud Proven Infrastructure Guide
Set up the initial VNX configuration	Configure the IP address information and other key parameters on the VNX.	VSPEX Private Cloud Proven Infrastructure Guide
Provision core data storage	Configure the core data storage, as required for the selected solution variant and size.	<i>VNX5200 Unified Installation Guide</i> <i>VNX5400 Unified Installation Guide</i> <i>VNX5600 Unified Installation Guide</i> <i>VNX File and Unified Worksheet</i> <i>VNX Block Configuration Worksheet</i> <i>Unisphere System Getting Started Guide</i> - Vendor's switch configuration guide - Solution Design Guide
Provision storage for VMFS datastores (block only)	Create LUNs that will be presented to the vSphere servers as VMFS datastores hosting the virtual desktops. Enable FAST Cache.	
Provision storage for NFS datastores (file only)	Create NFS file systems that will be presented to the vSphere servers as NFS datastores hosting the virtual desktops. Enable FAST Cache.	
Provision optional storage for user data	Create CIFS file systems that will be used to store roaming user profiles and home directories. Optionally, configure FAST VP.	
Provision optional storage for infrastructure virtual machines	Optionally, create additional VMFS/NFS datastores to host SQL Server, domain controller, vCenter Server, and VMware View Connection Server virtual machines.	Setting Virtual Provisioning thresholds and alerts
Configure Virtual Provisioning thresholds and alerts	Configure storage pool capacity thresholds and related alerts.	

Prepare the VNX

There are no specific setup steps for this solution. For instructions on assembly, racking, cabling, and powering the VNX array, refer to the relevant VNX installation guide:

- For up to 500 virtual desktops: *EMC VNX5200 Unified Installation Guide*
- For up to 1,000 virtual desktops: *EMC VNX5400 Unified Installation Guide*
- For up to 2,000 virtual desktops: *EMC VNX5600 Unified Installation Guide*

Set up the initial VNX configuration

After preparing the VNX, configure key information about the existing environment so that the storage array can communicate with it. Configure the following common items in accordance with your IT data center policies and existing infrastructure information:

- Domain Name System (DNS)
- Network Time Protocol (NTP)
- Storage network interfaces
- Storage network IP address
- Common Internet File System (CIFS) services and Active Directory (AD) Domain membership

The reference documents listed in [Table 4](#) provide more information on how to configure the VNX platform. The Design Guide provides information about the disk layout.

Provision core data storage

The Design Guide describes the target storage layout for both the block and file variants for 500, 1,000, and 2,000 virtual desktops.

Provision storage for VMFS datastores (block only)

Complete the following steps in EMC Unisphere to configure LUNs on the VNX for storing virtual desktops:

1. Create a block-based RAID 5 storage pool with the characteristics shown in Table 5.

Table 5. Create a block-based RAID 5 storage pool

Configuration	Number of drives	Drive type
500 virtual desktops	10	300 GB SAS
1,000 virtual desktops	15	300 GB SAS
2,000 virtual desktops	30	300 GB SAS

- a. Log in to Unisphere.
- b. Select the array used in the solution.
- c. Select **Storage > Storage Configuration > Storage Pools**.
- d. Click **Pools**.
- e. Click **Create**.

- f. In the dialog box that appears, specify the pool parameters, and then click **OK**.
 - g. Ensure that FAST Cache is enabled for the storage pool.
2. Configure the required LUNs from the pool, as detailed in Table 6, to present to the vSphere servers as four VMFS datastores.

Table 6. LUNs on VNX for storing virtual desktops

Configuration	Number of LUNs	LUN size (GB)
500 virtual desktops	1	50
	4	485
1,000 virtual desktops	2	50
	8	360
2,000 virtual desktops	2	50
	16	360

- a. Select **Storage > LUNs**.
 - b. In the dialog box that appears, click **Create**.
 - c. Select the pool created in Step 1 and specify the LUN size and number of LUNs to be provisioned, as detailed in Table 6.
3. To enable vSphere servers to access the newly created LUNs, configure a storage group:
 - a. Select **Hosts > Storage Groups**.
 - b. Create a new storage group.
 - c. Select the LUNs and ESXi hosts to add to the storage group.

Provision storage for NFS datastores (file only)

Complete the following steps in Unisphere to configure NFS file systems on the VNX to store virtual desktops:

1. Create a block-based RAID 5 storage pool with the characteristics shown in Table 7.

Table 7. Create a block-based RAID 5 storage pool

Configuration	Number of drives	Drive type
500 virtual desktops	10	300 GB SAS
1,000 virtual desktops	15	300 GB SAS
2,000 virtual desktops	30	300 GB SAS

- a. Log in to Unisphere.
 - b. Select the VNX array used for the solution.
 - c. Select **Storage > Storage Configuration > Storage Pools**.
 - d. Click **Pools**.

- e. Click **Create**.
 - f. In the dialog box that appears, specify the pool parameters, and then click **OK**.
 - g. Ensure that FAST Cache is enabled for the pool.
2. Configure the required LUNs from the pool, as detailed in Table 8, to present to the Data Mover as dvols of a system-defined NAS pool.

Table 8. Configure LUNs for NAS pool

Configuration	Number of LUNs	LUN size (GB)
500 virtual desktops	10	200
1,000 virtual desktops	10	300
2,000 virtual desktops	10	600

- a. Select **Storage > LUNs**.
- b. Click **Create**.
- c. Select the pool created in Step 1 and specify the user capacity and number of LUNs, as detailed in Table 8.
- d. Select **Hosts > Storage Groups**.
- e. Select **File storage**.
- f. Under **Available LUNs**, click **Connect LUNs**.
- g. Select the 10 LUNs you just created.
They appear under **Selected LUNs**.
- h. Select **A new storage pool for file is ready or manually rescan**.
- i. Select **Storage > Storage Pool for File > Rescan Storage System** to create multiple file systems.

Note: EMC Performance Engineering best practice recommends that you create approximately 1 LUN for every 4 drives in the storage pool and that you create LUNs in even multiples of 10. Refer to *EMC VNX Unified Best Practices For Performance Applied Best Practices Guide*.

3. Configure file systems from the NAS pool, as detailed in Table 9, to present to the vSphere servers as four NFS datastores.

Table 9. Configure file systems as NFS datastores

Configuration	Number of file systems	File system size (GB)
500 virtual desktops	1	50
	4	485
1,000 virtual desktops	2	50
	8	360

Configuration	Number of file systems	File system size (GB)
2,000 virtual desktops	2	50
	16	360

- a. Select **Storage > Storage Configuration > File Systems**.
 - b. In the dialog box that appears, click **Create**.
 - c. Select **Create** from **Storage Pool**.
 - d. In **Storage Capacity**, type the required number of file systems (as detailed in Table 9) and accept the default values for all other parameters.
4. Export the file systems using NFS, and give root access to vSphere servers.
 5. Configure the required Data Mover parameters:
 - a. Select **Settings > Data Mover Parameters**.
 - b. From the **Set Parameters** list, select **All Parameters**, as shown in Figure 6.



Figure 6. View all Data Mover parameters

- c. For each Data Mover, select **Properties**, and update **nthreads**, as shown in Figure 7.

Note: The default number of threads serving NFS requests is 384 per Data Mover on VNX. Because more than 384 desktop connections are required in this solution, increase the number of active NFS threads on each Data Mover to a maximum of 512 (for 500 virtual desktops) or 1,024 (for 1,000 virtual desktops) or 2,048 (for 2,000 virtual desktops).

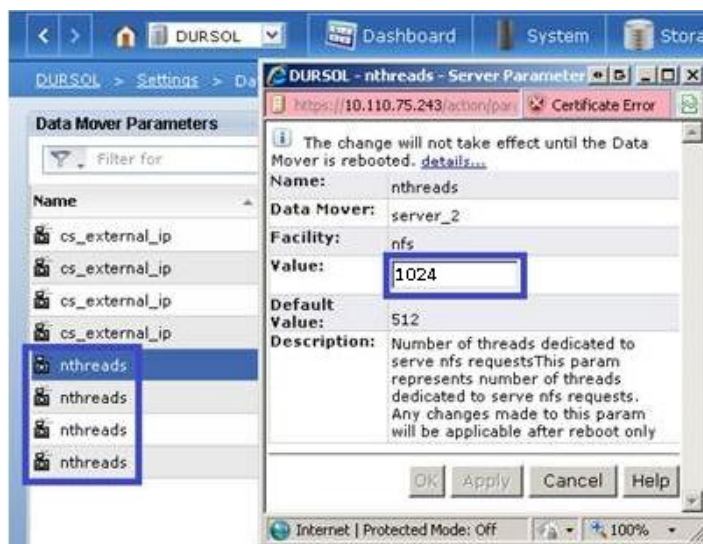


Figure 7. Set nthread parameter

Configure Fast Cache

To configure FAST Cache on the storage pool for this solution, complete the following steps in Unisphere:

1. To view FAST Cache information for the VNX array:
 - a. In Unisphere, click **Properties** and select **Manage Cache**.
 - b. In the **Storage System Properties** dialog box, shown in Figure 8, click **FAST Cache** to view FAST Cache information.

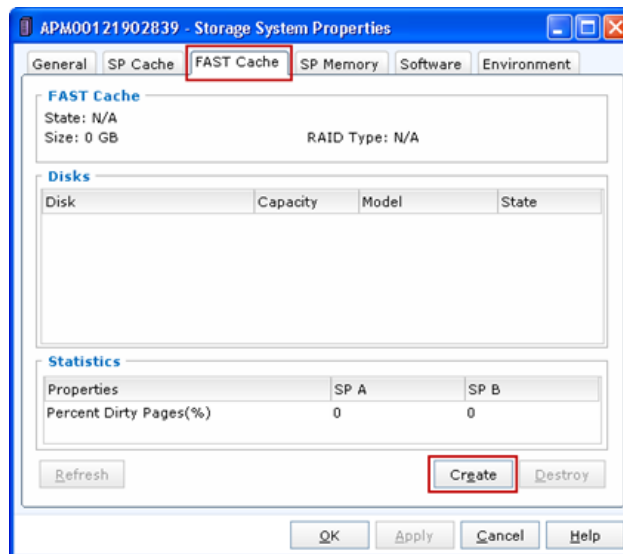


Figure 8. Storage System Properties dialog box

2. To create FAST Cache:
 - a. Click **Create** to open the **Create FAST Cache** dialog box.

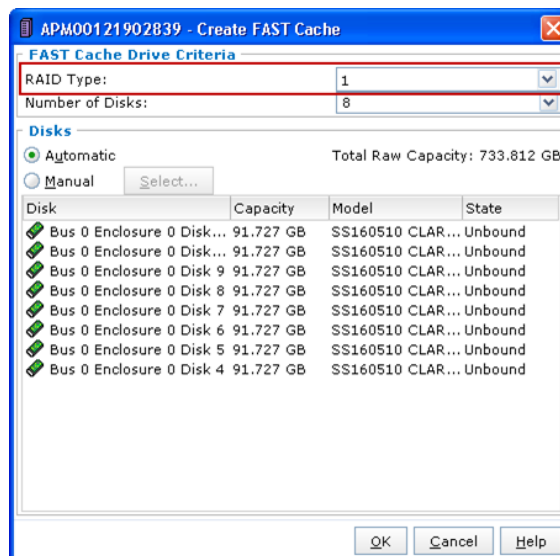


Figure 9. Create FAST Cache dialog box

- b. Select the required number of disks to be used for FAST Cache.

Note: To determine the number of flash drives to use, refer to the Design Guide.

- c. With **Automatic** selected, flash drives that will be used for creating FAST Cache are listed in the bottom portion of the dialog box.

To select the drives manually, select **Manual**.

- d. Click **OK** to create FAST Cache using the selected disks.
-

Note: If a sufficient number of flash drives is not available, an error message appears and FAST Cache cannot be created.

- e. Enable FAST Cache for the storage pool created for the solution.
- After FAST Cache is created, it is enabled by default for all new pools created.
 - To enable FAST Cache for an existing pool, select the **FAST Cache Enabled** option under **Advanced** in the **Storage Pool Properties** dialog box.

The FAST Cache feature on VNX does not cause an instant performance improvement. The system must collect data about access patterns and promote frequently used information into the cache. This process can take a few hours during which the performance of the array steadily improves.

Provision optional storage for user data

If the storage required for user data (that is, roaming user profiles or View Persona Management repositories and home directories) does not exist in the production environment already and the optional user data disk pack has been purchased, complete the following steps in Unisphere to configure two CIFS file systems on VNX:

1. Create a block-based RAID 6 storage pool with the characteristics shown in Table 10.

Table 10. Create block-based RAID 6 storage pool

Configuration	Number of drives	Drive type
500 virtual desktops	8	2 TB NL-SAS
1,000 virtual desktops	16	2 TB NL-SAS
2,000 virtual desktops	32	2 TB NL-SAS

The Design Guide describes the storage layouts.

2. Provision the required LUNs from the pool, as detailed in Table 11, to present to the Data Mover as dvols of a system-defined NAS pool.

Table 11. Configure LUNs for NAS pool

Configuration	Number of LUNs	LUN size (TB)
500 virtual desktops	10	1
1,000 virtual desktops	10	1.5

Configuration	Number of LUNs	LUN size (TB)
2,000 virtual desktops	10	3

3. Provision four file systems from the NAS pool to be exported as CIFS shares on a CIFS server.

Configure FAST VP for user data

You can configure FAST VP to automate data movement between storage tiers in the user data storage pool—this is optional. You can configure FAST VP at the pool level or at the LUN level.

Configuring FAST VP at pool level

To view and manage FAST VP at the pool level, select the storage pool to be used for user data and click **Properties** to open the **Storage Pool Properties** dialog box.

Figure 10 shows the tiering information for a specific FAST VP enabled pool.

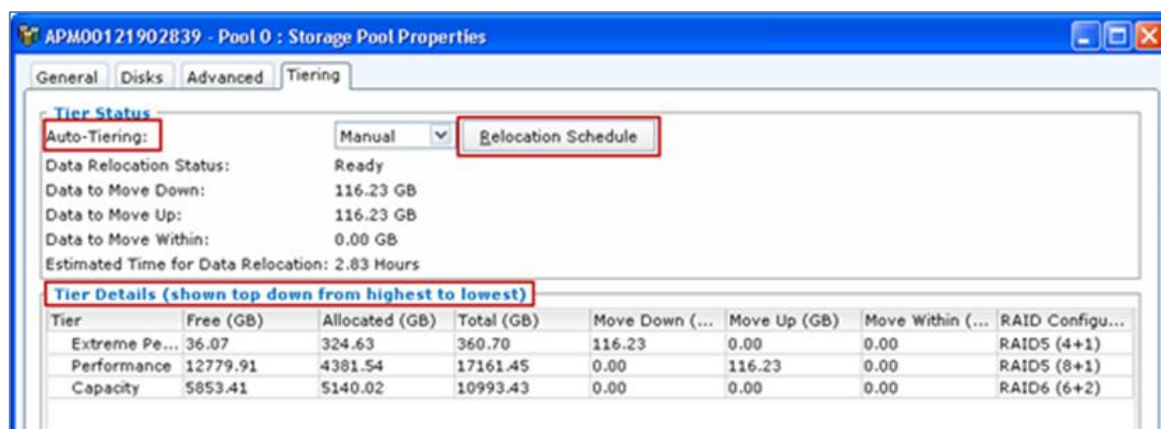


Figure 10. Storage Pool Properties dialog box

Tier Status shows FAST VP relocation information specific to the pool selected. **Tier Details** shows the exact distribution of the data.

You can select scheduled relocation at the pool level from the **Auto-Tiering** menu. You can set this to either **Automatic** or **Manual**. Click **Relocation Schedule** to open the **Manage Auto-Tiering** window shown in Figure 11.

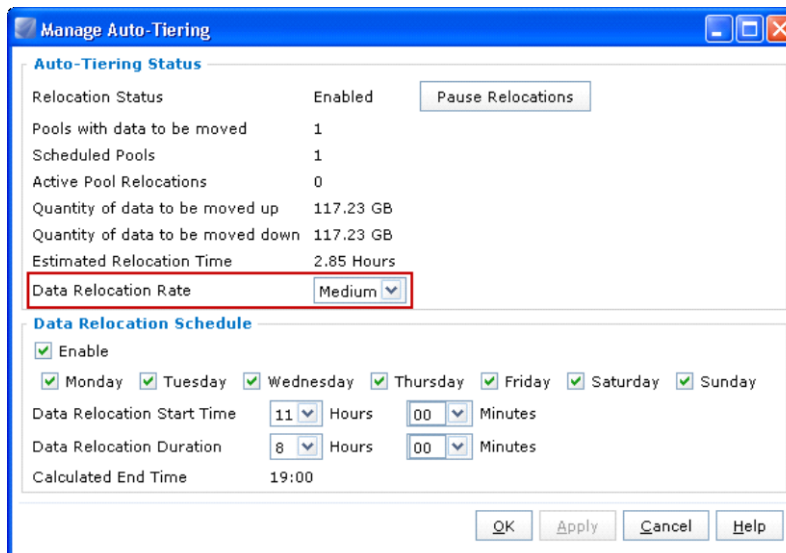


Figure 11. Manage Auto-Tiering Window

From this window, you can control the **Data Relocation Rate**. The default rate is set to **Medium** to avoid significantly affecting host I/O.

Note: FAST VP is a completely automated tool and you can schedule relocations to occur automatically. EMC recommends that relocations be scheduled during off-peak hours to minimize any potential performance impact.

Configuring FAST VP at LUN level

Some FAST VP properties are managed at the LUN level. Right-click the required LUN and select **Properties** to open the **LUN Properties** dialog box. In this dialog box, click **Tiering** to view tiering information for the LUN, as shown in Figure 12.

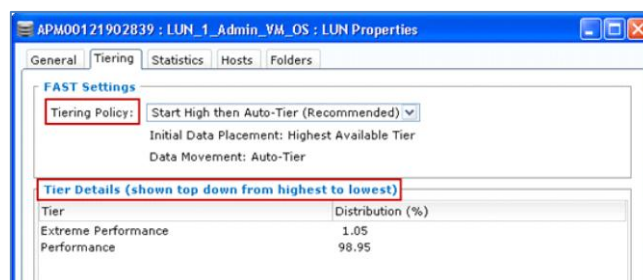


Figure 12. LUN Properties window

Tier Details displays the current distribution of slices within the LUN. You can select a tiering policy for the LUN from the **Tiering Policy** list box. The default and recommended setting is **Start High then Auto-Tier**.

Provision optional storage for infrastructure virtual machines

If the storage required for infrastructure virtual machines (that is, SQL Server, domain controller, vCenter Server, and Horizon View Connection servers) does not exist in the production environment already and you have purchased the optional user data disk pack, configure an NFS file system on the VNX to be used as the NFS datastore in which the infrastructure virtual machines reside. Repeat the configuration steps in [Provision storage for NFS datastores \(file only\)](#) to provision the optional storage, while taking into account the smaller number of drives.

Setting Virtual Provisioning thresholds and alerts

Figure 13 shows the **Storage Pool Properties** dialog box in Unisphere, which displays parameters such as **Total**, **Free**, **Percent Full**, and **Total Allocation** for a system's physical capacity, and **Total Subscription**, **Percent Subscribed**, and **Percent Oversubscribed** for a system's virtual capacity.

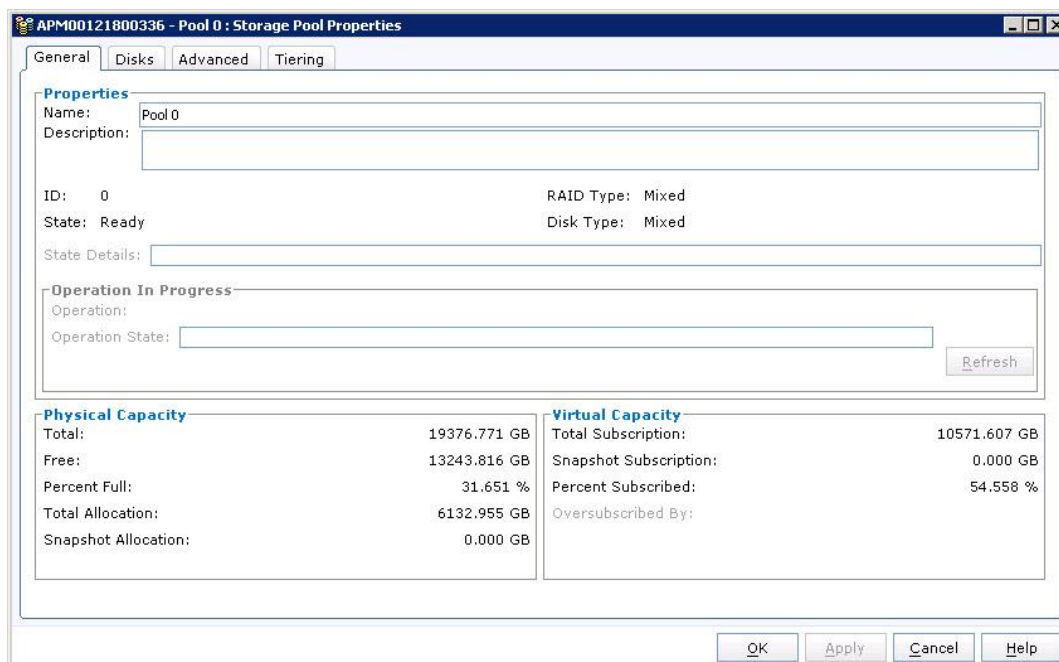


Figure 13. Examining storage pool space utilization

When storage pool capacity becomes exhausted, any requests for additional space allocation on thin-provisioned LUNs fail. Applications attempting to write data to these LUNs usually fail as well, and an outage is the likely result. To avoid this situation:

1. Monitor pool utilization.
2. Set an alert that notifies you when thresholds are reached.
3. Set **Percentage Full Threshold** to allow enough buffer space to correct the situation before an outage situation occurs.

This setting is under **Advanced** in the **Storage Pool Properties** dialog box, as shown in Figure 14.

Note: This alert is active only if there are thin LUNs in the pool, because thin LUNs provide the only way you can oversubscribe a pool. If the pool contains only thick LUNs, the alert is not active because there is no risk of running out of space due to oversubscription. You can also specify the value for **Percent Full Threshold**, which equals **Total Allocation/Total Capacity**, when a pool is created.

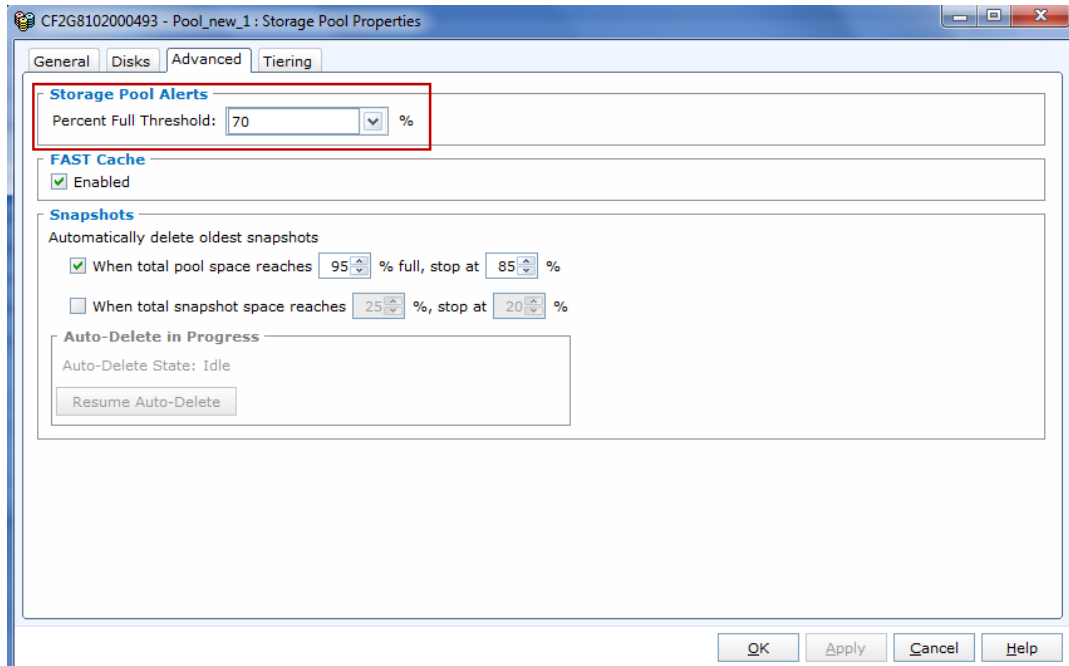


Figure 14. Defining storage pool utilization thresholds

4. Figure 15 shows the **Event Notification** window, where you can configure and view alerts. Use the Configuration Wizard to select the option to receive alerts through email, a paging service, or an SNMP trap.

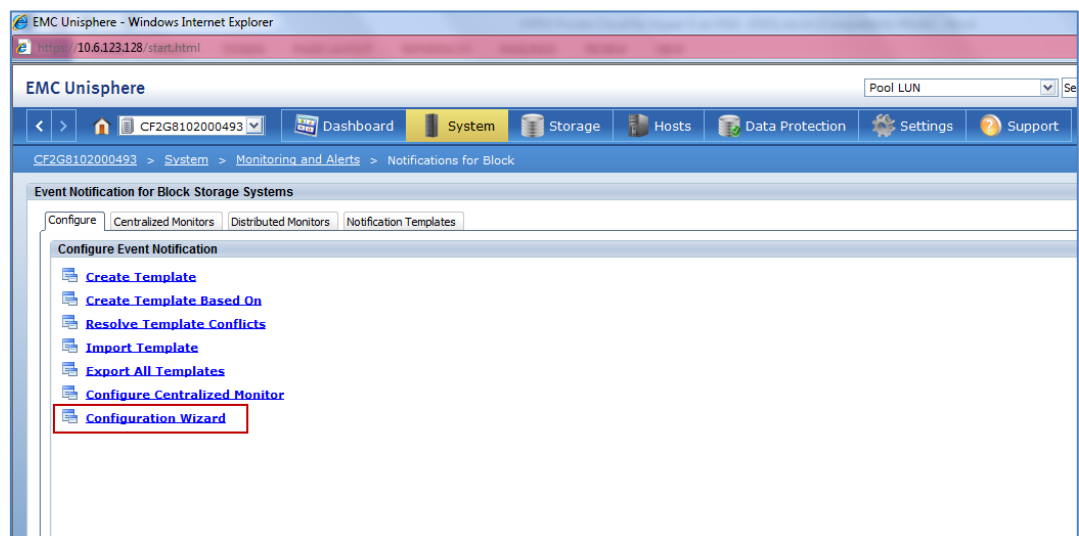


Figure 15. Defining automated notifications for block

Table 12 lists information about thresholds and their settings for VNX Operating Environment (OE) for Block Release 33.

Table 12. VNX thresholds and settings

Threshold type	Threshold range	Threshold default	Alert severity	Side effect
User settable	1%-84%	70%	Warning	None
Built-in	N/A	85%	Critical	Clears user settable alert

Note: Allowing total allocation to exceed 90 percent of total capacity puts you at risk of running out of space and affecting all applications that use thin LUNs in the pool.

Install and configure the vSphere hosts

This section provides information about installing and configuring the vSphere hosts and infrastructure servers required to support the architecture. Table 13 describes the tasks to be completed.

Table 13. Tasks for server installation

Task	Description	Reference
Install vSphere	Install the vSphere hypervisor on the physical servers deployed for the solution.	<i>vSphere Installation and Setup Guide</i>
Configure vSphere networking	Configure vSphere networking including network interface card (NIC) trunking, VMkernel ports, and virtual machine port groups and jumbo frames.	<i>vSphere Networking</i>
Add vSphere hosts to VNX storage groups (block variant)	Add the vSphere hosts to the storage groups created in Prepare and configure the storage array .	EMC Online Support
Connect VMware datastores	Connect the VMware datastores to the vSphere hosts deployed for the solution.	<i>vSphere Storage Guide</i>

Install vSphere

On initial power up of the servers being used for vSphere, confirm or enable the hardware-assisted CPU virtualization setting and the hardware-assisted MMU virtualization setting in the server's BIOS. If the servers are equipped with a RAID controller, EMC recommends that you configure mirroring on the local disks.

Start up the vSphere installation media and install the hypervisor on each of the servers. vSphere hostnames, IP addresses, and a root password are required for installation. The [Customer Configuration Worksheet](#) provides appropriate values.

Configure vSphere networking

The VMware *vSphere Networking* guide describes vSphere networking configuration, including load balancing, link aggregation, and failover options. Choose the appropriate load-balancing option based on what is supported by the network infrastructure. Refer to the list of documents in [Reference Documentation](#) for more information.

Network interface cards

During the installation of vSphere, a standard virtual switch (vSwitch) is created. By default, vSphere chooses only one physical NIC as a vSwitch uplink. To maintain redundancy and bandwidth requirements, configure an additional NIC, either by using the vSphere console or by connecting to the vSphere host from the vSphere Client.

Each vSphere server should have multiple interface cards for each virtual network to ensure redundancy and provide for the use of network load balancing, link aggregation, and network adapter failover.

VMkernel ports

Create VMkernel ports as required, based on the infrastructure configuration:

- VMkernel port for NFS traffic (file variant only)
- VMkernel port for vMotion
- Virtual desktop port groups (used by the virtual desktops to communicate on the network)

The VMware *vSphere Networking* guide describes the procedure for configuring these settings. Refer to the list of documents in [Reference Documentation](#) for more information.

Jumbo frames

You can enable jumbo frames on the vSphere server at two different levels:

- If all the portals on the vSwitch need to be enabled for jumbo frames, edit the MTU settings under the vSwitch **Properties** from vCenter.
- If specific VMkernel ports are to be jumbo frame-enabled, edit the VMkernel port under **Network Properties** from vCenter.

To enable jumbo frames on VNX:

1. In Unisphere, navigate to **Settings > Network > Settings for File**.
2. Select the appropriate network interface under **Interfaces**.

3. Select **Properties**.
4. Set the MTU size to **9,000**.
5. Click **OK** to apply the changes.

Jumbo frames might also need to be enabled on each network switch. Consult your switch configuration guide for instructions.

Connect VMware datastores

Connect the data stores configured in [Prepare and configure the storage array](#) to the appropriate vSphere servers. These include the datastores configured for:

- Virtual desktop storage
- Infrastructure virtual machine storage (if required)
- SQL Server storage (if required)

The VMware *vSphere Storage Guide* provides instructions on how to connect the VMware datastores to the vSphere host. Refer to the list of documents in [Reference Documentation](#) for more information.

Install and configure the SQL Server database

Table 14 describes the tasks for setting up and configuring a Microsoft SQL Server database for the solution. When the tasks are complete, SQL Server is set up on a virtual machine, with the all databases required by vCenter, Update Manager, Horizon View, and View Composer configured for use.

Note: EMC recommends that you put the OS volume for the SQL Server virtual machine into the VSPEX private cloud pool. The recommended values for CPU and memory are 2 and 6 GB respectively.

Table 14. Tasks for SQL Server database setup

Task	Description	Reference
Create a virtual machine for Microsoft SQL Server	Create a virtual machine to host SQL Server on one of the vSphere servers designated for infrastructure virtual machines, and use the datastore designated for the shared infrastructure. Verify that the virtual server meets the hardware and software requirements.	<i>vSphere Virtual Machine Administration</i>
Install Microsoft Windows on the virtual machine	Install Microsoft Windows Server 2008 R2 Standard Edition on the virtual machine.	Installing Windows Server 2008 R2
Install Microsoft SQL Server	Install Microsoft SQL Server on the virtual machine.	SQL Server Installation (SQL Server 2008 R2)

Task	Description	Reference
Configure the database for VMware vCenter Server	Create the database required for vCenter Server on the appropriate datastore.	<i>Preparing vCenter Server Databases</i>
Configure the database for VMware Update Manager	Create the database required for Update Manager on the appropriate datastore.	<i>Preparing the Update Manager Database</i>
Configure the database for VMware Horizon View Composer	Create the database required for Horizon View Composer on the appropriate datastore.	<i>VMware Horizon View Installation</i>
Configure the database for VMware Horizon View Manager	Create the database required for Horizon View Manager event logs on the appropriate datastore.	<i>VMware Horizon View Installation</i>
Configure the VMware Horizon View and View Composer database permissions	Configure the database server with appropriate permissions for the Horizon View and Horizon View Composer databases.	<i>VMware Horizon View Installation</i>
Configure VMware vCenter database permissions	Configure the database server with appropriate permissions for vCenter.	<i>Preparing vCenter Server Databases</i>
Configure VMware Update Manager database permissions	Configure the database server with appropriate permissions for Update Manager.	<i>Preparing the Update Manager Database</i>

VMware vCenter Server deployment

Table 15 describes the tasks to be completed to configure VMware vCenter Server for the solution.

Note: EMC recommends that you put the OS volume for the vCenter Server virtual machine into the VSPEX private cloud pool. The recommended values for CPU and Memory are 4 and 8 GB respectively.

Table 15. Tasks for vCenter configuration

Task	Description	Reference
Create the vCenter host virtual machine	Create a virtual machine for vCenter Server.	<i>vSphere Virtual Machine Administration</i>

Task	Description	Reference
Install the vCenter guest OS	Install Windows Server 2008 R2 Standard Edition on the vCenter host virtual machine.	VMware vSphere Documentation
Update the virtual machine	Install VMware Tools, enable hardware acceleration, and allow remote console access.	<i>vSphere Virtual Machine Administration</i>
Create vCenter ODBC connections	Create the 64-bit vCenter and 32-bit vCenter Update Manager ODBC connections.	• <i>vSphere Installation and Setup</i> • <i>Installing and Administering VMware vSphere Update Manager</i>
Install vCenter Server	Install the vCenter Server software.	<i>vSphere Installation and Setup</i>
Install vCenter Update Manager	Install the vCenter Update Manager software.	<i>Installing and Administering VMware vSphere Update Manager</i>
Create a virtual datacenter	Create a virtual datacenter.	<i>vCenter Server and Host Management</i>
Apply vSphere license keys	Type the vSphere license keys in the vCenter licensing menu.	<i>vSphere Installation and Setup</i>
Add vSphere Hosts	Connect the vCenter server to the vSphere hosts.	<i>vCenter Server and Host Management</i>
Configure vSphere clustering	Create a vSphere cluster and move the vSphere hosts into it.	<i>vSphere Resource Management</i>
Perform vSphere host discovery from the array	Perform vSphere host discovery from the Unisphere console.	<i>Using EMC VNX Storage with VMware vSphere—TechBook</i>
Install the vCenter Update Manager plug-in	Install the vCenter Update Manager plug-in from the administration console.	<i>Installing and Administering VMware vSphere Update Manager</i>
Deploy the VMware Storage APIs for Array Integration (VAAI) Plug-in	Using Update Manager, deploy the VAAI Plug-in for VNX to all vSphere hosts.	• <i>EMC VNX VAAI NFS Plug-in—Read Me file on EMC Online Support.</i> • <i>Installing and Administering VMware vSphere Update Manager</i>
Deploy EMC PowerPath/VE (block variant)	Use Update Manager to deploy the PowerPath/VE plug-in to all vSphere hosts.	<i>EMC PowerPath/VE for VMware vSphere Installation and Administration Guide</i>
Install the EMC VSI for VMware vSphere plug-in	Install the VSI for VMware vSphere plug-in on the administration console.	<i>EMC VSI for VMware vSphere: Unified Storage Management—Product Guide</i>

Task	Description	Reference
Install EMC PowerPath Viewer (block variant)	Install PowerPath Viewer on the administration console.	<i>EMC PowerPath Viewer Installation and Administration Guide</i>

Set up VMware View Connection Server

This section provides information on how to set up and configure VMware View Connection Server for the solution. For a new installation of Horizon View, VMware recommends that you complete the tasks in the order shown in Table 16.

Note: EMC recommends that you put the OS volumes for the View Connection Server virtual machines into the VSPEX private cloud pool. The recommended values for CPU and memory are 2 and 5 GB, respectively.

Table 16. Tasks for VMware Horizon View Connection Server setup

Task	Description	Reference
Create virtual machines for VMware View Connection Server	Create two virtual machines in vSphere Client. These virtual machines will be used as View Connection Server hosts. Install Windows Server 2008 R2 as the guest OS for the servers.	<i>VMware Horizon View Installation</i>
Install VMware View Connection Server	Install View Connection Server software on one of the previously prepared virtual machines. Enter the View license key in the View Manager web console.	VMware Horizon View documentation
Configure the View event log database connection	Configure the View event log database settings using the appropriate database information and login credentials.	
Add a replica View Connection Server instance	Install View Connection Server software on the second server.	
Configure the View Composer ODBC connection	On either the vCenter server or a dedicated Windows Server 2008 R2 server, configure an ODBC connection for the previously configured View Composer database.	
Install View Composer	Install View Composer on the server used in the previous step.	

Task	Description	Reference
Connect VMware Horizon View to vCenter and View Composer	Use the View Manager web interface to connect Horizon View to the vCenter server and View Composer.	<i>VMware Horizon View Administration Guide</i>
Prepare a master virtual machine	Create a master virtual machine as the base image for the virtual desktops.	
Configure View Persona Management group policies	Configure AD group policies to enable View Persona Management.	
Configure folder redirection group policies for EMC Avamar	Configure AD group policies to enable folder redirection for Avamar.	
Configure View PCoIP group policies	Configure AD group policies for PCoIP protocol settings.	

Install VMware View Connection Server

Install the View Connection Server software using the instructions in the *VMware Horizon View Installation Guide*. Select **Standard** when prompted for the View Connection Server type. Enter the View license key in the View Manager web console.

Configure the View event log database connection

Configure the View event log database connection using the database server name, database name, and database login credentials. Review the *VMware Horizon View Installation Guide* for specific instructions on how to configure the event log.

Add a replica View Connection Server instance

Repeat the View Connection Server installation process on the second target virtual machine. When prompted for the connection server type, specify **Replica**, and then provide the VMware Horizon View administrator credentials to replicate the View configuration data from the first View Connection Server instance.

Configure the View Composer ODBC connection

On the server that will host the View Composer service, create an ODBC connection for the previously configured View Composer database. Review the *VMware Horizon View Installation Guide* for specific instructions on how to configure the ODBC connection.

Install View Composer

On the server that will host the View Composer service, install the View Composer software. Specify the previously configured ODBC connection when prompted during the installation process. Review the *VMware Horizon View Guide* for specific instructions on how to configure the ODBC connection.

Connect VMware Horizon View to vCenter and View Composer

Using the Horizon View Manager web console, create the connection between Horizon View and both the vCenter server and View Composer. Review the *VMware Horizon View Administration Guide* for specific instructions on how to create the connections. When presented with the option, enable vSphere host caching (also known as View Storage Accelerator or Content Based Read Cache) and set the cache amount at 2 GB, which is the maximum amount supported.

You can also enable **Reclaim VM disk space**. This feature is currently supported only with Windows 7 desktops. If you enable **Reclaim VM disk space**, you must specify a blackout period that controls when the operation should not process. As the operation should not execute during periods of heavy use, include those times in the blackout period. By default, space reclamation only runs when there is 1 GB of space or more to reclaim. You can specify a different value when implementing your desktop pools.

Prepare a master virtual machine

Complete the following steps to prepare the master virtual machine:

1. Using the vSphere Web Client, create a virtual machine using the VMware version 9 hardware specification. You cannot create version 9 virtual machines with the software client; you must use the web client.
2. Install the Windows 7 guest OS.
3. Install appropriate integration tools such as VMware Tools.
4. Optimize the OS settings to avoid unnecessary background services generating extraneous I/O operations that adversely affect the overall performance of the storage array. Refer to the following white papers for details: *Deploying Microsoft Windows 7 Virtual Desktops with VMware Horizon View—Applied Best Practices* and *VMware Horizon View Optimization Guide for Windows 7*.
5. Install the third-party tools or applications, such as Microsoft Office, relevant to your environment.
6. Install the Avamar Desktop/Laptop Client. Refer to *EMC Backup and Recovery for VSPEX for End-User Computing with VMware Horizon View Design and Implementation Guide* for details.
7. Install the Horizon View agent.

Note: If you use the View Persona Management feature, install the Persona Management component of the VMware Horizon View agent at this time. Ensure that the Persona Management option is selected during the installation of the Horizon View agent.

Configure View Persona Management group policies

View Persona Management is enabled using AD group policies that are applied to the organizational unit (OU) that contains the virtual desktop computer accounts. The View Group Policy templates are located in the **\Program Files\VMware\VMware Horizon View\Server\extras\GroupPolicyFiles** directory on the View Connection server.

Configure folder redirection group policies for EMC Avamar

Enable folder redirection by using the AD group policies that are applied to the organizational unit (OU) that contains the virtual desktop user accounts. AD folder redirection is used (instead of View Persona Management folder redirection) to ensure that the folders maintain the naming consistencies required by the Avamar software. Refer to *EMC Backup and Recovery for VSPEX for End User Computing for VMware Horizon View* for details.

Configure View PCoIP group policies

You control View PCoIP protocol settings using AD group policies that are applied to the OU containing the View Connection servers. The View group policy templates are located in the **\Program Files\VMware\VMware View\Server\extras\GroupPolicyFiles** directory on the View Connection server. Use the group policy template **pcoip.adm** to specify the following PCoIP protocol settings:

- Maximum Initial Image Quality value: 70
- Maximum Frame Rate value: 24
- Turn off Build-to-Lossless feature: Enabled

Note: Higher PCoIP session frame rates and image qualities can adversely affect server resources.

Provision virtual desktops

Use View Composer in the Horizon View console to deploy your virtual desktops:

1. Create an automated desktop pool.
2. Specify the preferred **User Assignment**:
 - **Dedicated**: Users receive the same desktop every time they log in to the pool.
 - **Floating**: Users receive desktops picked randomly from the pool each time they log in.
3. Specify View Composer linked clones.
4. Specify a value for the **Pool Identification**.
5. Configure **Pool Settings** as required.
6. Configure **Provisioning Settings** as required.
7. Accept the default values for **View Composer Disks** or edit as required.

If View Persona Management is used, select **Do not redirect Windows profile** under **Persistent Disk**, as shown in Figure 16.

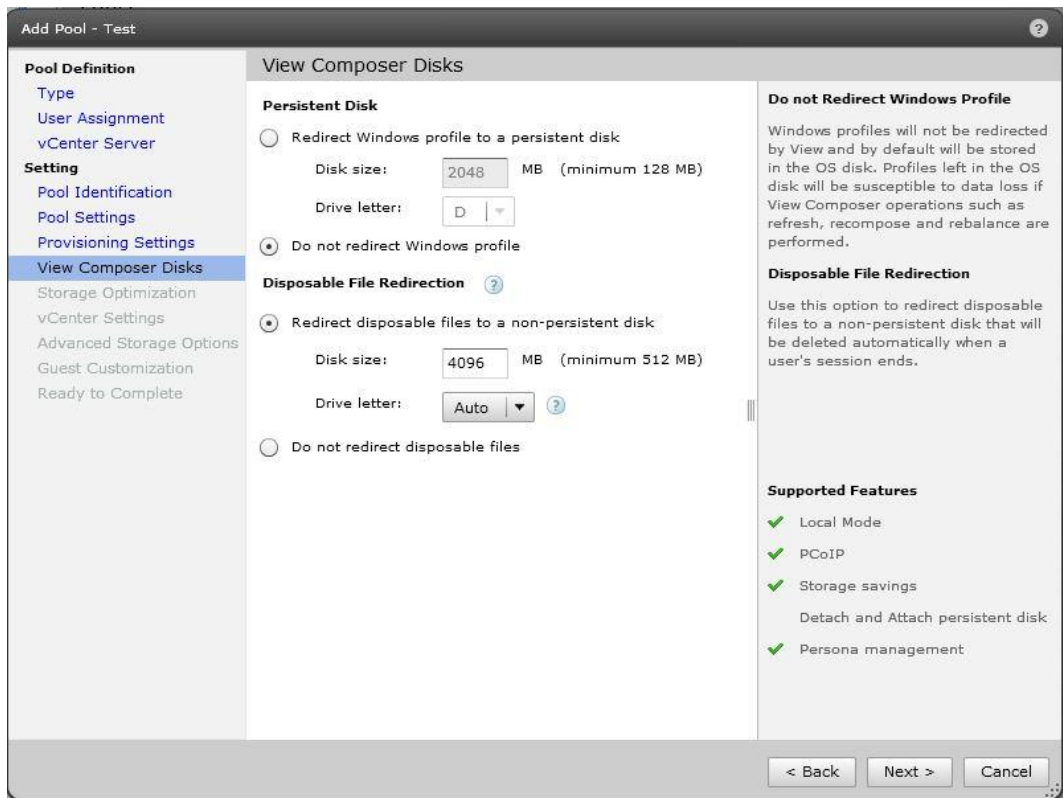


Figure 16. View Composer Disks window

8. Configure the AD group policy for View Persona Management.
9. Select **Select separate datastores for replica and OS disk**.
10. Select the appropriate parent virtual machine, virtual machine snapshot, folder, vSphere hosts or clusters, vSphere resource pool, and linked clone and replica disk datastores.
11. Enable host caching for the desktop pool and specify cache regeneration blackout times.
12. Specify image customization options as required.
13. Complete the pool creation process to initiate the creation of the virtual desktop pool.

Set up EMC Avamar

If your solution includes Avamar backup and recovery, refer to the *EMC Backup and Recovery for VSPEX End User Computing for VMware Horizon View Design and Implementation Guide* for detailed information on implementing your backup and recovery solution.

Set up VMware vShield Endpoint

This section provides information on how to set up and configure the components of vShield Endpoint. Table 17 describes the tasks to be completed.

Note: EMC recommends that you put the OS volume for VMware vShield Endpoint into the VSPEX private cloud pool. Refer to the *vShield Quick Start Guide* for the recommended CPU and memory configuration.

Table 17. Tasks required to install and configure vShield Endpoint

Task	Description	Reference
Verify desktop vShield Endpoint driver installation	Verify that the vShield Endpoint driver component of VMware Tools has been installed on the virtual desktop master image.	<i>vShield Quick Start Guide</i>
Deploy the vShield Manager appliance	Deploy and configure the vShield Manager appliance.	
Register the vShield Manager plug-in.	Register the vShield Manager plug-in with the vSphere Client.	
Apply vShield Endpoint licenses	Apply the vShield Endpoint license keys using the vCenter license utility.	
Install the vShield Endpoint service	Install the vShield Endpoint service on the desktop vSphere hosts.	
Deploy an antivirus solution management server	Deploy and configure an antivirus solution management server.	<i>vShield Quick Start Guide</i> Note: vShield Endpoint partners provide antivirus management server software and security virtual machines. Consult the vendor documentation for specific details concerning installation and configuration.
Deploy vSphere security virtual machines	Deploy and configure security virtual machines (SVMs) on each desktop vSphere host.	
Verify vShield Endpoint functionality	Verify the functionality of the vShield Endpoint components using the virtual desktop master image.	Note: Consult the vendor documentation for specific details on how to verify vShield Endpoint integration and functionality.

**Verify desktop
vShield Endpoint
driver installation**

The vShield Endpoint driver is a subcomponent of the VMware Tools software package that is installed on the virtual desktop master image. The driver is installed using one of two methods:

- Select **Complete** during VMware Tools installation.
- Select **Custom** during VMware Tools installation. From the VMware **Device Drivers** list box, select **VMCI Driver**, and then select **vShield Driver**.

To install the vShield Endpoint driver on a virtual machine that already has VMware Tools installed, initiate the VMware Tools installation and select the appropriate option.

**Deploy the vShield
Manager appliance**

The vShield Manager appliance is provided by VMware as an OVA file that is imported through the vShield client using **File – Deploy OVF template**. The vShield Manager appliance is preconfigured with all required components.

**Install the vShield
Endpoint service**

The vShield Endpoint service must be installed on all vSphere virtual desktop hosts. The service is installed on the vSphere hosts by the vShield Manager appliance. The vShield Manager web console is used to initiate the vShield Endpoint service installation and to verify that the installation is successful.

**Deploy an
antivirus solution
management
server**

The antivirus solution management server is used to manage the antivirus solution and is provided by vShield Endpoint partners. The management server and associated components are a required component of the vShield Endpoint platform.

**Deploy vSphere
security virtual
machines**

The vSphere security virtual machines are provided by the vShield Endpoint partners and are installed on each vSphere virtual desktop host. The security virtual machines perform security related operations for all virtual desktops that reside on their vSphere host. The security virtual machines and associated components are required components of the vShield Endpoint platform.

**Verify vShield
Endpoint
functionality**

After all required components of the vShield Endpoint platform have been installed and configured, verify the functionality of the platform before deploying the virtual desktops.

Using the documentation provided by the vShield Endpoint partner, verify the functionality of the vShield Endpoint platform with the virtual desktop master image.

Set up VMware vCenter Operations Manager for Horizon View

This section provides information on how to set up and configure VMware vCenter Operations Manager (vCOPS) for Horizon View. Table 18 describes the tasks that must be completed.

Note: EMC recommends that you put the OS volume for the VMware vCOPS for Horizon View server into the VSPEX private cloud pool. Refer to *Deployment and Configuration Guide: vCenter Operations Manager 5* for the recommended CPU and memory configuration.

Table 18. Tasks required to install and configure vCOPS

Task	Description	Reference
Create a vSphere IP pool for vCOPS	Create an IP pool with two available IPs for use by the vCOPS analytics and user interface virtual machines	<i>Deployment and Configuration Guide – vCenter Operations Manager 5</i>
Deploy the vCOPS vSphere Application Services (vApp)	Deploy and configure the vCOPS vApp. Adjust the specifications of the two virtual servers that comprise the vCOPS vApp based on the number of virtual machines being monitored.	
Specify the vCenter server to monitor	From the vCenter Operations Manager main web interface, specify the name of the vCenter server that manages the virtual desktops.	
Assign the vCOPS license	Apply the vCOPS for Horizon View license keys using the vCenter license utility.	
Configure SNMP and SMTP settings	From the vCenter Operations Manager main web interface, configure any required SNMP or SMTP settings for monitoring purposes. Note: Optional.	
Update the virtual desktop settings	Update the virtual desktop firewall policies and services to support vCOPS for Horizon View desktop-specific metrics gathering.	<i>vCenter Operations Manager for View Integration Guide</i>
Create the virtual machine for the vCOPS for Horizon View Adapter server	Create a virtual machine in the vSphere Client to be used as the vCOPS for Horizon View Adapter server.	
Install the guest OS for the vCOPS for Horizon View Adapter server	Install Windows Server 2008 R2 as the guest OS for the vCOPS for Horizon View Adapter server.	

Task	Description	Reference
Install the vCOPs for Horizon View Adapter software	Deploy and configure the vCOPs for Horizon View Adapter software.	<i>vCenter Operations Manager for View Integration Guide</i>
Import the vCOPs for Horizon View PAK file	Import the vCenter Operations Manager for Horizon View Adapter PAK file using the vCOPs main web interface.	
Verify vCOPs for Horizon View functionality	Verify the functionality of vCOPs for Horizon View using the virtual desktop master image.	

Chapter 5 Solution Verification

This chapter presents the following topics:

- Overview54
- Post-installation checklist55
- Deploy and test a single virtual desktop55
- Verify the redundancy of the solution components55

Overview

After you configure the solution, complete the tasks in Table 19 to verify the configuration and functionality of specific aspects of the solution and ensure that the configuration supports core availability requirements.

Table 19. Tasks for testing the installation

Task	Description	Reference
Verify installation with post installation checklist	Verify that adequate virtual ports exist on each vSphere host virtual switch.	<i>vSphere Networking</i>
	Verify that each vSphere host has access to the required datastores and VLANs.	• <i>vSphere Storage Guide</i> • <i>vSphere Networking</i>
	Verify that the vMotion interfaces are configured correctly on all vSphere hosts.	<i>vSphere Networking</i>
Deploy and test a single virtual desktop	Deploy a single virtual machine from the vSphere interface by using the customization specification.	• <i>vCenter Server and Host Management</i> • <i>vSphere Virtual Machine Management</i>
Verify redundancy of the solution components	Restart each storage processor in turn and ensure that connectivity to the VMware datastores is maintained.	Verify the redundancy of the solution components
	Disable each of the redundant switches in turn and verify that the vSphere host, virtual machine, and storage array connectivity remains intact.	Vendor's documentation
	On a vSphere host that contains at least one virtual machine, enable maintenance mode and verify that the virtual machine can successfully migrate to an alternate host.	<i>vCenter Server and Host Management</i>
Provision remaining virtual desktops	Provision desktops using View Composer linked clones.	<i>VMware Horizon View Administration</i>

Post-installation checklist

The following configuration items are critical to the functionality of the solution, and should be verified prior to deployment into production. On each vSphere server used as part of this solution, verify that:

- The vSwitches hosting the client VLANs are configured with sufficient ports to accommodate the maximum number of virtual machines a host can accommodate.
- All the required virtual machine port groups are configured and each server has access to the required VMware datastores.
- An interface is configured correctly for vMotion. Refer to the *vSphere Networking* guide for details.

Refer to the list of documents in [Chapter 6](#) for more information.

Deploy and test a single virtual desktop

Deploy a single virtual machine to verify the operation of the solution. Ensure the virtual machine has been joined to the applicable domain, has access to the expected networks, and that it is possible to log in.

Verify the redundancy of the solution components

To ensure that the various components of the solution maintain availability requirements, it is important to test specific scenarios related to maintenance or hardware failure.

1. Restart each VNX storage processor in turn and verify that the connectivity to the VMware datastores is maintained during the operation. Complete the following steps:
 - a. Log into the control station with administrator privileges.
 - b. Navigate to **/nas/sbin**.
 - c. Restart SPA: use the command **./navicli -h spa rebootsp**.
 - d. During the restart cycle, check for the presence of datastores on vSphere hosts.
 - e. When the cycle completes, restart SPB: **./navicli -h spb rebootsp**.
2. Perform a failover of each VNX Data Mover in turn and verify that connectivity to the VMware datastores is maintained and that connections to the CIFS file systems are reestablished. Use the following approach for each Data Mover; use the Unisphere interface to restart.
 - a. From the control station \$ prompt, execute the command **server_cpu movername -reboot**, where *movername* is the name of the Data Mover.

- b.** To verify that network redundancy features function as expected, disable each of the redundant switching infrastructures in turn. While each of the switching infrastructures is disabled, verify that all the components of the solution maintain connectivity to each other and to any existing client infrastructure as well.
- 3.** On a vSphere host that contains at least one virtual machine, enable maintenance mode and verify that the virtual machine can migrate to an alternate host.

Chapter 6 Reference Documentation

This chapter presents the following topics:

EMC documentation	58
Other documentation	58

EMC documentation

The following documents, located on [EMC Online Support](#) provide additional and relevant information. Access to these documents depends on your login credentials. If you do not have access to a document, contact your EMC representative.

- *EMC VNX5200 Unified Installation Guide*
- *EMC VNX5400 Unified Installation Guide*
- *EMC VNX5600 Unified Installation Guide*
- *EMC VSI for VMware vSphere: Storage Viewer Product Guide*
- *EMC VSI for VMware vSphere: Unified Storage Management Product Guide*
- *VNX Block Configuration Worksheet*
- *VNX Installation Assistant for File/Unified Worksheet*
- *VNX FAST Cache: A Detailed Review White Paper*
- *Using EMC VNX Storage with VMware vSphere TechBook*
- *Deploying Microsoft Windows 7 Virtual Desktops with VMware View—Applied Best Practices White Paper*
- *EMC PowerPath/VE for VMware vSphere Installation and Administration Guide*
- *EMC PowerPath Viewer Installation and Administration Guide*
- *EMC VNX Unified Best Practices for Performance—Applied Best Practices White Paper*
- *EMC VNX VAAI NFS Plug-in—Read Me file*

Other documentation

The following documents, available on the [VMware website](#), provide additional and relevant information:

- *Deployment and Configuration Guide: vCenter Operations Manager 5*
- *Installing and Administering VMware vSphere Update Manager*
- *Preparing the Update Manager Database*
- *Preparing vCenter Server Databases*
- *vCenter Operations Manager for View Integration Guide*
- *vCenter Server and Host Management*
- *VMware Horizon View Administration Guide*
- *VMware Horizon View Architecture Planning Guide*
- *VMware Horizon View Installation Guide*
- *VMware Horizon View Integration Guide*
- *VMware Horizon View User Profile Migration Guide*

- *VMware Horizon View Security Guide*
- *VMware Horizon View Upgrades Guide*
- *VMware Horizon View 5.3 Release Notes*
- *VMware vCenter Operations Manager Administration Guide*
- *VMware vCenter Operations Manager for View Installation Guide*
- *VMware vCenter Operations Manager Installation Guide*
- *VMware Horizon View Optimization Guide for Windows 7*
- *vShield Administration Guide*
- *vShield Quick Start Guide*
- *vSphere Installation and Setup Guide*
- *vSphere Networking*
- *vSphere Resource Management*
- *vSphere Storage Guide*
- *vSphere Virtual Machine Administration*
- *vSphere Virtual Machine Management*

Appendix A Configuration Worksheet

This appendix presents the following topic:

Customer Configuration Worksheet62

Customer Configuration Worksheet

Before configuring the solution, you need to gather some customer-specific configuration information such as IP addresses, hostnames, and so on. Table 20 to Table 25 provide a worksheet that you can use to record the information. You can also print and use the worksheet as a customer “leave behind” document for future reference.

A standalone copy of the worksheet is attached to this document in Microsoft Office Word format. To view and print the worksheet:

1. In Adobe Reader, open the **Attachments** panel, as follows:
 - Select **View > Show/Hide > Navigation Panes > Attachments**.
 - or*
 - Click the **Attachments** icon as shown in Figure 17.

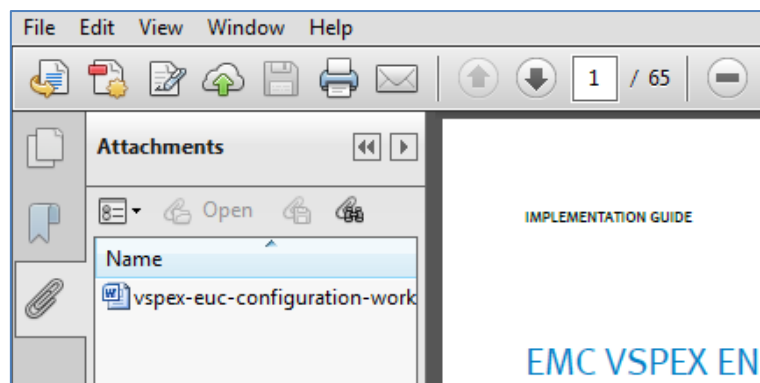


Figure 17. Opening attachments in a PDF file

2. Under **Attachments**, double-click the attached file to open and print the worksheet.

To confirm the customer information, cross-reference with the relevant array configuration worksheet: *VNX Block Configuration Worksheet* or *VNX Installation Assistant for File/Unified Worksheet*.

Table 20. Common server information

Server name	Purpose	Primary IP
	Domain Controller	
	DNS Primary	
	DNS Secondary	
	DHCP	
	NTP	
	SMTP	
	SNMP	
	VMware vCenter Console	
	VMware View Connection Servers	
	Microsoft SQL Server	
	VMware vShield Manager	
	Antivirus solution management server	
	vCops for Horizon View Adapter server	

Table 21. vSphere Server information

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

Table 22. Array information

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

Table 23. Network infrastructure information

Name	Purpose	IP	Subnet mask	Default gateway
	Ethernet switch 1			
	Ethernet switch 2			
	...			

Table 24. VLAN information

Name	Network purpose	VLAN ID	Allowed subnets
	Client access network		
	Storage network		
	Management network		

Table 25. Service accounts

Account	Purpose	Password (optional, secure appropriately)
	Windows Server administrator	
Root	vSphere root	
Root	Array root	
	Array administrator	
	VMware vCenter administrator	
	VMware Horizon View administrator	
	SQL Server administrator	
	VMware vCOPS administrator	
	VMware vShield Manager administrator	