WHITE PAPER

EMC INFRASTRUCTURE FOR VIRTUAL DESKTOPS ENABLED BY IOMEGA® StorCenter® px, VMware VSPHERE 4.1, VMware VIEW 4.6, AND CISCO UNIFIED COMPUTING SYSTEM

Reference Archictecture

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REFERENCE ARCHITECTURE OVERVIEW

Document purpose

The document describes the reference architecture of the EMC® Infrastructure for Virtual Desktops Enabled by Iomega® StorCenter™ PX, VMware® vSphere™ 4.1, VMware View™ 4.6, and Cisco Unified Computing System (UCS) solution.

Introduction to the Iomega StorCenter px series

The Iomega StorCenter px series network storage is ideal for small- to medium-sized businesses or distributed enterprises and offers a compact business-class desktop storage device or a 1U space-saving server-class rackmount array.

Powered by EMC storage technology, the Iomega StorCenter px4-300d, px6-300d, px4-300r, and px12-350r are high performance network storage devices built for advanced data protection and local and remote office content sharing. Offering up to 36TB of storage capacity, including a diskless option, the px series network storage devices are easy to set up and manage, and affordable to own.

Key characteristics of the Iomega StorCenter px series include:

- High performance – Support of solid state drives (SSD), dual core Intel® Atom™ or Celeron® processor, 2GB or 4GB memory, dual or quad GbE NICs.

- Flexible configuration – Diskless configuration, bring your own drives, storage pools with RAID expansion and migration and hot spares. Second redundant power supply with the px12-350r, and optionally with px4-300r.

- Server-class pedigree – Certified for Citrix® XenServer™ 5.6, Windows Server 2003, Windows Server 2008, and Windows Server 2008 R2, VMware vSphere 4.1, EMC E-Lab tested.

- Business-class features – iSCSI block-level access in parallel with CIFS/NFS/AFP file sharing, Windows Active Directory Trusted Domains, Microsoft Cluster Service (MSCS), and Hyper-V™ failover cluster support.

- Built-in cloud technologies – Iomega Personal Cloud for protection and sharing of data from anywhere, backup options to the MozyConnect™ or Amazon S3™ storage clouds.

Solution purpose

The purpose of this reference architecture is to build and demonstrate the functionality, performance, and scalability of virtual desktops enabled by the Iomega StorCenter series, VMware vSphere 4.1, VMware View 4.6, VMware View Composer 2.6, and Cisco Unified Computing System. We built this solution on an Iomega px6-300d device with NFS and tiered storage, including SSD and Serial ATA II drives.

This reference architecture validates the performance of the solution and provides guidelines to build similar solutions. The solution specifically targets a small deployment of less than 100 virtual desktops per Iomega StorCenter px series storage device.

This document is not a comprehensive guide to every aspect of this solution.

The business challenge
Customers require a scalable, tiered, and highly available infrastructure on which to deploy their virtual desktop environment. The same requirement applies to businesses of any size. There are several new technologies available to assist them in architecting a virtual desktop solution, but they need to know how to best use these technologies to maximize their investment, support service-level agreements (SLAs), and reduce their desktop total cost of ownership (TCO).

The purpose of this solution is to build a replica of a common customer virtual desktop infrastructure (VDI) environment and validate the environment for performance, scalability, and functionality. Customers will realize:

• Increased control and security of their mobile desktop environment, which is typically their most at-risk environment.

• Better end-user productivity with a more consistent environment.

• Simplified management with the environment contained by IT.

• Better support of SLAs and compliance initiatives.

• Lower operational and maintenance costs.

The technology solution
This solution demonstrates how to use an Iomega StorCenter px series storage device to provide the storage resources for a robust VMware View 4.6 environment by using Windows XP virtual desktops.

Planning and designing the storage infrastructure for VMware View is a critical step because the shared storage must be able to absorb large bursts of I/Os that occur during the course of a day, which can lead to periods of erratic and unpredictable virtual desktop performance. Users can adapt to slow performance, but unpredictable performance will quickly frustrate them.

To provide a predictable performance to a virtual desktop infrastructure, the storage must be able to handle the peak I/O load from the clients without resulting in a lengthy response time.

This solution incorporates the following components and the Iomega px6-300d device:

• 50 Microsoft Windows XP Professional SP3 virtual desktops

• VMware View Composer 2.6 based linked clones

- VMware View Manager 4.6
- Storage tiering (SSD and SATA II) on Iomega px6-300d
- VMware vSphere 4.1and NFS datastores
- Cisco Unified Computing System (UCS)
- Sizing and layout of the 50-desktop VMware View 4.6 environment
- Self-contained domain infrastructure
- Wyse P20 Zero Clients at end points

SOLUTION ARCHITECTURE

This section describes the tests performed to validate the EMC Infrastructure for Virtual Desktops Enabled by Iomega StorCenter PX, VMware® vSphere™ 4.1, VMware View™ 4.6, and Cisco Unified Computing System (UCS) solution. It involves building a 50-desktop VMware View 4.6 environment on a StorCenter px series device and integrates the new features of each of these systems to provide a compelling, cost-effective VDI platform for a small business or a remote workgroup.

Architecture diagram

Figure 1 shows the overall physical architecture of the solution. Two connections between the ESX Server and the Iomega px6 are established to separate traffic between different NFS datastores.
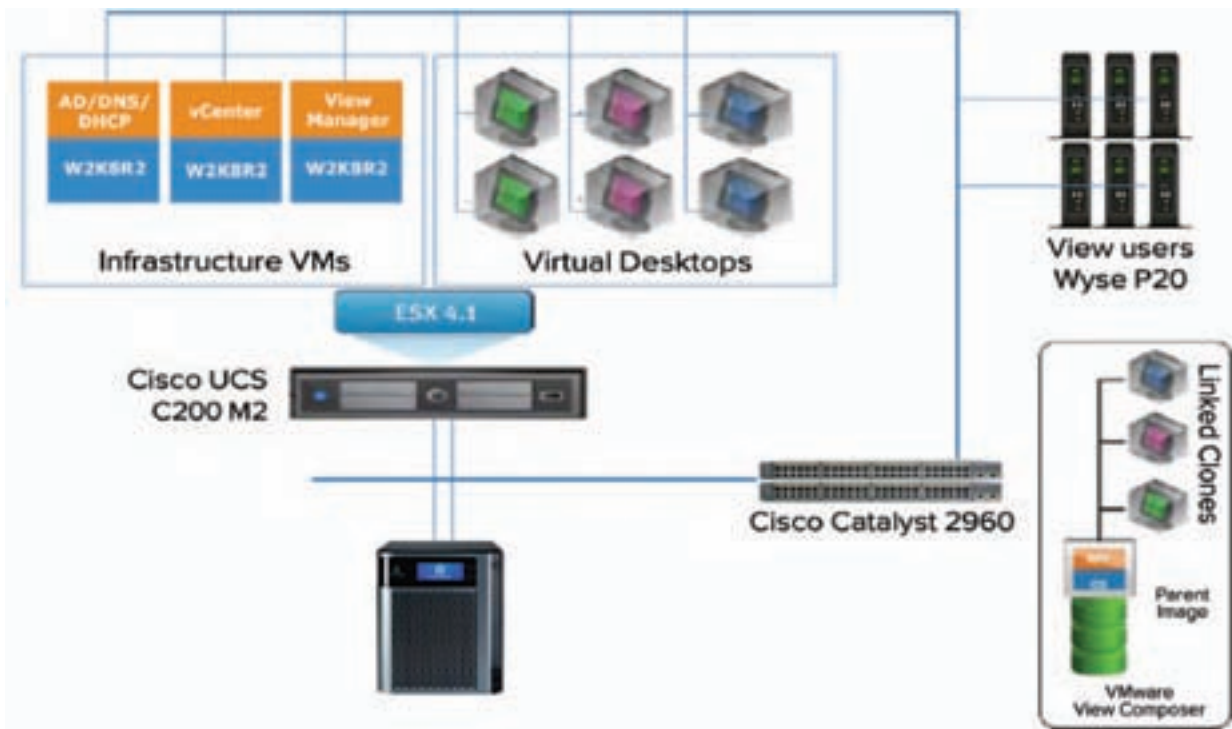

Figure 1. Solution architecture

Hardware resources
Table 1 lists the hardware used in this solution.

Hardware	Quantity	Configuration	Notes
Iomega StorCenter px6-300d	1	Intel Atom Dual Core 1.8GHz Processor 2GB RAM 2 Micron C400 256GB SSD drives 4 Hitachi Deskstar HDS723020BLA642 2TB SATA disks Dual-port GbE NIC	Shared storage providing NFS shares
Cisco UCS C200 M2	1	2 Intel Xeon X5670 6 core 2.93GHz CPUs 96GB RAM 4 146GB 15K RPM SAS disks Quad-port GbE NIC	VMware ESX server hosting infra structure management VMs and virtual desktops
Cisco Catalyst 2960	2	48-port GbE switch	Ethernet switch for storage connectivity and infrastructure
Wyse P20 Zero Client	50	Teradici 1100P PCoIP 1GB RAM	Hardware PCoIP engine for virtual desktop connection
Windows 2008 R2 VMs	Each	1 vCPU, 4GB RAM, 40 GB vDisk, 1GbE vNIC	VMs that are created to be infrastructure management servers
Windows XP virtual desktops	Each	1 vCPU, 1GB RAM, 20 GB vDisk, 1 GbE vNIC	Virtual desktops that are created for this solution

Table 1. Solution hardware

Software resources
Table 2 lists the software used in this solution.

Software	Configuration	Notes
EMC Lifeline™	3.1.10.45882	Operating system for Iomega px6-300d
VMware vSphere ESXi	4.1 U1	Server hypervisor
VMware vCenter	4.1 U1	vSphere Management Server
VMware View Manager	4.6	Software hosting virtual desktops
VMware View Composer	2.6	View component that uses linked clone technology to reduce storage size
Microsoft SQL Server	2005	Database that hosts the tables for vCenter, View Composer, and View Events
Microsoft Windows Server 2008	R2 64-bit	Operating system for the infrastructure management server
Microsoft Windows XP	Professional SP3 32-bit	Operating system for the virtual desktops

Table 2. Solution software

Storage layout

Figure 2 depicts a logical view of how storage on the Iomega px6-300d device is provisioned in the solution.
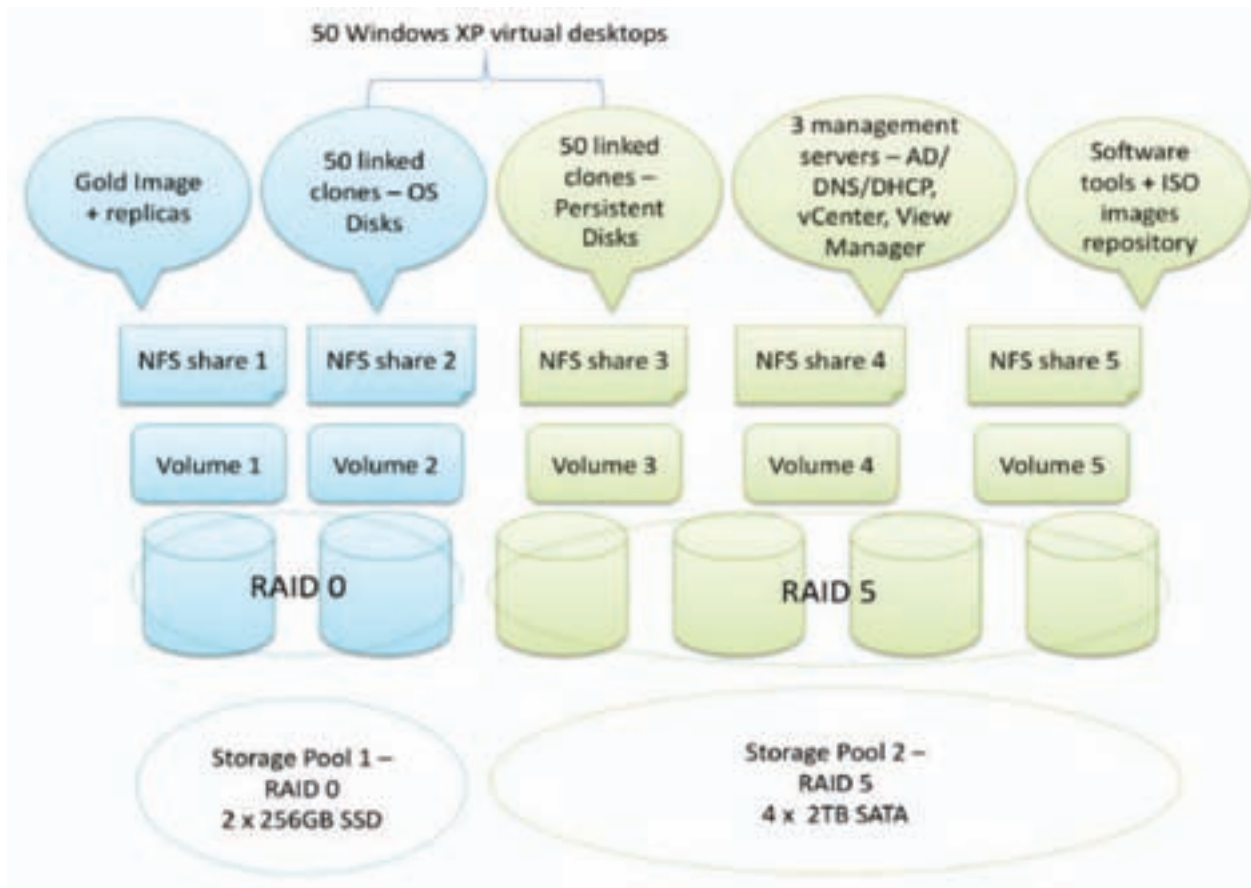

Figure 2. Storage layout

Note: in solution validation testing, the SSD drives were tested with both RAID 0 and RAID 1 configurations. No significant performance difference was observed between the configurations when supporting 50 virtual desktops. Therefore, the choice between RAID 0 and RAID 1 in a deployment of the solution is primarily a tradeoff between capacity and data protection.

KEY COMPONENTS

Introduction
This section briefly describes the key components used in this solution, including:

- Iomega StorCenter px series
- VMware vSphere 4.1
- VMware View 4.6
- VMware View Composer 2.6
- Cisco Unified Computing System (UCS)

Iomega StorCenter px series
The Iomega StorCenter px series network storage array offers versatile storage provisioning, advanced protocol capabilities, expandability, and affordability in an easy-to-use product ideal for small businesses, workgroups, and departments. Based on enterprise-class EMC storage technology, the StorCenter px series provides multiple gigabit Ethernet connections, easy file sharing, iSCSI block access, flexible RAID configurations for optimized data protection, and storage pools for application flexibility and expandability to match your budget.

Iomega StorCenter network storage devices can present NFS-exported shares and iSCSI LUNs to VMware ESX Server to create Datastores for virtual machines and virtual disks. The Iomega StorCenter px series network storage devices satisfy requirements for both storage options on VMware ESX Server and are certified in the VMware Hardware Compatibility List (HCL). An Iomega StorCenter px series device is a proven storage platform for small businesses that want to deploy VMware vSphere.

VMware vSphere 4.1
VMware vSphere 4.1 is the market-leading virtualization platform that is used across thousands of IT environments around the world. VMware vSphere 4.1 can transform or virtualize computer hardware resources, including CPUs, RAM, hard disks, and network controllers, to create a fully functional virtual machine that runs its own operating system and applications just like a physical computer.

The high-availability features of VMware vSphere 4.1 coupled with DRS and Storage vMotion enable the seamless migration of virtual desktops from one VMware ESX server to another with minimal or no impact to the customer's usage.

VMware View 4.6
VMware View 4.6 is the leading desktop virtualization solution that enables desktops to deliver cloud-computing services to users. VMware View 4.6 integrates effectively with vSphere 4.1 to provide:

- View Composer 2.6 performance optimization – optimizes storage utilization and performance by reducing the footprint of virtual desktops and using tiered storage.

- Tiered storage support – supports the use of different tiers of storage to maximize performance and reduce cost.

- Thin provisioning support – enables efficient allocation of storage resources when virtual desktops are provisioned. This results in better use of the storage infrastructure and reduced CAPEX/OPEX.

VMware View Composer 2.6
VMware View Composer is a service that is installed on the vCenter server and provides storage savings by using linked clone technology to share the hard disk of parent virtual machines. This component is described further in this document.

Cisco Unified Computing System
Cisco UCS provides the computing platform purpose-built for virtualization, delivering a cohesive system that unites computing, networking, and storage access. Cisco UCS integrates a low-latency, lossless 10-Gigabit Ethernet unified network fabric with enterprise-class, x86-architecture servers that scale to the demands of virtualized desktop workloads without sacrificing performance or application responsiveness. Cisco UCS Manager enables a stateless computing model that uses Service Profile Templates to scale-up large pools of fully provisioned computing resources from bare metal, within a fraction of the time required by traditional server solutions.

VMware VIEW TECHNOLOGY OVERVIEW

Introduction
VMware View delivers personalized virtual desktops as a managed service from a virtualization platform built to deliver the entire desktop, including the operating system, applications, and user data. VMware View 4.6 provides centralized automated management of these components with increased control and cost savings. VMware View 4.6 improves business agility while providing a flexible high-performance desktop experience for end users across a variety of network conditions.

VMware View components
To provide a virtual desktop experience, VMware View uses various components, each with its own purpose. The components that make up the View environment are:

- Hypervisor
- VMware View Connection Server
- VMware vSphere vCenter Server/View Composer
- VMware View Security Server
- VMware View Transfer Server
- Supported database server like Microsoft SQL Server

- VMware View Agent
- VMware View Client
- VMware View Admin Console
- View PowerCLI
- ThinApp

Figure 3 shows the VMware View components described in the following sections.
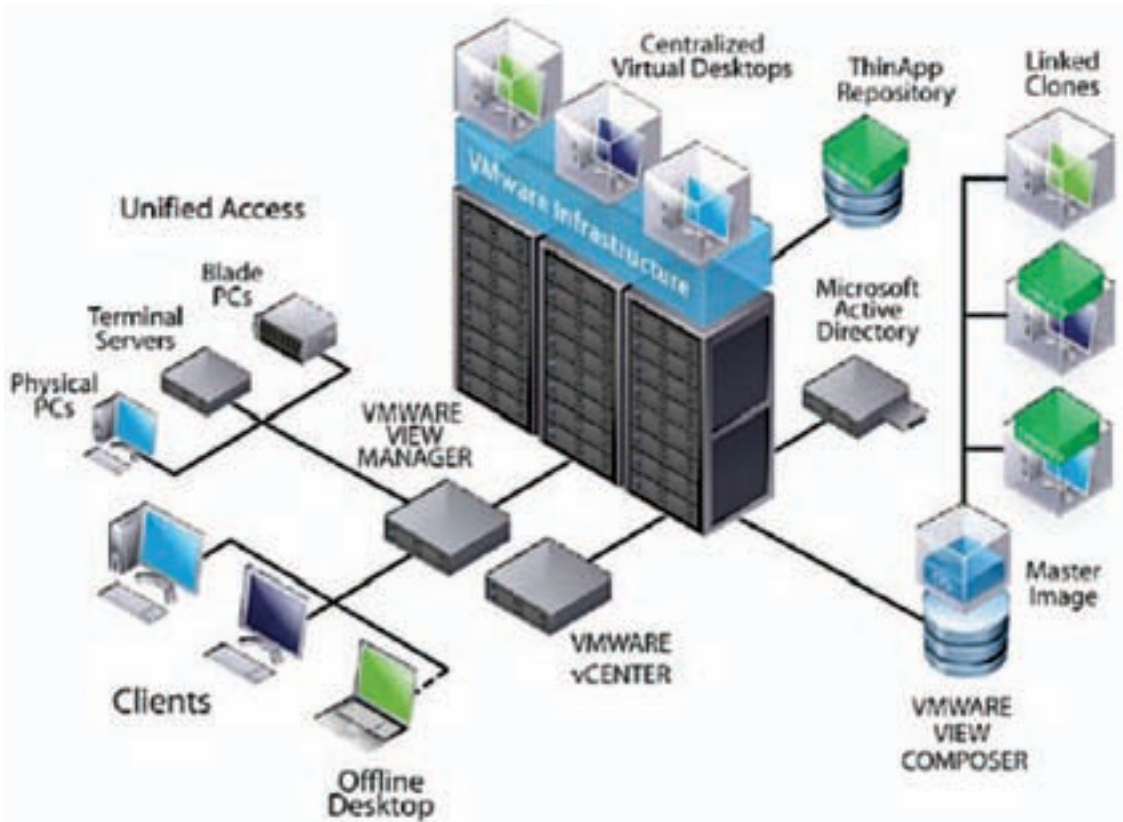

Figure 3. VMware View components

Hypervisor
Hypervisor is used to host the virtual desktops. To get most of the features, we recommend that you use VMware vSphere 4.1. The vSphere 4.1 features such as vSphere API for array integration (VAAI), memory compression, and ballooning help to host more virtual desktops on a host.

VMware View Connection Server
The VMware View Connection Server hosts the LDAP directory and keeps the configuration information of the VMware View desktop pools, its associated virtual desktops, and VMware View. This data information can be replicated to other View Connection Replica servers. The View Connection Server also acts as a connection broker that maintains the desktop assignment. It supports an SSL connection to the desktop using RDP or PCoIP. It also supports RSA® SecureID® two-factor authentication and smart card authentication.

VMware vSphere vCenter/View Composer
The VMware vSphere vCenter Server helps you manage your virtual machines and vSphere ESX hosts and provides high availability (HA) and Distributed Resource Scheduling (DRS) clusters. VMware vCenter Server hosts customization specification that permits cloned virtual machines to join the Active Directory (AD) domain.

The View Composer service is installed on the vCenter Server that provides storage savings by using linked clone technology to share the hard disk of the parent virtual machine as shown in Figure 4.
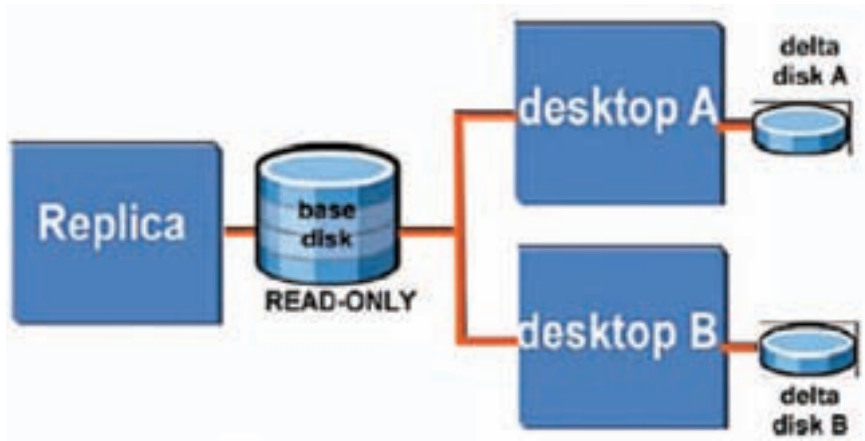

Figure 4. Linked clones

The desktop operating system reads from the common read-only replica image and writes to the linked clone. Any unique data created by the virtual desktop is also stored in the linked clone. A logical representation of this relationship is shown in Figure 5.

Figure 5. Linked clone virtual machines

With View Composer, you can configure OS data and user information on separate disks in linked-clone desktops. View Composer preserves the user information on the persistent disk when the OS data is updated, refreshed, or rebalanced. A View Composer persistent disk contains user settings and other user-generated data.

VMware View Security Server
The VMware View Security Server is a different type of View Connection Server. It supports two network interfaces – one to a private enterprise network and another to the public network. It is typically used in a demilitarized zone (DMZ) and enables users outside the organization to securely connect to their virtual desktops.

VMware View Transfer Server
The VMware View Transfer Server is another type of View Connection Server that is required when you use the local mode feature. The Transfer Server can use the CIFS share on Iomega StorCenter to store the published image. The local mode allows users to work on a virtual desktop disconnected from the network and later synchronizes the changes with the View environment.

Database Server
The VMware View supported database server is used to host the tables used by View Composer and can optionally store the VMware View events.

VMware View Agent
VMware View Agent is installed on the virtual desktop template and is deployed to all the virtual desktops. It provides communication to the View Connection Server and enables options for USB redirection, virtual printing, PCoIP server, and Smartcard over PCoIP.

VMware View Client
VMware View Client software is used to connect to the virtual desktops using the connection broker. View Client allows users to print locally from their virtual desktop, and with the proper configuration, users can access USB devices locally.

VMware View Admin Console
VMware View Admin Console is a browser-based administration tool for VMware View and is hosted on the View Connection Server.

VMware View PowerCLI
VMware View PowerCLI provides the basic management of VMware View using Windows Powershell. It allows administrators to script some basic VMware View operations and can be used along with other Powershell scripts.

VMware ThinApp
VMware ThinApp is an application virtualization product for enterprise desktop administrators and application owner. It enables rapid deployment of applications to physical and virtual desktops. ThinApp links the application, the ThinApp runtime, the virtual file system, and the virtual registry into a single package. The CIFS share on an Iomega StorCenter device can be used as a repository and to deploy the ThinApp to the virtual desktops.

CONCLUSION

VMware View 4.6 virtualization technology meets user and IT needs, providing compelling advantages compared to traditional physical desktops and terminal services.

The Iomega® StorCenter™ px series network storage is high-performance, ease-of-use, and highly reliable storage dev ices specifically designed to meet the storage challenges that small businesses face daily.

The device supports the NFS and iSCSI protocols, the two predominant ways of utilizing IP storage by the VMware ESX Server. Customers' total infrastructure costs are further reduced by using an existing Ethernet infrastructure.

The zero-page recognition and transparent page sharing vSphere 4.1 features help you save memory and allow you to host more virtual desktops per server. Cisco UCS delivers the large memory and processing capability to achieve higher densities of virtual desktops per server, providing ideal scaling without sacrificing performance.

REFERENCES

EMC documentation
The following documents, located on the Iomega website or EMC Powerlink®, provide additional and relevant information. If you do not have access to a document, contact your EMC representatives:

• Iomega StorCenter px Series Network Storage data sheet

• Using Iomega StorCenter PX Series with VMware vSphere 4.1

• EMC Performance Optimization for Microsoft Windows XP for the Virtual Desktop Infrastructure – Applied Best Practices

• Deploying Microsoft Windows 7 Virtual Desktops with VMware View – Applied Best Practices Guide

VMware documentation
The following VMware documents, located on the VMware website, also provide useful information:

• Introduction to VMware View Manager

• VMware View Manager Administrator Guide

• VMware View Architecture Planning Guide

• VMware View Installation Guide

• VMware View Integration Guide

• VMware View Reference Architecture

• Storage Deployment Guide for VMware View

• VMware View Windows XP Deployment Guide

• VMware View Guide to Profile Virtualization

Cisco documentation
The following Cisco documents, located on the Cisco website, also provide useful information:

• Solve the Desktop Crisis with Cisco Desktop Virtualization (a solution with VMware View and Cisco Desktop Virtualization whitepaper)

• Desktop Virtualization with View 4.5 and EMC Storage

• Cisco Desktop Virtualization Solutions website: www.cisco.com/go/vdi

• Cisco Virtualization Experience Infrastructure website: www.cisco.com/go/vxi