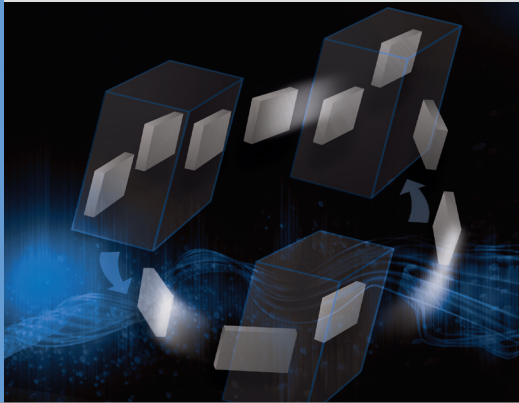


REFERENCE ARCHITECTURE BRIEF: DELL VIRTUAL REMOTE DESKTOP FEATURING VMWARE VIEW 4



To help simplify enterprise desktop management, Dell and VMware have created a flexible, highly scalable desktop virtualization reference architecture based on Dell™ PowerEdge™ servers, Dell EqualLogic™ PS Series iSCSI SAN arrays, and powerful new VMware® View 4 technology.

Today's challenging economic environment is forcing many organizations to revisit their IT infrastructure strategies. Exploring cost-effective alternatives to manage the enterprise desktop environment is high on the agenda of many CIOs, given escalating maintenance and support costs, frequent security patches and software upgrades, and an explosion of remote and mobile user devices. In addition, CIOs must address data security and compliance issues on remote devices, plan for rapid recovery in the event of a disaster, and be able to deploy client applications and services quickly and easily. To address these challenges, many are evaluating virtualization technology to deliver desktops as a managed service.

The benefits are compelling. Hardware-independent desktop environments allow IT organizations to create a standardized, centrally managed desktop image, helping reduce costs by avoiding the need for administrators to be in physical proximity to update and patch each device. Also, by moving data storage from local devices susceptible to theft or loss to a centrally managed location, this approach can help significantly increase security.

IT organizations are seeking ways to gain these benefits while minimizing startup costs, complexity, and risk. Dell and VMware have partnered to create a scalable reference architecture model that helps organizations size and build out the IT infrastructure using a flexible building-block approach that can be implemented in a repeatable, predictable fashion.

WORKING TOGETHER TO PROVIDE A COMPREHENSIVE SOLUTION

Dell and VMware have worked together to create the Dell Virtual Remote Desktop™ reference architecture featuring VMware View 4 as part of the Dell Flexible Computing initiative. By bringing the comprehensive Dell portfolio of server, storage, client, support, and professional service offerings together with cutting-edge VMware virtualization technology, the two companies have created an outstanding end-to-end framework to address a comprehensive range of client virtualization needs.

VMware View Dell Edition—the combination of Dell servers, storage, and client devices with the VMware View 4 client virtualization solution—is designed to greatly simplify the design, deployment, management, and support of Dell Virtual Remote Desktop Flexible Computing solution deployments through a single point of contact. Combined with Dell's strong traditional client management and deployment services, the Dell Flexible Computing initiative enables organizations to leverage an exceptional mix of virtual and traditional computing capabilities.

VMware View 4 is a key component of the Dell Flexible Computing architecture, and the Dell Virtual Remote Desktop solution is designed to offer the benefits of VMware View in a highly flexible design that can scale from dozens to thousands of virtual desktops. The reference architecture is general enough that organizations can easily adapt it to help meet diverse end-user requirements in a wide range of use cases.

For enterprises that require additional assistance, the Dell ProConsult team offers an End User Profiling assessment service that helps organizations define user groups and their workloads before building their own virtual desktop architecture—a step designed to save significant time and expense. The profiling service utilizes online surveys and remote auditing of end-user devices to gather data. Usage patterns are then compared with Dell-validated configurations. Matching user profiles to configurations not only helps increase efficiency for IT staff, but can also enhance productivity throughout the organization.

Dell Virtual Remote Desktop

A vital component of the Dell Flexible Computing framework, the Dell Virtual Remote Desktop solution featuring VMware View 4 enhances IT efficiencies from the data center to the desktop through a powerful combination of VMware View virtualization software together with optimized Dell hardware and comprehensive Dell services and support:

- **Dell PowerEdge servers:** Cost-effective 11th-generation Dell PowerEdge servers offer a simplified, high-performance platform for enterprise data centers. Dell has optimized the standards-based PowerEdge server family for virtualization to help meet enterprise density, flexibility, and performance needs without locking organizations into proprietary infrastructures.
- **Dell EqualLogic storage:** Dell EqualLogic Internet SCSI (iSCSI) storage area network (SAN) arrays provide a virtualized storage infrastructure designed to maximize the advantages of server

WHY PCoIP MAKES A DIFFERENCE

VMware View 4 supports Teradici PC-over-IP (PCoIP) technology, which enables a high-quality desktop experience designed to surpass legacy application delivery systems. The PCoIP display protocol helps deliver virtual desktops efficiently over the network by optimizing low-bandwidth, high-latency connections. Advantages of VMware View 4 with PCoIP include the following:

- Consistent, high-performance end-user desktop experience over a local area network (LAN) or wide area network (WAN)
- Multi-media redirect, USB redirect, and multi-monitor configuration support for a familiar desktop experience
- Desktop access from a wide array of devices, allowing increased availability in virtualized environments
- Use of progressive build technology to display images
- Support for Microsoft® ClearType® fonts

The PCoIP protocol compresses, encrypts, and encodes a comprehensive user configuration at the data center and transmits it “pixels only” across a standard IP network to PCoIP-enabled desktop devices. This approach contributes to a successful virtual desktop infrastructure deployment by offering a desktop computing experience designed to meet or exceed user expectations—including streaming video and high-resolution graphics.

virtualization—creating a flexible storage pool that helps dramatically simplify deployment and management.

- **Dell OptiPlex™ clients:** The Dell OptiPlex family addresses a wide range of security, workload, and remote access requirements—including the OptiPlex FX160 thin client, which provides an embedded OS for simple virtual desktop implementations. The OptiPlex FX160 is also certified as part of the VMware Ready™ Program.
- **Dell services and support:** Dell service and support teams use innovative tools and automated analysis to help organizations understand and optimize their virtualized environments. Dell consultants work with organizations worldwide

to provide advice, readiness assessments, design, and implementation services, while the Dell technical support team is ready to assist with hardware- and software-related questions.

VMware View 4

VMware View 4 offers a tightly integrated, end-to-end solution built specifically for delivering desktops as a managed service. It is designed to create simplified, automated desktop workflows that help reduce operational costs and increase control for IT staff, while providing end users with a rich, flexible desktop experience regardless of device, network, or use case.

Built into VMware View 4 is an innovative display technology specifically developed for virtual desktop delivery. The Teradici® PC-over-IP® (PCoIP®) protocol is designed to dynamically detect and adapt to end-user network connections, enabling IT organizations to provide a high-quality desktop experience regardless of user location (see the “Why PCoIP makes a difference” sidebar). VMware View 4 with

“VMware View 4 offers a tightly integrated, end-to-end solution built specifically for delivering desktops as a managed service.”

PCoIP supports a variety of software and hardware configurations. For example, users can play rich media content, choose from a range of monitor configurations, and seamlessly access locally attached peripheral devices such as printers, scanners, and mass storage.

In addition, VMware View 4 is tightly integrated with VMware vSphere™ 4 virtualization software. Building on the power of the widely deployed VMware Infrastructure virtualization platform, vSphere helps bring the benefits and enterprise features of data center virtualization to the desktop environment. Extending features such as VMware vMotion™, VMware High Availability (HA), VMware Distributed Resource Scheduler (DRS), and VMware Fault Tolerance (FT) technology to the desktop facilitates built-in disaster recovery and business continuity.

CREATING THE VIRTUAL REMOTE DESKTOP REFERENCE ARCHITECTURE

To help simplify deployment and scalability, Dell and VMware have designed the Dell Virtual Remote Desktop reference architecture with VMware View 4 using a building-block approach. This model provides the flexibility to create a comprehensive virtual desktop infrastructure that can be tailored to specific organizational objectives while maintaining a straightforward architecture designed to simplify IT while advancing enterprise efficiency. This reference architecture comprises four main layers, each building on the previous layer and all working together to provide a comprehensive platform for VMware View 4 deployment.

VMware vSphere infrastructure

VMware vSphere 4 provides the foundation for the virtualized infrastructure. vSphere abstracts processor, memory, storage, and networking resources into components that serve multiple virtual machines (VMs), enabling optimal hardware utilization and flexibility. Figure 1 shows the vSphere remote desktop virtualization delivery architecture.

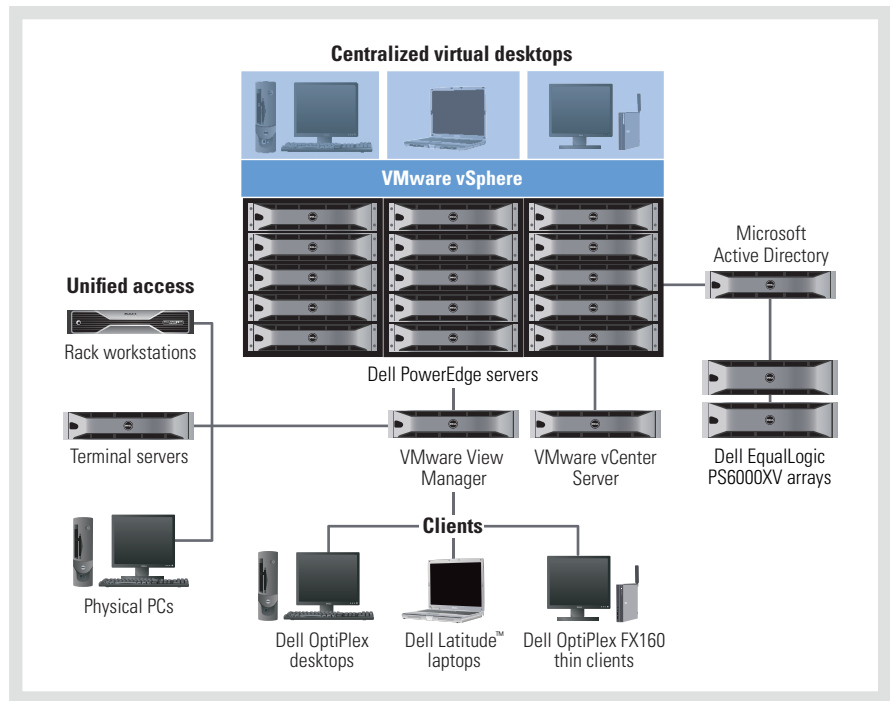


Figure 1. VMware vSphere remote desktop virtualization delivery architecture

Dell PowerEdge servers

The 11th-generation Dell PowerEdge server family is optimized for integration with VMware vSphere 4, including increased memory capacity, more integrated I/O than previous-generation PowerEdge servers, and the innovative Intel® Xeon® processor 5500 series. A common design and components used across the PowerEdge server family help simplify management and maintenance while helping reduce cost and complexity. As a result, PowerEdge servers are quick to deploy and easy to integrate with vSphere 4.

Dell EqualLogic iSCSI SAN arrays

The iSCSI protocol enables VMware View environments to support cost-effective and easy-to-manage storage such as the Dell EqualLogic PS Series, which provides a high-performance iSCSI SAN built on fully redundant, hot-swappable hardware. Software functionality built into EqualLogic arrays includes automatic volume snapshots and replication, multipath I/O, storage tiering, and more. Additional options help minimize the cost

of VMware View storage as administrators scale the deployment. For example, thin provisioning features on the EqualLogic arrays allow overprovisioning of storage to help reduce costs during rollout; new arrays can be added non-disruptively as users consume disk space, allowing cost-effective, just-in-time, linear growth. EqualLogic arrays can also help minimize desktop downtime, by taking snapshots of logical units (LUNs) at specific points in time and providing them to VMware View as new writable data stores.

Tight integration between EqualLogic PS Series arrays and VMware software provides additional capabilities. For example, the EqualLogic PS Series is tightly integrated with VMware vCenter™ Site Recovery Manager, which can enable failovers of the desktop infrastructure to a designated disaster recovery location as well as granular control over how desktop recovery is handled. Also, VMware View Composer's Linked Clone technology helps to increase storage efficiency and dramatically simplify virtual desktop provisioning and management. By managing user-unique virtual

desktop data separately from common data, VMware View Composer efficiently integrates storage deduplication.

Support for tiered storage using EqualLogic PS Series arrays can also help ensure high desktop computing performance while maintaining virtualization's economies. Because of their I/Os per second (IOPS) characteristics, virtualized desktops can benefit from high-performance Serial Attached SCSI (SAS) disks such as those incorporated in the EqualLogic PS6000XV array. A trade-off exists, however, between storage optimized for capacity and storage optimized for performance. Many enterprises can therefore benefit from the arrays' ability—particularly in mixed-array SANs—to automatically assign storage resources to the most appropriate workloads. This intelligent automation provides IT administrators with a simple means to use high-performance SAS disks in VMware View infrastructures while leveraging economical Serial ATA (SATA) disks for applications less sensitive to performance factors, such as file shares.

VMware View and VMware View Manager

VMware View Manager is an enterprise-class desktop management server designed to securely connect users to virtual desktops residing in the data center, and provides an easy-to-use Web browser-based interface for managing VMware View environments. VMware View Manager can use an existing Microsoft Active Directory® infrastructure for authentication and user management. Moreover, VMware View Manager integrates with VMware vCenter Server software to manage virtual desktops running on VMware hosts. Session

management includes integration with existing desktop infrastructure services to maintain user and computer accounts.

In addition, VMware View Manager not only acts as a connection broker to VMware vSphere 4 virtual desktops for both thin and fat client devices, but can also manage one-to-one connections between thin clients and dedicated data center-based desktops such as Dell Precision™ R5400 rack workstations. By providing a single connection broker that manages software-to-software, software-to-hardware, and hardware-to-hardware virtual desktop connections, VMware View 4 Dell Edition aims to greatly simplify virtual desktop deployments, helping avoid the need for multiple connection brokers to handle different types of virtual desktop implementations.

VMware View Composer

VMware View Composer is a key component of VMware View 4 that works with VMware View Manager to help reduce storage requirements and enhance the image management capability of virtualized desktops. When deployed in a VMware View environment, it can offer significant benefits—helping to dramatically reduce storage costs, management, and desktop provisioning time. Administrators can use VMware View Composer to manage hundreds of desktops from a single central image, and can retain end-user settings when updating or patching service packs, applying application updates, or even performing OS upgrades. And by enabling virtually instantaneous rollback, it helps administrators to streamline management and ensure that end-user systems are up-to-date.

MAPPING OUT A 1,000-NODE REFERENCE ARCHITECTURE

Earlier this year, Dell and VMware engineers studied the performance characteristics of VMware View on a single server. The team ran a randomized workload designed to represent a typical task-worker profile using a common set of business productivity tools, and made the following general observations:

- Memory overcommit contributed to efficient memory usage and enhanced density, enabling the server being observed in this study to host an increasing number of VMs up to an expected limit.
- The number of storage IOPS for the task-worker profile in this study was measured in a standard acceptable range. The team observed this value to be independent of the virtualization platform and infrastructure because IOPS performance typically results from the type of workload on the storage system. Each virtualized desktop with this profile used approximately 5 IOPS, which served as a guide for sizing the storage and user profiles for a 1,000-node deployment.

Armed with these observations, Dell and VMware engineers then created a building-block reference architecture designed to support up to 1,000 virtual desktop users running a common set of business productivity tools (see Figure 2). The following recommended components were selected for this architecture model, identifying servers and storage with the requirements of the task worker in mind:

- Sixteen Dell PowerEdge R710 servers with quad-core Intel Xeon X5550 processors at 2.66 GHz, 64 GB of RAM, an 8 MB cache, and a 2.5-inch, 73 GB, 10,000 rpm hot-pluggable hard drive
- Two Dell EqualLogic PS6000XV iSCSI SAN arrays with sixteen 600 GB, 15,000 rpm SAS hard drives
- A VMware View Manager server running in a VM configured with two

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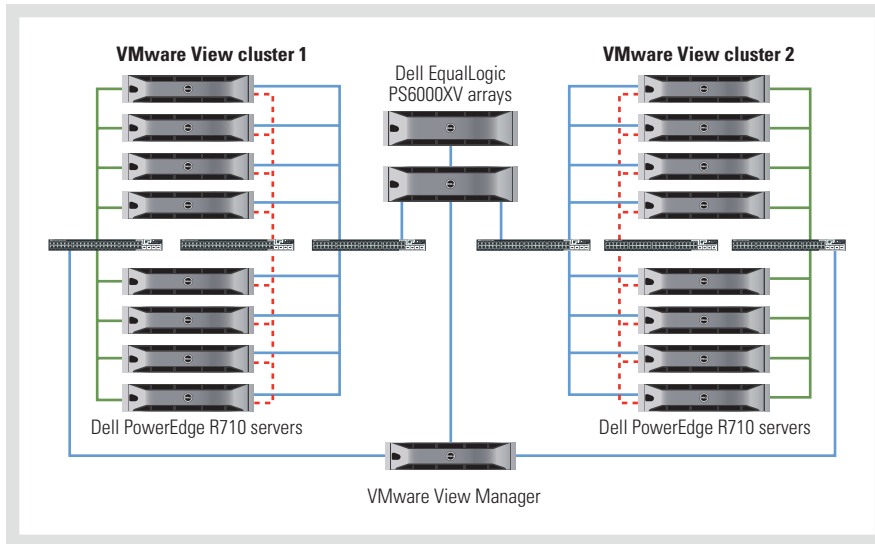


Figure 2. Building-block design for the Dell Virtual Remote Desktop reference architecture featuring VMware View 4

virtual processors, 4 GB of RAM, and a 20 GB virtual hard drive

Based on the user profile workload, this model is built to support up to 1,000 virtual desktops. Testing is underway with VMware View 4 and vSphere 4, and Dell and VMware expect complete performance and usage details on this reference architecture to be available in the first quarter of 2010.

This building block has been designed with both Dell and VMware best practices in mind. When designing a specific enterprise implementation, administrators should deploy the first building block as a proof of concept with a group of pilot users. This approach offers an opportunity to take baseline performance measurements on the system to help ensure sizing estimates are in line with actual usage as the solution scales.

TRANSITIONING TO CENTRALIZED DESKTOP MANAGEMENT AND DELIVERY

By leveraging the Dell Virtual Remote Desktop reference architecture featuring VMware View 4, IT leaders can easily and cost-effectively evolve their organizations away from the era of distributed PC image management and toward the delivery of user desktops as a managed service within their own IT infrastructure. The Dell Services team is ready to help assess, design, implement, and maintain desktop virtualization in specific organizational environments while offering a single point of contact for ongoing hardware and software support.

With its Flexible Computing initiative, Dell continues to pave the way for comprehensive, scalable solutions designed to satisfy diverse user profiles in a wide variety of enterprises and industries. VMware is a key partner in

the Dell Flexible Computing initiative, and VMware View 4 is tightly integrated with the Dell Virtual Remote Desktop approach—enabling enterprises to leverage exceptional hardware and software innovations resulting from the Dell and VMware collaboration.

The Dell Virtual Remote Desktop solution, featuring VMware View 4 and virtualization-optimized Dell hardware, enables administrators to rapidly provision virtual desktops and provide end users with personalized desktop environments while helping eliminate the need for retraining and application sharing. This approach can help boost enterprise efficiency, reduce total cost of ownership for the desktop infrastructure, and enable organizations to respond quickly and flexibly to ever-changing business needs. [u](#)

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www.vmware.com/view

Dell PowerEdge servers:
DELL.COM/PowerEdge

Dell EqualLogic PS Series:
DELL.COM/EqualLogic
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Dell Services:
DELL.COM/Services



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