Abstract
This Implementation Guide describes the high-level steps required to deploy an EMC® VSPEX® end-user computing solution for Citrix XenDesktop 7.1 for Microsoft Hyper-V enabled by EMC VNXe3200™ storage and EMC Powered Backup.

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Chapter 1: Introduction

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 Citrix XenDesktop 7.1 runs on a Microsoft Hyper-V virtualization layer backed by the highly available EMC VNXe3200™, which provides the storage. In this solution, the desktop virtualization infrastructure components, such as the XenDesktop controller, PVS server, Active Directory controller, and Virtual Machine manager, are layered on a VSPEX Proven Infrastructure, while the desktops are hosted on dedicated resources.

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 Citrix XenDesktop 7.1 data.

This VSPEX end-user computing solution is validated up to 500 virtual desktops, and can be scaled from 125 virtual desktops (as one building block) up to 500 virtual desktops (as four building blocks). These validated configurations are based on a reference desktop workload and form the basis for creating cost-effective, custom solutions for individual customers.

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 a VSPEX end-user computing solution for Citrix XenDesktop 7.1 with Microsoft Hyper-V enabled by EMC VNXe3200 and EMC Powered Backup.

Business value

Business applications are becoming more integrated into a consolidated compute, network, and storage environment. This VSPEX end-user computing solution with Microsoft Hyper-V reduces the complexity of configuring every component of a traditional deployment model. The solution simplifies 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 Citrix XenDesktop include:

- An end-to-end virtualization solution to use the capabilities of the unified infrastructure components
- Efficient virtualization of up to 500 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 Citrix XenDesktop 7.1 on a VSPEX Private Cloud for Microsoft Hyper-V Proven Infrastructure. It provides examples of deployments on EMC VNXe3200 storage array.

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 Citrix XenDesktop have the necessary training and background to install and configure an end-user computing solution based on Citrix XenDesktop with Microsoft Hyper-V as the hypervisor, EMC VNXe3200 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>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference architecture</td>
<td>A validated architecture that supports this VSPEX end-user computing solution at a particular point of scale—that is, 500, virtual desktops.</td>
</tr>
<tr>
<td>Reference workload</td>
<td>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 usage to the 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.</td>
</tr>
<tr>
<td>Storage Processor (SP)</td>
<td>The compute component of the storage array. SPs handle all aspects of data moving into, out of, and between arrays.</td>
</tr>
<tr>
<td>End-User Computing (EUC)</td>
<td>Decouples the desktop from the physical machine. In an EUC 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.</td>
</tr>
</tbody>
</table>
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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 Citrix XenDesktop solution.

The Design Guide for this solution—EMC VSPEX End-User Computing: Citrix XenDesktop 7.1 and Microsoft Hyper-V for up to 500 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, whose results are needed at the time of installation. Examples of pre-deployment tasks include the collection of host names, IP addresses, VLAN IDs, license keys, and installation media. You should perform these tasks before the customer visit to reduce the amount of time required on site.

Table 2. Tasks for pre-deployment

<table>
<thead>
<tr>
<th>Task</th>
<th>Description</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gather documents</td>
<td>Gather the related documents listed in the 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.</td>
<td>• Essential reading</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Reference Documentation</td>
</tr>
<tr>
<td>Gather tools</td>
<td>Gather the required and optional tools for the deployment. Use Table 4 to confirm that all equipment, software, and licenses are available before the deployment process.</td>
<td>Deployment prerequisites checklist</td>
</tr>
<tr>
<td>Gather data</td>
<td>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 VNXe worksheet. These worksheets are available on EMC Online Support.</td>
<td>• VNXe Series Configuration Worksheet</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Customer Configuration Worksheet</td>
</tr>
</tbody>
</table>
Deployment workflow

To design and implement your end-user computing solution, refer to the process flow in Table 3.

Table 3. Deployment workflow

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Use the Customer Sizing Worksheet in the Design Guide to collect customer requirements.</td>
</tr>
<tr>
<td>2</td>
<td>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. <strong>Note:</strong> If the Sizing Tool is not available, you can manually size the application using the guidelines in the Design Guide.</td>
</tr>
<tr>
<td>3</td>
<td>Use the Design Guide to determine the final design for your VSPEX solution. <strong>Note:</strong> Ensure that all resource requirements are considered, not just the requirements for end-user computing.</td>
</tr>
<tr>
<td>4</td>
<td>Select and order the right VSPEX reference architecture and Proven Infrastructure. Refer to the VSPEX Proven Infrastructure Guide in Essential reading for guidance on infrastructure resources selecting a Private Cloud Proven Infrastructure.</td>
</tr>
<tr>
<td>5</td>
<td>Follow this Implementation Guide to deploy and test your VSPEX solution. <strong>Note:</strong> If you already have a VSPEX Proven Infrastructure environment, you can skip the implementation steps that are already completed.</td>
</tr>
</tbody>
</table>

Essential reading

EMC recommends that you read the following documents, available from the VSPEX space in the EMC Community Network or from the VSPEX Proven Infrastructure pages on EMC.com.

**VSPEX Solution Overview**
Refer to the following VSPEX Solution Overview document:

*EMC VSPEX End User Computing*

**VSPEX Design Guide**
Refer to the following VSPEX Design Guide:

*EMC VSPEX End-User Computing: Citrix XenDesktop 7.1 and Microsoft Hyper-V for up to 500 Virtual Desktops*
Chapter 2: Before You Start

**VSPEX Proven Infrastructure Guide**

Refer to the following VSPEX Proven Infrastructure Guide:

*EMC VSPEX Private Cloud: Microsoft Windows Server 2012 R2 with Hyper-V for up to 125 Virtual Machines*

## Deployment prerequisites

Table 4 itemizes the hardware, software, and licenses required to configure the solution. [EMC Online Support](#) provides more information on these prerequisites.

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Description</th>
</tr>
</thead>
</table>
| **Hardware** | • Physical servers with sufficient capacity to host the virtual desktops as recommended in the Design Guide  
• Microsoft Hyper-V Server 2012 R2 to host the virtual infrastructure servers  
• Networking switch port capacity and capabilities as required for end-user computing  
• EMC VNXe3200 storage array with the required disk layout  
**Note:** These requirements might be covered by existing infrastructure. |
| **Software** | • Microsoft Windows Server 2012 R2 installation media  
• Microsoft System Center Virtual Machine Manager (SCVMM) 2012 R2 installation media  
• Citrix XenDesktop 7.1 installation media  
• Citrix Provisioning Services 7.1 installation media  
• ESI for Windows version 3.1  
• Avamar 7.0 installation media  
• Microsoft Windows Server 2012 R2 installation media (suggested OS for AD, DHCP, DNS, Hypervisor, Citrix XenDesktop Controller)  
• Microsoft Windows 8.1 installation media  
• Microsoft SQL Server 2012 SP1 installation media  
**Note:** Some of these requirements might be covered in the existing infrastructure. |
| **Software (block variant only)** | EMC PowerPath® |
| **Licenses** | • SCVMM 2012 R2 license keys  
• Citrix XenDesktop 7.1 license key  
• Microsoft Windows Server 2012 R2 Standard Edition (or later) license keys  
• Microsoft Windows 8.1 license keys  
• Microsoft SQL Server license key  
**Note:** Some of these requirements might be covered by an existing license. |
| **Licenses (block variant only)** | EMC PowerPath license files |
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Chapter 3: Solution Overview

Overview

This chapter provides an overview of the VSPEX end-user computing for Citrix XenDesktop with Microsoft Hyper-V 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 a reference architecture capable of supporting up to 500 virtual desktops.

The desktop virtualization infrastructure components of the solution are designed to be layered on a VSPEX Private Cloud with Microsoft Hyper-V Proven Infrastructure. However, the reference architectures do not include the configuration details for the underlying infrastructure. Refer to the VSPEX Proven Infrastructure Guide 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 Citrix XenDesktop 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 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.
Chapter 3: Solution Overview

Solution architecture

High-level architecture

The EMC VSPEX end-user computing for Citrix XenDesktop solution provides a complete system architecture capable of supporting up to 500 virtual desktops. It supports both block and file storage.

The solution uses EMC VNXe3200 and Microsoft Hyper-V to provide the storage and virtualization platforms for a Citrix XenDesktop 7.1 environment of Microsoft Windows 8.1 virtual desktops provisioned by Citrix Provisioning Services (PVS) or Machine Creation Services (MCS).

For the solution, we deployed the VNXe3200 to support up to 500 virtual desktops. Figure 2 shows the high-level architecture of the validated solution.

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1 In this guide, "we" refers to the EMC Solutions engineering team that validated the solution.
Chapter 3: Solution Overview

Figure 2. Architecture of the validated solution

The desktop virtualization infrastructure components are designed to be layered on a VSPEX Private Cloud solution with Microsoft Hyper-V, backed by the highly available EMC VNXe3200, which provides the storage. The infrastructure services running on the infrastructure cluster for the solution, as shown in Figure 3, 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 the solution. The virtual desktops cluster, as shown in Figure 3, requires dedicated end-user computing resources and is not intended to be layered on a VSPEX Private Cloud.

Planning and designing the storage infrastructure for a Citrix XenDesktop environment is critical because the shared storage must be able to absorb large bursts of I/O that occur when, for example, many desktops boot at the start of the workday or when required patches are applied. These bursts can lead to periods of erratic and unpredictable 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 Fully Automated Storage Tiering (FAST™) Cache to reduce the number of disks required.

EMC Powered Backup solutions enable user data protection and end-user recoverability. This XenDesktop solution uses EMC Avamar and its desktop client to achieve this.
The EMC VSPEX end-user computing for Citrix XenDesktop solution includes both block and file storage. Figure 3 shows the logical architecture of the solution.

![Logical architecture for both block and file storage](image)

**Figure 3.** Logical architecture for both block and file storage

The block variant with FC protocol uses two networks: one 8 Gb Fibre Channel (FC) network for carrying virtual desktop and virtual server OS data and one 10 GbE network for carrying all other traffic. The block variant with iSCSI protocol and the file variant uses a 10 GbE IP network for all traffic.

---

**Note:** The solution also supports 1 GbE if the bandwidth requirements are met.

**Summary of key components**

Table 5 summarizes the key technologies used in this solution. The Design Guide provides overviews of the individual components.
Table 5. Solution components

<table>
<thead>
<tr>
<th>VSPEX layer</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application layer</td>
<td>• Citrix XenDesktop 7.1 with the following:</td>
</tr>
<tr>
<td></td>
<td>▪ Citrix Director</td>
</tr>
<tr>
<td></td>
<td>▪ Citrix Receiver</td>
</tr>
<tr>
<td></td>
<td>▪ Citrix Storefront</td>
</tr>
<tr>
<td></td>
<td>▪ Citrix Studio</td>
</tr>
<tr>
<td></td>
<td>▪ Delivery Controller</td>
</tr>
<tr>
<td></td>
<td>▪ Virtual Delivery Agent (VDA)</td>
</tr>
<tr>
<td></td>
<td>▪ Server OS machines</td>
</tr>
<tr>
<td></td>
<td>▪ Desktop OS machines</td>
</tr>
<tr>
<td></td>
<td>▪ Remote PC Access</td>
</tr>
<tr>
<td></td>
<td>• Machine Creation Services (MCS)</td>
</tr>
<tr>
<td></td>
<td>• Citrix Provisioning Services (PVS)</td>
</tr>
<tr>
<td></td>
<td>• Citrix Personal vDisk (PvDisk or PvD)</td>
</tr>
<tr>
<td></td>
<td>• Citrix Profile Management</td>
</tr>
<tr>
<td>Virtualization layer</td>
<td>Microsoft Windows Server 2012 R2 with Hyper-V and:</td>
</tr>
<tr>
<td></td>
<td>▪ Microsoft System Center Virtual Machine Manager</td>
</tr>
<tr>
<td></td>
<td>▪ Windows Failover Clustering</td>
</tr>
<tr>
<td>Compute layer</td>
<td>VSPEX defines the minimum amount of compute layer resources required but</td>
</tr>
<tr>
<td></td>
<td>allows the customer to implement the requirements using any server</td>
</tr>
<tr>
<td></td>
<td>hardware that meets these requirements.</td>
</tr>
<tr>
<td>Network layer</td>
<td>VSPEX defines the minimum number of network ports required for the</td>
</tr>
<tr>
<td></td>
<td>solution and provides general guidance on network architecture, but</td>
</tr>
<tr>
<td></td>
<td>allows the customer to implement the requirements using any network</td>
</tr>
<tr>
<td></td>
<td>hardware that meets these requirements.</td>
</tr>
<tr>
<td>Storage layer</td>
<td>EMC VNXe3200 with the following:</td>
</tr>
<tr>
<td></td>
<td>▪ EMC Unisphere Management Suite</td>
</tr>
<tr>
<td></td>
<td>▪ EMC Storage Integrator for Windows</td>
</tr>
<tr>
<td></td>
<td>▪ EMC VNXe Snapshots</td>
</tr>
<tr>
<td></td>
<td>▪ EMC VNXe Virtual Provisioning</td>
</tr>
<tr>
<td></td>
<td>▪ Windows ODX</td>
</tr>
<tr>
<td></td>
<td>▪ EMC FAST Suite (FAST Cache and FAST VP)</td>
</tr>
<tr>
<td></td>
<td>▪ VNXe file shares</td>
</tr>
<tr>
<td>Backup and recovery layer</td>
<td>EMC Avamar</td>
</tr>
</tbody>
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Overview

This chapter describes how to implement the reference architectures of the end-user computing solution for Citrix XenDesktop 7.1. 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 6 lists the main stages in the solution implementation process, with links to the relevant sections in the chapter.

Table 6. Implementation process overview

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Configure the switches and networks and connect to the customer network.</td>
<td>Network implementation</td>
</tr>
<tr>
<td>2</td>
<td>Install and configure the VNXe.</td>
<td>Preparing and configuring the storage array</td>
</tr>
<tr>
<td>3</td>
<td>Configure the virtual machine network shares.</td>
<td>Preparing and configuring the storage array</td>
</tr>
<tr>
<td>4</td>
<td>Install and configure the servers.</td>
<td>Installing and configuring the Microsoft Hyper-V hosts</td>
</tr>
<tr>
<td>5</td>
<td>Set up SQL Server (used by SCVMM, Citrix XenDesktop, and PVS).</td>
<td>Installing and configuring the SQL Server database</td>
</tr>
<tr>
<td>6</td>
<td>Install and configure SCVMM and virtual machine networking.</td>
<td>Deploying the System Center Virtual Machine Manager server</td>
</tr>
<tr>
<td>7</td>
<td>Set up XenDesktop Controller.</td>
<td>Installing and configuring XenDesktop Delivery Controllers</td>
</tr>
<tr>
<td>8</td>
<td>Set up EMC Avamar.</td>
<td>Setting up EMC Avamar</td>
</tr>
</tbody>
</table>
Network implementation

This section describes the requirements for preparing the network infrastructure required to support this solution. Table 7 summarizes the tasks to be completed, with references for further information.

**Table 7. Tasks for switch and network configuration**

<table>
<thead>
<tr>
<th>Task</th>
<th>Description</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuring the infrastructure network</td>
<td>Configure the storage array and Hyper-V host infrastructure networking.</td>
<td>Configuring the infrastructure network</td>
</tr>
<tr>
<td>Configuring the VLANs</td>
<td>Configure private and public VLANs as required.</td>
<td>Vendor switch configuration documentation</td>
</tr>
<tr>
<td>Configuring the storage network (FC block variant only)</td>
<td>Configure FC switch ports and zoning for Hyper-V hosts and the storage array.</td>
<td>• Configuring the storage network (block variant)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Vendor switch configuration documentation</td>
</tr>
<tr>
<td>Completing the network cabling</td>
<td>Connect the switch interconnect ports, VNXe ports, and Hyper-V server ports.</td>
<td>Completing the network cabling</td>
</tr>
</tbody>
</table>

The infrastructure network requires redundant network links for each Hyper-V 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
Ensure that there are adequate switch ports for the storage array and Hyper-V hosts. EMC recommends that you configure the Hyper-V 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**—SMB3/iSCSI networking and Live migration (private network)
- **Management network**—Hyper-V management (private network)

The block variant with FC protocol of the solution requires a separate storage network. Here, we used an FC network as an example. The infrastructure FC network requires redundant FC switches and links for each Hyper-V host and the storage array. This configuration provides both redundancy and additional storage network bandwidth. We connected each Hyper-V host to both FC switches, and each switch to each storage processor on the storage array. We then placed each FC connection between the Hyper-V 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
Completing 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 these are 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.

Preparing and configuring the storage array

This section describes how to configure the VNXe3200. In this solution, VNXe3200 provides SMB3 file system or block LUN data storage for Hyper-V hosts. Table 8 shows the tasks for storage configuration.

**Table 8. Tasks for storage configuration**

<table>
<thead>
<tr>
<th>Task</th>
<th>Description</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparing the VNXe3200</td>
<td>Install the VNXe3200 hardware according to the product documentation.</td>
<td>• <em>EMC VNXe3200 Installation Guide</em>&lt;br&gt;• <em>VNXe Series Configuration Worksheet</em>&lt;br&gt;• <em>EMC VNXe Unisphere CLI User Guide</em>&lt;br&gt;• <em>Using a VNXe3200 System with CIFS File Systems</em>&lt;br&gt;• Vendor switch configuration documentation&lt;br&gt;• Solution design guides</td>
</tr>
<tr>
<td>Setting up the initial VNXe3200 configuration</td>
<td>Configure the IP address information and other key parameters on the VNXe3200.</td>
<td>-</td>
</tr>
<tr>
<td>Provisioning core data storage</td>
<td>Configure the core data storage, as required for the selected solution variant and size.</td>
<td>-</td>
</tr>
<tr>
<td>Provisioning block storage for Hyper-V (block only)</td>
<td>Create LUNs that will be presented to the servers as clustered share volumes (CSVs) hosting the virtual desktops. Enable FAST Cache.</td>
<td>-</td>
</tr>
<tr>
<td>Provisioning file systems for SMB3 storage (file only)</td>
<td>Create CIFS file systems that will be presented to the Hyper-V servers as network shares hosting the virtual desktops. Enable FAST Cache.</td>
<td>-</td>
</tr>
<tr>
<td>Provisioning optional storage for user data</td>
<td>Create CIFS file systems that will be used to store roaming user profiles and home directories. Optionally, configure FAST VP.</td>
<td>-</td>
</tr>
<tr>
<td>Provisioning optional storage for infrastructure virtual machines</td>
<td>Optionally, create additional CIFS network shares to host SQL Server, domain controller, and XenDesktop Delivery Controller virtual machines.</td>
<td>-</td>
</tr>
<tr>
<td>Configuring Virtual Provisioning thresholds and alerts</td>
<td>Configure storage pool capacity thresholds and related alerts.</td>
<td><em>Setting Virtual Provisioning thresholds and alerts</em></td>
</tr>
</tbody>
</table>
There are no specific setup steps for this solution. For instructions on assembly, racking, cabling, and powering the VNXe3200, refer to the *EMC VNXe3200 Installation Guide*.

After preparing the VNXe3200, 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 8 provide more information on how to configure the VNXe platform. The Design Guide provides information about the disk layout.

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

To configure LUNs on the VNXe for storing virtual desktops in EMC Unisphere for VNXe:

**Note:** The following procedure is an example for an MCS/non-Personal-vDisk configuration. For other MCS or PVS configurations, refer to the Design Guide.

1. Create a block-based RAID 5 storage pool with the characteristics shown in Table 9.

   **Table 9. RAID 5 storage pool characteristics**

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Number of drives</th>
<th>Drive type</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 virtual desktops</td>
<td>5</td>
<td>600 GB SAS</td>
</tr>
<tr>
<td>250 virtual desktops</td>
<td>10</td>
<td>600 GB SAS</td>
</tr>
<tr>
<td>375 virtual desktops</td>
<td>15</td>
<td>600 GB SAS</td>
</tr>
<tr>
<td>500 virtual desktops</td>
<td>20</td>
<td>600 GB SAS</td>
</tr>
</tbody>
</table>

   a. Log in to Unisphere.
   b. Select the array used in the solution.
   c. Select Storage › Storage Configuration › Storage Pools.
   d. Click Create.
Chapter 4: Solution Implementation

2. Configure the required LUNs from the pool, as detailed in Table 10, to present to the Hyper-V servers as CSVs.

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Number of LUNs</th>
<th>LUN size (TB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 virtual desktops</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>250 virtual desktops</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>375 virtual desktops</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>500 virtual desktops</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>

a. Select Storage > LUNs and then when prompted, click Create.

b. Select Create a LUN.

c. In the Create a LUN group or LUN window, specify the LUN name and description and click Next.

   Use Create a LUN group when multiple LUNs require snapshot consistency.

d. Select the storage pool created in Step 1 and specify the LUN size.

e. In the Configure a LUN window, select Thin and click Next.

f. In the Configure Snapshot Schedule window, specify a snapshot schedule and click Next.

g. In the Configure Host Access window, select LUN access for all hypervisor hosts that will host the desktops and click Next.

h. In the Summary window, verify the information and click Finish.
To configure CIFS file systems on the VNXe3200 to store virtual desktops in Unisphere:

**Note:** The following procedure is an example for an MCS/non-PvD configuration. For other MCS or PVS configurations, refer to the Design Guide.

1. Create a RAID 5 storage pool with the characteristics shown in Table 11.

   **Table 11.  RAID 5 storage pool characteristics**
   
<table>
<thead>
<tr>
<th>Configuration</th>
<th>Number of drives</th>
<th>Drive type</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 virtual desktops</td>
<td>5</td>
<td>600 GB SAS</td>
</tr>
<tr>
<td>250 virtual desktops</td>
<td>10</td>
<td>600 GB SAS</td>
</tr>
<tr>
<td>375 virtual desktops</td>
<td>15</td>
<td>600 GB SAS</td>
</tr>
<tr>
<td>500 virtual desktops</td>
<td>20</td>
<td>600 GB SAS</td>
</tr>
</tbody>
</table>

   a. Log in to Unisphere.
   b. Select **Storage > Storage Configuration > Storage Pools**.
   c. Click **Create**.
   d. In the **Specify Pool Name** window, specify the pool name and description and click **Next**.
   e. In the **Select Storage** window, select the appropriate drive type and RAID type and click **Next**.
   f. In the **Select Amount of Storage** window, select the number of drives according to Table 11 and click **Next**.
   g. In the **FAST Cache** window, select **FAST Cache** and click **Next**.
   h. In the **Summary** window, verify the information and click **Finish**.

2. Configure SMB file shares, as detailed in Table 12, to present to the Hyper-V servers as file shares.

   **Table 12.  Configure SMB CIFS shares**
   
<table>
<thead>
<tr>
<th>Configuration</th>
<th>Number of SMB file shares</th>
<th>SMB file share size (TB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>125 virtual desktops</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>250 virtual desktops</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>375 virtual desktops</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>500 virtual desktops</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>

   a. Select **Storage > File Systems**.
   b. In the **File Systems** page, click **Create**.
   c. Select **Windows Shares** and in the **Specify File System Type** window, select the appropriate NAS server and click **Next**.
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To configure FAST Cache for this solution, complete the following steps in Unisphere:

1. To create FAST Cache:
   a. Log in to Unisphere.
   b. Select Storage > FAST Cache.
   c. Click Create.
   d. Select Yes to enable FAST Cache.
   e. Select the number of FAST cache drives and click Next.
   f. In the Summary window, verify the information and click Finish.

2. To configure FAST Cache for a storage pool:
   a. When creating a new pool and prompted to use FAST Cache, click Yes, as shown in Figure 6.

Figure 6. Storage pool set to use Fast Cache
b. Or as shown in Figure 7, on the **Storage Pool Settings** page, select **Allow this pool to use the FAST Cache.**

![Figure 7. VNXe storage pool setting to use FAST Cache](image)

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

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

1. Create a RAID 5 storage pool with up to 500 virtual desktops and 10 SAS, 600 GB drives.
   
   The Design Guide describes the storage layouts.

2. Provision two file systems from the storage pool created in Step 1 and configure the file system as CIFS shares on a CIFS server.

   a. Log in to Unisphere.
   
   b. Select **Storage > File Systems.**
   
   c. Click **Create.**
   
   d. Select **Windows Shares** and the applicable NAS server and then click **Next.**
   
   e. Specify the file system name and description and click **Next.**
   
   f. Select the storage pool created in Step 1 and specify the file system size and then click **Next.**
You can optionally configure FAST VP to automate data movement between storage tiers in the user data storage pool. You can also configure FAST VP at the pool level or at the LUN and file system level.

### Configuring FAST VP for user data

You can optionally configure FAST VP to automate data movement between storage tiers in the user data storage pool. You can also configure FAST VP at the pool level or at the LUN and file system 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 **Details** to open the **Storage Pool** page.

Figure 8 shows the tiering information for a specific FAST VP enabled pool.

**Figure 8. Storage Pool page**

You can set the relocation schedule on the **Fast VP Settings** page, as shown in Figure 9.
EMC Unisphere

From the **General** tab, you can control the **Data Relocation Rate**. The default rate is set to **Medium** to avoid significant affects to host I/O. On the **Schedule** tab, you can set the day and time of the relocation.

**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 file system level**

Some FAST VP properties are managed at the file system level. To open the File System page, select the applicable file system and click **Details**. To open the **FAST VP Settings** page, click **FAST VP** for the FAST VP tiering information for the file system, as shown in Figure 10.

Figure 9. **FAST VP Settings page**

**Fast VP Settings**

- **Enable Scheduled Relocations**
- **Amount of Data to Relocate**:
  - 0 GB to a higher performance storage tier
  - 0 GB to a lower performance storage tier
  - 0 GB to rebalance within a storage tier
- **Estimated Scheduled Data Relocation Time**: 0 hours 0 minutes
- **Data Relocation Rate**: Medium
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EMC Unisphere

Figure 10. File system FAST VP page

You can select a tiering policy for the file system in the Tiering Policy list box. The default and recommended setting is Start High then Auto-Tier.

Figure 11 shows the Storage Pool page in Unisphere. The Utilization tab displays parameters, such as total space, available space, subscription percentage, and used space for a system physical capacity.

EMC Unisphere

Figure 11. Examining storage pool space utilization
When the storage pool capacity becomes exhausted, any requests for additional space allocation on thin-provisioned LUNs and file systems fail. Applications that try to write data to these LUNs and file systems usually fail which causes an outage.

To avoid this situation:

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

In the **Utilization** tab of the Storage Pool page, you can set the Alert Threshold percentage, as shown in Figure 11.

**Note:** This alert is active only if there are thin LUNs in the pool, because thin LUNs are the only way to oversubscribe a pool. If the pool contains only thick LUNs, the alert is not active because of no risk of running out of space due to oversubscription.

4. As shown in Figure 12, you can use the **Alert Settings** page to configure and view alerts. You can also select to receive alerts through email, SMTP server, or through SNMP alerts on this page.

![EMC Unisphere](image)

**Figure 12.** Automated notifications for storage alerts

**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 and file systems in the pool.
Installing and configuring the Microsoft Hyper-V hosts

This section provides information about installing and configuring the Windows hosts and infrastructure servers required to support the architecture. Table 13 describes the tasks that you need to complete.

Table 13. Tasks for server installation

<table>
<thead>
<tr>
<th>Task</th>
<th>Description</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installing the Windows hosts</td>
<td>Install Windows Server 2012 R2 on the physical servers deployed for the solution.</td>
<td>Install and Deploy Windows Server 2012 R2 and Windows Server 2012</td>
</tr>
</tbody>
</table>
| Installing Hyper-V and configuring Failover Clustering | 1. Add the Hyper-V Server role.  
2. Add the Failover Clustering feature.  
3. Create and configure the Hyper-V cluster. | • Hyper-V Overview  
• Failover Clustering Overview |
| Configuring Windows host networking       | Configure Windows hosts networking, including network interface card (NIC) teaming and the Virtual Switch network. | Hyper-V Network Virtualization Overview |
| Installing PowerPath on Windows servers   | Install and configure PowerPath to manage multipathing for VNXe LUNs.      | EMC PowerPath and PowerPath/VE for Microsoft Windows Installation and Administration Guide |

Installing the Windows hosts

Follow the Microsoft best practices to install Windows Server 2012 R2 on the physical servers for this solution. The Customer Configuration Worksheet provides applicable values.

Installing Hyper-V and configuring Failover Clustering

To install and configure Failover Clustering:

1. On each Windows host, install Windows Server 2012 R2 and patches.
2. Configure the Hyper-V role and the Failover Clustering feature.
3. Install the HBA drivers, or configure iSCSI initiators on each Windows host. For details, refer to EMC Host Connectivity Guide for Windows.

Configuring Windows host networking

To ensure performance and availability, the following NICs are required:

- At least one NIC for virtual machine networking and management (can be separated by network or VLAN if necessary).
- At least two 10 GbE NICs for the storage network.
- At least one NIC for Live Migration.

Note: Enable jumbo frames for NICs that transfer SMB data. Set the MTU to 9,000. Consult the NIC vendor configuration documentation for instructions.
Installing PowerPath on Windows servers

Install PowerPath on the Windows servers to improve and enhance the performance and capabilities of the VNXe3200. For detailed installation steps, refer to EMC PowerPath and PowerPath/VE for Microsoft Windows Installation and Administration Guide.

Enabling jumbo frames

This solution requires MTU set at 9,000 (jumbo frames) for efficient storage and migration traffic. To enable jumbo frames on the VNXe:

1. In Unisphere, navigate to Settings > More configuration... > Port Settings.
2. In Port Settings, select the applicable network interface.
3. Select Ethernet Port of IO Modules.
4. Set the MTU size for Port Details to 9,000.
5. Click Apply.

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

Installing and configuring 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 Microsoft SCVMM, XenDesktop, and Provisioning Services configured for use.

Note: EMC recommends that you include the OS volume for the SQL Server virtual machine in 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

<table>
<thead>
<tr>
<th>Task</th>
<th>Description</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creating a virtual machine for Microsoft SQL Server</td>
<td>Create a virtual machine to host SQL Server on one of the Windows servers designated for infrastructure virtual machines, and use the storage designated for the shared infrastructure. Verify that the virtual server meets the hardware and software requirements.</td>
<td>Install the Hyper-V Role and Configure a Virtual Machine</td>
</tr>
<tr>
<td>Installing Microsoft SQL Server</td>
<td>Install Microsoft SQL Server on the virtual machine.</td>
<td>Installation for SQL Server 2012</td>
</tr>
</tbody>
</table>
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### Deploying the System Center Virtual Machine Manager server

This section provides information on how to configure SCVMM. Complete the tasks in Table 15.

**Table 15. Tasks for SCVMM configuration**

<table>
<thead>
<tr>
<th>Task</th>
<th>Description</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creating the SCVMM host virtual machine</td>
<td>Create a virtual machine for the SCVMM server.</td>
<td>Creating Virtual Machines in Virtual Machine Manager</td>
</tr>
<tr>
<td>Installing the SCVMM guest OS</td>
<td>Install Windows Server 2012 R2 Datacenter Edition on the SCVMM host virtual machine.</td>
<td>SCVMM documentation</td>
</tr>
<tr>
<td>Installing the SCVMM server</td>
<td>Install an SCVMM server.</td>
<td>Installing a VMM Management Server</td>
</tr>
<tr>
<td>Installing the SCVMM Management Console</td>
<td>Install an SCVMM Management Console.</td>
<td>Installing and Opening the VMM Console</td>
</tr>
<tr>
<td>Installing the SCVMM agent locally on the hosts</td>
<td>Install an SCVMM agent locally on the hosts that SCVMM manages.</td>
<td>Installing a VMM Agent Locally</td>
</tr>
<tr>
<td>Adding the Hyper-V cluster into SCVMM</td>
<td>Add the Hyper-V cluster into SCVMM.</td>
<td>How to Add a Node to a Hyper-V Host Cluster in VMM</td>
</tr>
<tr>
<td>Adding file share storage to SCVMM (file variant only)</td>
<td>Add SMB file share storage to a Hyper-V cluster in SCVMM.</td>
<td>How to Add Windows File Server Shares in VMM</td>
</tr>
<tr>
<td>Creating a virtual machine in SCVMM</td>
<td>Create a virtual machine in SCVMM.</td>
<td>Creating and Deploying Virtual Machines in VMM</td>
</tr>
<tr>
<td>Creating a template virtual machine</td>
<td>Create a template virtual machine from the existing virtual machine.</td>
<td>• How to Create a Virtual Machine Template</td>
</tr>
<tr>
<td></td>
<td>Create the hardware profile and guest operating system profile at this time.</td>
<td>• Create VM from Template</td>
</tr>
<tr>
<td>Deploying virtual machines from the template virtual machine</td>
<td>Deploy the virtual machines from the template virtual machine.</td>
<td>How to Create and Deploy a Virtual Machine from a Template</td>
</tr>
</tbody>
</table>

Configuring the database for Microsoft SCVMM

<table>
<thead>
<tr>
<th>Description</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create the database required for SCVMM server on the appropriate network share.</td>
<td>SCVMM documentation</td>
</tr>
</tbody>
</table>

Configure XenDesktop database permissions

<table>
<thead>
<tr>
<th>Description</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configure the database server with appropriate permissions for the XenDesktop installer.</td>
<td>Database Access and Permissions for XenDesktop 7.1</td>
</tr>
</tbody>
</table>
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**Creating the SCVMM host virtual machine**

To deploy the Hyper-V server as a virtual machine on a Hyper-V server that is installed as part of this solution, connect directly to an infrastructure Hyper-V server by using the Hyper-V manager.

Create a virtual machine on the Hyper-V server with the customer guest OS configuration by using an infrastructure server share presented from the storage array.

The memory and processor requirements for the SCVMM server depend on the number of Hyper-V hosts and virtual machines that SCVMM must manage.

**Installing the SCVMM guest OS**

Install the guest OS on the SCVMM host virtual machine.

Install the required Windows Server version on the virtual machine and select the appropriate network, time, and authentication settings.

**Installing the SCVMM server**

Set up the VMM database and the default library server, and then install the SCVMM server.

Refer to the TechNet article, *Installing a VMM Management Server*, to install the SCVMM server.

**Installing the VMM Management Console**

The VMM Management Console is a client tool used to manage the SCVMM server. Install the VMM Management Console on the same computer as the SCVMM server.

Refer to the TechNet article, *Installing the VMM Administrator Console*, to install the VMM Management Console.

**Installing the SCVMM agent locally on a host**

If the hosts must be managed on a perimeter network, install an SCVMM agent locally on the host before adding it to VMM. Optionally, install an nSCVMM agent locally on a host in a domain before adding the host to SCVMM.

Refer to the TechNet article, *Installing a VMM Agent Locally*, to install an SCVMM agent locally on a host.

**Adding the Hyper-V cluster into SCVMM**

Add the deployed Microsoft Hyper-V cluster to SCVMM. SCVMM manages the Hyper-V cluster.

Refer to the TechNet article, *How to Add a Node to a Hyper-V Host Cluster in VMM* to add the Hyper-V cluster.

**Adding file share storage to SCVMM (file variant only)**

To add file share storage to SCVMM, complete the following steps:

1. Open the **VMs and Services** workspace.
2. In the **VMs and Services** pane, right-click the Hyper-V cluster name.
3. Click **Properties**.
4. In the **Properties** window, click **File Share Storage**.
5. Click **Add**, and then add the file share storage to SCVMM.
Chapter 4: Solution Implementation

Creating a virtual machine in SCVMM

Create a virtual machine in SCVMM to use as a virtual machine template. Install the virtual machine, then install the software, and change the Windows and application settings.

Refer to the TechNet article, *Creating and Deploying Virtual Machines in VMM* to create a virtual machine.

Creating a template virtual machine

Converting a virtual machine into a template removes the virtual machine. Backup the virtual machine, because the virtual machine could be destroyed during template creation.

Create a hardware profile and a guest operating system profile when creating a template. Use the profile to deploy the virtual machines.

Refer to the TechNet articles, *How to Create a Virtual Machine Template* and *Create VM from Template* to create the template.

Deploying virtual machines from the template virtual machine

Refer to the TechNet article, *How to Create and Deploy a Virtual Machine from a Template* to deploy the virtual machines.

The deployment wizard allows you to save the PowerShell scripts and reuse them to deploy other virtual machines with the same configuration.

Installing and configuring XenDesktop Delivery Controllers

This section provides information on how to set up and configure XenDesktop Delivery Controllers for the solution. For a new installation of XenDesktop, Citrix recommends that you complete the tasks in Table 16 in the order shown.

Table 16. Tasks for XenDesktop Delivery Controller setup

<table>
<thead>
<tr>
<th>Task</th>
<th>Description</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creating virtual machines for XenDesktop Delivery Controllers</td>
<td>Create two virtual machines in Hyper-V. These virtual machines are used as XenDesktop Delivery Controllers.</td>
<td><em>Install the Hyper-V Role and Configure a Virtual Machine</em></td>
</tr>
<tr>
<td>Installing the guest operating system for the XenDesktop Delivery Controllers</td>
<td>Install the Windows Server 2012 R2 guest operating system on the virtual machines.</td>
<td><em>Install and Deploy Windows Server 2012 R2 and Windows Server 2012</em></td>
</tr>
<tr>
<td>Installing the XenDesktop server-side components</td>
<td>Install the required XenDesktop server components on the first Delivery Controller.</td>
<td><em>Citrix website</em></td>
</tr>
<tr>
<td>Installing Citrix Studio</td>
<td>Install Citrix Studio to manage XenDesktop deployment remotely.</td>
<td></td>
</tr>
<tr>
<td>Configuring a site</td>
<td>Configure a site in Citrix Studio.</td>
<td></td>
</tr>
<tr>
<td>Adding a second Delivery Controller</td>
<td>Install an additional Delivery Controller for high availability.</td>
<td></td>
</tr>
</tbody>
</table>
### Chapter 4: Solution Implementation

#### Task | Description | Reference
--- | --- | ---
Preparing the master virtual machine | Create a master virtual machine as the base image for the virtual desktops. |  
Provisioning the virtual desktops | Provision the virtual desktops using MCS. |  

## Installing server-side components of XenDesktop

Install the following XenDesktop server-side components on the first Delivery Controller:

- **Delivery Controller**—Distributes applications and desktops, manages user access, and optimizes connections
- **Citrix Studio**—Creates, configures, and manages infrastructure components, applications, and desktops
- **Citrix Director**—Monitors performance and troubleshoots problems
- **License server**—Manages product licenses
- **Citrix StoreFront**—Provides authentication and resource delivery services for Citrix Receiver

**Note:** Citrix supports installation of XenDesktop components only through the procedures described in Citrix documentation.

## Installing Citrix Studio

Install Citrix Studio on appropriate administrator consoles to manage your XenDesktop deployment remotely.

## Configuring a site

To start Citrix Studio and configure a site:

1. License the site and specify which edition of XenDesktop to use.
2. Set up the site database using a designated login credential for SQL Server.
3. Provide information about your virtual infrastructure, including the SCVMM path that the controller will use to establish a connection to the Hyper-V infrastructure.

## Adding a second Delivery Controller

After you have configured a site, add a second Delivery Controller to provide high availability. The following XenDesktop server-side components are required for the second controller:

- Delivery Controller
- Citrix Studio
- Citrix Director
- Citrix StoreFront

Do not install the license-server component on the second controller because it is centrally managed on the first controller.
Chapter 4: Solution Implementation

Preparing the master virtual machine

To prepare the master virtual machine:

1. Install the Windows 8.1 guest OS.
2. Install applicable integration tools, such as Hyper-V integration services.
3. Optimize the OS settings to avoid unnecessary background services generating inessential I/O operations that adversely affect the overall performance of the storage array.

   Refer to the *Windows 8 and 8.1 Virtual Desktop Optimization Guide* for more details.

4. Install the Virtual Delivery Agent.
5. Install the third-party tools or applications, such as Microsoft Office, relevant to your environment.
6. Install the Avamar Desktop/Laptop Client.

Provisioning the virtual desktops

To deploy MCS-based virtual desktops:

1. In Citrix Studio, create a machine catalog using the master virtual machine as the base image.

   MCS allows the creation of a machine catalog that contains various types of desktops. We tested the following desktop types for this solution:

   - **Windows Desktop OS**:
     - Random—Users connect to a new (random) desktop each time they log on.
     - Personal vDisk—Users connect to the same (static) desktop each time they log on. Changes are saved on a separate Personal vDisk.

   - **Windows Server OS**—Provides hosted shared desktops for a deployment of standardized machines.

2. Add the machines created in the catalog to a delivery group so that the virtual desktops are available to the end users.
Installing and configuring Citrix Provisioning Services

This section provides information about how to set up and configure Citrix PVS for the solution. For a new installation of PVS, Citrix recommends that you complete the tasks in Table 17 in the order shown.

**Table 17. Tasks for PVS setup**

<table>
<thead>
<tr>
<th>Task</th>
<th>Description</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creating virtual machines for PVS servers</td>
<td>Create two virtual machines in Hyper-V Server. These virtual machines are used as PVS servers.</td>
<td>Install the Hyper-V Role and Configure a Virtual Machine</td>
</tr>
<tr>
<td>Installing the guest operating system for the PVS servers</td>
<td>Install the Windows Server 2012 R2 guest operating system for the PVS servers.</td>
<td>Install and Deploy Windows Server 2012 R2 and Windows Server 2012</td>
</tr>
<tr>
<td>Installing the PVS server-side components</td>
<td>Install the PVS server components and console on the PVS servers.</td>
<td>Citrix website</td>
</tr>
<tr>
<td>Configuring a PVS server farm</td>
<td>Run the Provisioning Services Configuration Wizard to create a PVS server farm.</td>
<td></td>
</tr>
<tr>
<td>Adding a second PVS server</td>
<td>Install the PVS server components and console on the second server and join it to the existing server farm.</td>
<td></td>
</tr>
<tr>
<td>Creating a PVS store</td>
<td>Specify the store path where the vDisks will reside.</td>
<td></td>
</tr>
<tr>
<td>Configuring inbound communication</td>
<td>Adjust the total number of threads to be used to communicate with each virtual desktop.</td>
<td></td>
</tr>
<tr>
<td>Configuring a bootstrap file</td>
<td>Update the bootstrap image to use both PVS servers to provide streaming services</td>
<td></td>
</tr>
<tr>
<td>Preparing the master virtual machine</td>
<td>Create a master virtual machine as the base image for the virtual desktops.</td>
<td></td>
</tr>
<tr>
<td>Provisioning the virtual desktops</td>
<td>Provision the virtual desktops using PVS.</td>
<td></td>
</tr>
</tbody>
</table>

**Configuring a PVS server farm**

After the PVS server components are installed on the PVS server, start the Provisioning Services Configuration Wizard and configure a new server farm with the following options:

1. Specify the DHCP service to be run on another computer.
2. Specify the PXE service to be run on local computer.
3. Select **Create farm** to create a new PVS server farm using a designated SQL Server database instance.
4. When creating a new server farm, you need to create a site. Provide an appropriate name for the new site and target device collection.
5. Select the license server that is running on the XenDesktop controller.
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Adding a second PVS server

After you have configured a PVS server farm, add a second PVS server to provide high availability. Install the PVS server components and console on the second PVS server and run the Provisioning Services Configuration Wizard to join the second server to the existing server farm.

Creating a PVS store

A PVS store is a logical container for vDisks. PVS supports the use of a CIFS share as the storage target of a PVS store. When creating a PVS store, set the default store path to the universal naming convention (UNC) path of a CIFS share that is hosted on the VNXe3200. In the Provisioning Services console, right-click a store, select Properties and Validate to confirm that all PVS servers in the server farm can access the CIFS share.

Configuring inbound communication

Each PVS server maintains a range of User Datagram Protocol (UDP) ports to manage all inbound communications from virtual desktops. Ideally, there should be one thread dedicated to each desktop session. The total number of threads supported by a PVS server is calculated as:

\[
\text{Total threads} = (\text{Number of UDP ports} \times \text{Threads per port} \times \text{Number of network adapters})
\]

Adjust the thread count accordingly to match the number of deployed virtual desktops.

Configuring a bootstrap file

To update the bootstrap file required for the virtual desktops to PXE boot:

1. In the Provisioning Services console, select Farm > Sites > Site-name > Servers.
2. Right-click a server and select Configure Bootstrap.

The Configure Bootstrap dialog box appears, as shown in Figure 13.

Figure 13. Configure Bootstrap dialog box
3. Update the bootstrap image to reflect the IP addresses used for all PVS servers that provide streaming services. Select **Read Servers from Database** to obtain a list of PVS servers automatically or select **Add** to manually add the server information.

4. After modifying the configuration, click **OK** to update the ARDBP32.BIN bootstrap file, which is located at C:\ProgramData\Citrix\Provisioning Services\Tftpboot.

5. Navigate to the folder and examine the timestamp of the bootstrap file to ensure that it is updated on the intended PVS server.

---

### Preparing the master virtual machine

To prepare the master virtual machine:

1. Install the Windows 8.1 guest OS.
2. Install appropriate integration tools, such as Hyper-V integration services.
3. Optimize the OS settings to avoid unnecessary background services generating inessential I/O operations that adversely affect the overall performance of the storage array. Refer to the *Windows 8 and 8.1 Virtual Desktop Optimization Guide* for more details.
4. Install the Virtual Delivery Agent.
5. Install the third-party tools or applications, such as Microsoft Office, relevant to your environment.
6. Install the PVS target device software on the master virtual machine.
7. Run the PVS imaging wizard to clone the master image onto a vDisk. Select the MAC address of the legacy network adapter\(^1\) when registering the PVS server. When prompted, shut down the virtual machine.
8. Modify the BIOS of the master virtual machine so that the network adapter is at the top of the boot order, which ensures a PXE boot of the PVS bootstrap image, and then start the virtual machine.
9. Login virtual machine to finish vDisk preparation and then shut down the virtual machine.

---

**Note:** Hyper-V only supports PXE boots with a legacy network adapter. Add a legacy network adapter to the master image and confirm it is the first listed in the boot order for network adapters.

### Provisioning the virtual desktops

To deploy the PVS-based virtual desktops:

1. Set the following vDisk properties:
   - **Access mode:** Standard Image
   - **Cache type:** Cache on device hard drive
2. Prepare a virtual machine template to be used in the next step.
3. In the PVS console, run the **XenDesktop Setup Wizard** to create a machine catalog that contains the specified number of virtual desktops.

4. Add the virtual desktops created in the catalog to a delivery group so that the virtual desktops are available to the end users.

**Setting up EMC Avamar**

*Avamar configuration overview*

This section provides information about installing and configuring Avamar to support guest-based backups of user files. Other Avamar-based methods for backing up user files are available; however, guest-based backups provide end-user restore capabilities by using a common GUI. This configuration assumes that only a user’s files and profile are being backed up. Table 18 describes the tasks that must be completed.

*Note:* In addition to the backups produced by this procedure, you should regularly back up the data center infrastructure components required by XenDesktop virtual desktops. A full disaster recovery requires the ability to restore XenDesktop end-user computing in combination with the ability to restore XenDesktop virtual desktop user data and files.

<table>
<thead>
<tr>
<th>Task</th>
<th>Description</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Microsoft Active Directory preparation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Configuring Group Policy Object (GPO) additions for Avamar</td>
<td>Create and configure a GPO to enable Avamar backups of user files and profiles.</td>
<td><em>EMC Avamar 7 Administrator Guide</em></td>
</tr>
<tr>
<td><strong>Citrix XenDesktop master (gold) image preparation</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Preparing the master image for Avamar          | Install and configure the Avamar Client to run in user mode.                | *Installing and configuring XenDesktop Delivery Controllers*  
|                                                |                                                                            | *Preparing the master virtual machine*        |
| **Avamar preparation**                         |                                                                            |                                               |
| Defining Avamar datasets                       | Create and configure Avamar datasets to support user files and profiles.    | *EMC Avamar 7 Administrator Guide*            |
| Defining Avamar backup schedules               | Create and configure an Avamar backup schedule to support virtual desktop backups. | *EMC Avamar 7 Operational Best Practices*      |
| Adjusting the maintenance window schedule      | Modify the maintenance window schedule to support virtual desktop backups.  |                                               |
| Defining Avamar retention policies             | Create and configure Avamar retention policies.                             |                                               |
| Creating Avamar groups and group policies      | Create and configure Avamar groups and group policies.                      |                                               |
### Configuring Group Policy Object (GPO) additions for Avamar

Because of current Avamar limitations (no support for client-side variables, such as `%username%`) and to reduce the management burden, you must use mapped drives for user data and user profiles.

To create the mapped drives and to configure Windows Folder Redirection to create the Universal Naming Convention (UNC) paths needed for the drives, you create and edit a new GPO in the Group Policy Management Editor, as described in the following procedures.

#### Folder redirection

To configure Windows folder redirection:

1. Select **User Configuration > Policies > Windows Settings > Folder Redirection** and right-click **Documents**.
2. Select **Properties**.
3. From the **Setting** list box, select **Basic – Redirect everyone's folder to the same location**.
4. In the **Root Path**, type `\CIFS_server\folder`, as shown in Figure 14.

![Figure 14. Configuring Windows Folder Redirection](image)
Mapped drives
Create two mapped drive configurations—one for user files and one for user profiles. You follow the same procedure for each mapped drive but use different values for Location, Label As, and Drive Letter Used.

To configure drive mappings:

1. In the Group Policy Management Editor, navigate to User Configuration > Preferences > Windows Settings > Drive Maps.
2. Right-click the blank (white) area on the right side of the window.
3. Select New > Mapped Drive, as shown in Figure 15.

The Mapped Drive Properties window appears.

4. To create the user files mapped drive, follow these steps, as shown in Figure 16:
   a. From the Action list box, select Create.
   b. In Location, type \CIFS_server\folder\%username%.
   c. Select Reconnect.
   d. In Label as, type User_Files.
   e. In Drive Letter, select Use: and U.
   f. In Hide/Show this drive, select Hide this drive.
5. In the **Properties** window, click **Common** and select **Run in logged-on user’s security context (user policy option)**, as shown in Figure 17.

![Figure 16. Creating a Windows network drive mapping for user files](image)

![Figure 17. Configuring drive mapping common settings](image)

6. Click **Apply**.

7. To create the user profiles mapped drive, repeat the steps for creating the user files mapped drive, but change the following three variables as specified (Figure 18 shows a sample configuration):

   - In **Location**, type `\CIFS_server\folder\%username%.domain.V2`, where domain is the Active Directory domain name.
   - In **Label as**, type **User_Profile**.
   - In **Drive Letter**, select **Use:** and **P**.
This section provides information about using the Avamar Client for Windows to provide backup and restore support for XenDesktop virtual desktops that store user-generated files in VNXe home directories.

The Avamar Client for Windows installs and runs as a Windows service, named Backup Agent. This service provides backup and restore functions.

Windows security limits the access of services logged on using the Local System account to local resources only. In its default configuration, the Backup Agent uses the Local System account to log on. It cannot access network resources, including the XenDesktop user profile or data file shares.

To access XenDesktop user profile and data file shares, the Backup Agent must run as the currently logged on user. A batch file starts Backup Agent and logs it on as a user when the user logs in.

The next several sections assume that the Avamar Grid is running and functional and that you have logged into Avamar Administrator. For information on accessing Avamar Administrator, refer to *EMC Avamar 7 Administration Guide*.

An Avamar dataset consists of lists of directories and files to backup from a client. Assigning a dataset to a client or group enables you to save backup selections. For additional information about datasets, refer to *EMC Avamar 7 Administration Guide*.

This section provides dataset configuration information specific to XenDesktop virtual desktops, which is required to ensure successful backups of user files and user profiles. Create two datasets—one for user files and one for user profiles. You follow the same procedure for each dataset, but use different values for **Name** and **Drive Letter Used**.

---

**Windows security for Avamar client service**

This section provides information about using the Avamar Client for Windows to provide backup and restore support for XenDesktop virtual desktops that store user-generated files in VNXe home directories.

The Avamar Client for Windows installs and runs as a Windows service, named Backup Agent. This service provides backup and restore functions.

Windows security limits the access of services logged on using the Local System account to local resources only. In its default configuration, the Backup Agent uses the Local System account to log on. It cannot access network resources, including the XenDesktop user profile or data file shares.

To access XenDesktop user profile and data file shares, the Backup Agent must run as the currently logged on user. A batch file starts Backup Agent and logs it on as a user when the user logs in.

**Defining Avamar datasets**

The next several sections assume that the Avamar Grid is running and functional and that you have logged into Avamar Administrator. For information on accessing Avamar Administrator, refer to *EMC Avamar 7 Administration Guide*.

An Avamar dataset consists of lists of directories and files to backup from a client. Assigning a dataset to a client or group enables you to save backup selections. For additional information about datasets, refer to *EMC Avamar 7 Administration Guide*.

This section provides dataset configuration information specific to XenDesktop virtual desktops, which is required to ensure successful backups of user files and user profiles. Create two datasets—one for user files and one for user profiles. You follow the same procedure for each dataset, but use different values for **Name** and **Drive Letter Used**.
To complete the additional steps to create the user profiles dataset:

1. In the **Avamar Administrator** window, click **Tools** and select **Manage Datasets**.

![Managing Avamar Datasets](image1.png)

**Figure 19.** Managing Avamar Datasets

2. In the **Manage All Datasets** window, click **New**.

3. In the **New Dataset** window, select the custom settings shown in **Figure 20**.

![Configuring Avamar Dataset settings](image2.png)

**Figure 20.** Configuring Avamar Dataset settings

4. Click **OK** to save the dataset.

a. Remove all other plug-ins from the list by selecting each one and clicking **Remove** (−).

b. In **Name**, type **View-User-Files**.

c. Select **Enter Explicitly**.

d. From the **Select Plug-in Type** list box, select **Windows File System**.

e. In **Select Files and/or Folders**, type **U:\**, and then click **+** to add it.
5. Repeat steps 1 to 4 using the following values to create a new dataset for user profile data:
   - In **Name**, type **View-User-Profile**.
   - In **Select Files and/or Folders**, type **P:\**.

Additional configurations are required to back up **User Profile** data; Figure 21 shows a sample configuration.

6. Click **Exclusions**.

7. From the **Select Plug-in Type** list box, select **Windows File System**.

8. In **Select Files and/or Folders**, type **P:\avs** and click **+** to add it.

9. Click **Options**.

10. From the **Select Plug-in Type** list box, select **Windows File System**.

11. Select **Show Advanced Options**.

12. Scroll down the list of options and select **Volume Freezing Options**.
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**Figure 23. Volume Freezing Options**

13. From the *Method to freeze volumes* list box, select **None**.
14. Click **OK** to save the dataset.

**Defining Avamar backup schedules**

Avamar schedules are reusable objects that control when group backups and custom notifications occur. Define a reoccurring schedule that satisfies your recovery point objectives (RPO). For additional information about datasets, refer to the *EMC Avamar 7 Administration Guide*.

**Adjusting the maintenance window schedule**

Avamar server maintenance includes the following essential activities:

- **Checkpoint**—A snapshot of the Avamar server specifically taken to facilitate server rollbacks.
- **Checkpoint validation**—An internal operation that validates the integrity of a specific checkpoint. Once a checkpoint passes validation, it can be considered reliable enough to be used for a server rollback.
- **Garbage collection**—An internal operation that recovers storage space from deleted or expired backups.

Each 24-hour day is divided into three operational windows, during which the following various system activities are performed:

- **Backup window**—That portion of each day reserved to perform normal scheduled backups. No maintenance activities are performed during the backup window.
- **Blackout window**—That portion of each day reserved to perform server maintenance activities, primarily Garbage Collection, that requires unrestricted access to the server. No backup or administrative activities are allowed during the blackout window. However, you can perform restores.
• **Maintenance window**—That portion of each day reserved to perform routine server maintenance activities, primarily checkpoint creation and validation.

Figure 24 shows the default Avamar backup, blackout, and maintenance windows.

![Figure 24. Avamar default Backup/Maintenance Windows schedule](image)

User files and profile data should not be backed up during the day while the users are logged onto their virtual desktops. Adjust the backup window start time to prevent backups from occurring during that time.

Figure 25 shows a modified backup, blackout, and maintenance window for backing up Citrix XenDesktop virtual desktops.

![Figure 25. Avamar modified Backup/Maintenance Windows schedule](image)
To adjust the schedule to appear as shown above, change the **Backup Window Start Time** from **8:00 PM** to **8:00 AM**, and click **OK** to save the changes.

For additional information about Avamar server maintenance activities, refer to the *EMC Avamar 7 Administration Guide*.

### Defining Avamar retention policies

Avamar backup retention policies enable you to specify how long to keep a backup in the system. A retention policy is assigned to each backup when the backup occurs. Specify a custom retention policy to perform an on-demand backup, or create a retention policy that is assigned automatically to a group of clients during a scheduled backup.

When the retention for a backup expires, the backup is automatically marked for deletion. The deletion occurs in batches during times of low system activity.

For additional information on defining retention policies, refer to the *EMC Avamar 7 Administration Guide*.

### Creating Avamar groups and group policies

Avamar uses groups to implement various policies to automate backups and enforce consistent rules and system behavior across an entire segment—or group—of the user community. Group members are client machines that have been added to a particular group to perform scheduled backups.

In addition to specifying which clients belong to a group, groups also specify the following:

- Datasets
- Schedules
- Retention polices

These objects make up the group policy, which controls backup behavior for all members of the group unless you override these settings at the client level. For additional information about groups and group policies, refer to the *EMC Avamar 7 Administration Guide*.

This section provides group configuration information that is required to ensure proper backups of user files and user profiles.
To create two groups and their respective group policy—one for user files and one for user profiles for each group (with different values for Name and Dataset Used):

1. In Avamar Administrator, select Actions > New Group, as shown in Figure 26.

![Figure 26. Creating a new Avamar backup group](image)

The New Group window appears.

2. In Name, type View_User_Data, as shown in Figure 27.

![Figure 27. New Group window](image)

3. Ensure that Disabled is cleared.

4. Click Next.

5. From the Select An Existing Dataset list box, select Citrix XenDesktop-User-Data.

6. Click Next.

7. From the Select An Existing Schedule list box, select a schedule, and then click Next, as shown in Figure 28.
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Figure 28. Select An Existing Schedule

8. From the Select An Existing Retention Policy list, select a retention policy.

9. Click Finish.

Note: If you select Next instead of Finish, you can select the clients to be added to the group. However, this step is unnecessary, because clients will be added to the group during activation.

Activating XenDesktop clients (desktops)

Avamar Enterprise Manager is a web-based multisystem management console application that provides centralized Avamar system administration capabilities, including the ability to add and activate Avamar Clients all at once.

In this section, we assume that you know how to log into Avamar Enterprise Manager (EM) and that the XenDesktop desktops are created.
After you log in to Avamar, the **EMC Avamar Enterprise Manager** dashboard appears, as shown in Figure 29.

![Figure 29. Avamar Enterprise Manager Dashboard](image)

1. Click **Client Manager**.
2. In the **Avamar Client Manager** window, click **Activate**, as shown in Figure 30.

![Figure 30. Avamar Client Manager](image)

3. In the **Activate** window, click the **Client Information** list arrow and select **Directory Service**, as shown in Figure 31.
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Figure 31. Client Information menu

The **Directory Service** dialog box appears.

4. Specify the following user credentials, as shown in Figure 32, and then click OK:
   a. **User Domain**: Directory service domain
   b. **User Name** and **Password**: Type the user name and password required for directory service authentication
   c. **Directory Domain**: Select a directory domain to query for client information

**Note**: This assumes an Active Directory service has been configured in Avamar. Refer to the *EMC Avamar 7 Administration Guide* for additional information about enabling LDAP Management.

Figure 32. User credentials for the directory service

The Active Directory information appears in the left pane of the **EMC Avamar Client Manager** window, as shown in Figure 33.
5. In **Client Information**, locate the Citrix XenDesktop virtual desktops. In this example, a VSPEX OU contains the desktops, as shown in Figure 34.

6. Select the virtual machine desktops you want to add to the Avamar server, as shown in Figure 35.
7. Drag and drop the selected list to the existing Avamar Domain in Server Information. The Select Groups window appears.

8. For Group Name, select the groups for which to add the desktops, and then click Add, as shown in Figure 36. The EMC Avamar Client Manager window reappears.

9. Select the Avamar domain with the virtual desktops and then click Activate, as shown in Figure 37.
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Figure 37. Activate domain

The Show Clients for Activation window appears.

10. Click Commit, as shown in Figure 38.

Figure 38. Show Clients for Activation window

An alert appears, indicating that the client activation will be performed as a background process.

11. Click OK.

A second alert indicates that the activation process has been initiated and to check the logs for status.

12. Click OK.

The Avamar Client Manager window reappears with the activated clients listed, as shown in Figure 39.
Figure 39. Avamar Client Manager with activated clients

13. Log out of Avamar Enterprise Manager.
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Chapter 5: Solution Verification

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 verifying the installation

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<thead>
<tr>
<th>Task</th>
<th>Description</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completing the post-installation checklist</td>
<td>Verify that adequate virtual ports exist on each Hyper-V host virtual switch.</td>
<td>Hyper-V: How many network cards do I need?</td>
</tr>
<tr>
<td></td>
<td>Verify that each Hyper-V host has access to the required storage and VLANs.</td>
<td>Windows Server 2012 Hyper-V Network Virtualization Survival Guide</td>
</tr>
<tr>
<td></td>
<td>Verify that the interfaces are configured correctly on all Hyper-V hosts.</td>
<td></td>
</tr>
<tr>
<td>Deploying and testing a single virtual desktop</td>
<td>Deploy a single virtual machine from the SCVMM interface.</td>
<td>Deploying Hyper-V Hosts Using Microsoft System Center 2012 Virtual Machine Manager</td>
</tr>
<tr>
<td>Verifying redundancy of the solution components</td>
<td>Restart each storage processor in turn and ensure that LUN connectivity is maintained.</td>
<td>Vendor documentation</td>
</tr>
<tr>
<td></td>
<td>Disable each of the redundant switches in turn and verify that the Hyper-V host, virtual machine, and storage array connectivity remains intact.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Disable each of the redundant XenDesktop Delivery Controllers, StoreFront servers, and PVS servers and verify that the virtual desktops remain accessible.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>On a Hyper-V host that contains at least one virtual machine, enable maintenance mode and verify that the virtual machine can successfully migrate to an alternate host.</td>
<td>Creating a Hyper-V Host Cluster in VMM Overview</td>
</tr>
<tr>
<td>Provisioning remaining virtual desktops</td>
<td>Provision desktops using MCS or PVS.</td>
<td>Installing and configuring XenDesktop Delivery Controllers, Installing and configuring Citrix Provisioning Services</td>
</tr>
</tbody>
</table>
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 Windows server used as part of this solution, verify that:

- The VLAN for virtual machine networking is configured correctly
- The storage networking is configured correctly
- Each server can access the required CSVs/Hyper-V SMB shares
- A network interface is configured correctly for Live Migration

Refer to the list of documents in Chapter 6 for more information.

Deploying and testing a single virtual desktop

Deploy a single virtual machine to verify the operation of the solution. Ensure the virtual machine has joined the applicable domain, has access to the expected networks, and can log in to the domain.
This chapter presents the following topics:

**EMC documentation** ................................................................. 72

**Other documentation** ............................................................. 72
Chapter 6: Reference Documentation

EMC documentation

The following documents, located on the EMC Online Support or EMC.com websites, 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 VNXe3200 Installation Guide
- VNXe Series Configuration Worksheet
- Introduction to the EMC VNXe3200 FAST Suite Overview White Paper
- Using a VNXe3200 System with CIFS File Systems
- EMC VNXe3200: Introduction to SMB 3.0 Support White Paper
- EMC VNXe3200 Capacity and Performance Metrics: A Detailed Review White Paper
- EMC VNXe Unisphere CLI User Guide
- EMC Storage Integrator for Windows Suite Release Notes
- EMC PowerPath Installation and Administration Guide
- EMC Avamar 7 Administrator Guide
- EMC Avamar 7 Operational Best Practices
- Avamar Client for Windows on Citrix XenDesktop Technical Note

Other documentation

Citrix
Refer to the Citrix website for Citrix XenDesktop documentation, including the:

Windows 8 and 8.1 Virtual Desktop Optimization Guide

Microsoft
Refer to the following topics on the Microsoft MSDN website:

- Installing Windows Server 2012 R2
- SQL Server Installation (SQL Server 2012 SP1)

Refer to the following topics on the Microsoft TechNet website:

- Create VM from Template
- Creating a Hyper-V Host Cluster in VMM Overview
- Creating and Deploying Virtual Machines in VMM
- Deploying Hyper-V Hosts Using Microsoft System Center 2012 Virtual Machine Manager

Note: The links provided were working correctly at the time of publication.
Chapter 6: Reference Documentation

- **Failover Clustering Overview**
- **How to Add a Node to a Hyper-V Host Cluster in VMM**
- **How to Add Windows File Server Shares in VMM**
- **How to Create a Virtual Machine Template**
- **How to Create and Deploy a Virtual Machine from a Template**
- **Hyper-V: How many network cards do I need?**
- **Windows Server 2012 Hyper-V Network Virtualization Survival Guide**
- **Hyper-V Network Virtualization Overview**
- **Hyper-V Overview**
- **Install Hyper-V and Configure a Virtual Machine**
- **Installation for SQL Server 2012**
- **Installing a VMM Agent Locally**
- **Installing a VMM Management Server**
- **Installing and Opening the VMM Console**
- **Install and Deploy Windows Server 2012 R2 and Windows Server 2012**
This appendix presents the following topic:

**Customer Configuration Worksheet** ................................................................. 76
Customer Configuration Worksheet

Before configuring the solution, you need to gather some customer-specific configuration information such as IP addresses and hostnames. The following tables provide a worksheet that you can use to record the information. You can also print and use the worksheet for customers and leave it for their 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 Attachments, as follows:
   - Select View > Show/Hide > Navigation Panes > Attachments.
   - Or click Attachments, as shown in Figure 40.

2. In Attachments, double-click the attached file to open and print the worksheet.
To confirm the customer information, cross-reference with the *VNXe Series Configuration Worksheet*.

**Table 20. Common server information**

<table>
<thead>
<tr>
<th>Server name</th>
<th>Purpose</th>
<th>Primary IP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domain Controller</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DNS Primary</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DNS Secondary</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DHCP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NTP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SMTP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SNMP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SCVMM Console</td>
<td></td>
<td></td>
</tr>
<tr>
<td>XenDesktop Console</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provisioning Services Console</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Microsoft SQL Server</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 21. Hyper-V Server information**

<table>
<thead>
<tr>
<th>Server name</th>
<th>Purpose</th>
<th>Primary IP</th>
<th>Private net (storage) addresses</th>
<th>VMkernel IP</th>
<th>vMotion IP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hyper-V Host 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hyper-V Host 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>...</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 22. Array information**

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Array name</td>
<td></td>
</tr>
<tr>
<td>Admin account</td>
<td></td>
</tr>
<tr>
<td>Management IP</td>
<td></td>
</tr>
<tr>
<td>Storage pool name</td>
<td></td>
</tr>
<tr>
<td>Share name</td>
<td></td>
</tr>
<tr>
<td>CIFS Server IP</td>
<td></td>
</tr>
</tbody>
</table>
### Table 23. Network infrastructure information

<table>
<thead>
<tr>
<th>Name</th>
<th>Purpose</th>
<th>IP</th>
<th>Subnet mask</th>
<th>Default gateway</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethernet switch 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethernet switch 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>...</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 24. VLAN information

<table>
<thead>
<tr>
<th>Name</th>
<th>Network purpose</th>
<th>VLAN ID</th>
<th>Allowed subnets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Client access network</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage network</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management network</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 25. Service accounts

<table>
<thead>
<tr>
<th>Account</th>
<th>Purpose</th>
<th>Password (optional, secure appropriately)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows Server administrator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>root</td>
<td>Hyper-V Administrator</td>
<td></td>
</tr>
<tr>
<td>root</td>
<td>Array administrator</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SCVMM administrator</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Citrix XenDesktop administrator</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Provisioning Services administrator</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SQL Server administrator</td>
<td></td>
</tr>
</tbody>
</table>