

Microsoft® Virtual Server 2005 R2

Windows Vista™ Enterprise Centralized Desktop and Virtual Server 2005 R2

White Paper

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Abstract

This white paper introduces Windows Vista™ Enterprise Centralized Desktop, a way of licensing Windows Vista for deployment in a centralized, virtualized setting. It then examines how Windows Vista Enterprise Centralized Desktop may be deployed using Microsoft® Virtual Server 2005 R2 along with other Microsoft software and technologies. It examines two common deployment scenarios, followed by considerations and recommendations for deploying Virtual Server in support of such solutions. It concludes by examining the key benefits of implementing Windows Vista Enterprise Centralized Desktop on Virtual Server and presenting additional sources of information on the topics discussed in the document.

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INTRODUCTION

Meeting the needs of both IT organizations and end users in today's business environment can be challenging. To give large organizations the options and flexibility needed to meet diverse business requirements, Microsoft offers a broad choice of desktop computing options, ranging from traditional Windows®-based desktops running on distributed PCs to centralized solutions in which a single server running Terminal Services supports many users. Because each of these solutions has its own management profile and capabilities, enterprise customers can choose from a range of client computing options to suit their particular needs.

In the case of distributed PCs, Microsoft offers many technologies designed to help lower the cost of desktop management and enable a much more agile, secure, and satisfying computing experience. Some of these technologies are built into Microsoft software, such as the Active Directory® service in the Windows Server® 2003 operating system and support for Group Policy in the Windows Vista operating system. Others are separate products and services that integrate with and help optimize a customer's existing PC infrastructure, such as Microsoft Systems Management Server.

As with server-based solutions that are typically consolidated in the data center, some customers are benefiting from centralized user desktops and applications, for which they have traditionally used Windows Server Terminal Services. Although this solution works well in many cases, some customers require a greater degree of isolation than that provided by Terminal Services, in which one instance of the operating system supports many users, or they wish to run applications that are not compatible with a Terminal Services environment.

To offer customers more options and even greater flexibility, Microsoft has introduced Windows Vista Enterprise Centralized Desktop, a version of Windows Vista Enterprise licensed for installation on virtual machines residing on a server. Windows Vista Enterprise Centralized Desktop is another option for the delivery of remote desktops that provide end users with the familiar Windows experience. At the same time, it enables enterprises to benefit from the many advantages of centralized desktop deployment and management, including improved IT efficiency, enhanced security, and lower total cost of ownership.

Windows Vista Enterprise Centralized Desktop enables companies to deploy the same applications that run on traditional desktop PCs, thereby allowing them to support and update desktops running Windows Vista Enterprise Centralized Desktop in the same manner as traditional PCs. Equally important, a deployment of Windows Vista Enterprise Centralized Desktop provides user isolation, wherein one virtual desktop running on a shared server cannot affect another, and each desktop environment can be optimized for its specific user.

The remainder of this document presents typical deployment scenarios and their solution components. It also outlines the benefits of implementing such a solution on Microsoft Virtual Server 2005 R2—the second release of Virtual Server 2005—as well as high-level considerations and recommendations for doing so.

SOLUTION COMPONENTS

Windows Vista Enterprise Centralized Desktop facilitates the deployment of Windows Vista Enterprise–based client desktops in a centrally hosted, virtualized environment. In addition to the Windows Vista operating system, the *minimum* recommended Microsoft products and technologies for implementing Windows Vista Enterprise Centralized Desktop include:

- 32-bit or 64-bit editions of Windows Server 2003 R2, the second release of Windows Server 2003, as a host operating system
- Microsoft Virtual Server 2005 R2 with Service Pack 1 (32-bit or 64-bit editions) for hardware virtualization
- Remote Desktop Protocol (RDP) as a client access method
- PCs or “thin client” devices running the RDP client

Optional Microsoft products and technologies that can enhance a deployment of Windows Vista Enterprise Centralized Desktop include:

- Microsoft SoftGrid Application Virtualization for application virtualization
- Windows Server Terminal Services for the delivery of existing Terminal Services–based applications to desktops running Windows Vista Enterprise Centralized Desktop
- Microsoft System Center Virtual Machine Manager for the management of virtual machine (VM) images
- Microsoft Systems Management Server (to be succeeded by Microsoft System Center Configuration Manager) for software distribution and inventory management
- Microsoft Operations Manager (to be succeeded Microsoft System Center Operations Manager) for physical host and VM session monitoring

Virtual Server 2005 R2

Microsoft Virtual Server 2005 R2 enables one or more instances of a *guest* operating system to run on top of a single *host* operating system—in this case Windows Server 2003 R2 running on an industry-standard x86-based or x64-based server computer. Each guest operating system runs within its own virtual machine, with Virtual Server providing the software infrastructure needed to create and manage the VMs. In turn, each VM provides a set of emulated hardware resources for its guest operating system, making it appear to the guest operating system as if it were running on its own physical server.

Microsoft recommends running Windows Vista Enterprise Centralized Desktop on Virtual Server 2005 R2 *with Service Pack 1 (SP1)*. In addition to formal support for Windows Vista as a guest operating system, SP1 provides a number of key functional enhancements, including support for:

- **Volume Shadow Copy Service (VSS)**, which enables snapshot backups of the physical disk volumes that contain VM images, their .vhd files, and Virtual Server configuration files. VSS support minimizes the number of steps involved in archive and restore operations, minimizes downtime, ensures the consistency of the data being archived or restored, and provides support for taking application-consistent snapshots of running VMs.
- **Offline Virtual Hard Disk (VHD) Mounting**, which enables administrators to view and manipulate offline the VHD files that emulate each user's hard disk. This capability enables administrators to more easily deploy scripts and perform virus scans across one or more VHDs without having to start each virtual machine.
- **Hardware-assisted virtualization**, which provides compatibility with AMD Virtualization (AMD-V) technology and Intel Virtualization Technology (IVT).

Remote Desktop Protocol

In a deployment of Windows Vista Enterprise Centralized Desktop, Remote Desktop Protocol is used to connect the guest operating systems and applications running centrally on Virtual Server with each user's desktop client device. First introduced with Microsoft Windows NT® Server version 4.0, Terminal Services Edition, the RDP client has since been enhanced to optimize network usage and deliver an enhanced user experience through features such as printing to local printers, 32-bit color and sound, support for console mode connections, session directory, and local resource mapping.

RDP 6.0, introduced with Windows Vista and Windows Server code name "Longhorn," adds support for the ability to remotely access a single application instead of the entire Windows desktop. RDP 6.0 also enables "desktop composition," which makes it possible to deliver the Windows Aero™ experience and applications based on Windows Presentation Foundation to remote desktop client devices running Windows Vista.

Desktop Client Device

Users access VMs running on Virtual Server using a desktop client device running the RDP client. The desktop client device can be a "thin client" device running the Windows XP Embedded or Windows CE Embedded operating system, or it can be a "rich client" device such as a traditional PC running Windows Vista or Windows Fundamentals for Legacy PCs. Some features of Remote Desktop—such as the Windows Aero experience and

compatibility with applications based on Windows Presentation Foundation—are only available if the desktop client device is running Windows Vista.

SoftGrid Application Virtualization

In a “static” implementation of Windows Vista Enterprise Centralized Desktop (described in more detail later), each end user is assigned his or her own virtual machine image, into which that user's specific set of applications is installed. These unique VM images typically are stored on a storage area network. When a user logs on to the system, the user's unique VM is delivered, through RDP, to the user's local PC or thin client device.

When SoftGrid is utilized, only a single, lightweight VM image containing the guest operating system image and the SoftGrid client is needed. When a user logs on, a desktop session based on the generic VM is delivered to the user, while the applications authorized for that user are streamed on demand via the SoftGrid server into the running VM session.

Windows Server 2003 Terminal Services

Terminal Services provides a method of presentation virtualization, in which multiple user sessions running on a single copy of the Windows Server operating system are remotely presented to PCs or thin client devices using the Remote Desktop Protocol. In a Windows Vista Enterprise Centralized Desktop deployment, Terminal Services can be used to deliver existing Terminal Services–based applications to a desktop running Windows Vista Enterprise Centralized Desktop. This capability can be especially useful when a user has full administrative rights on such a desktop but should not be granted the same rights for a given application due to compliance issues.

System Center Virtual Machine Manager 2007

Microsoft System Center Virtual Machine Manager is a solution for managing a virtualized data center based on Microsoft technology. In a Windows Vista Enterprise Centralized Desktop setting, System Center Virtual Machine Manager is used to provide a single, console-based view of all VMs, manage the deployment and provisioning of VMs using templates or standard SYSPREP images, and facilitate the intelligent placement of VMs among multiple physical Virtual Server host systems.

Systems Management Server 2003 R2

Microsoft Systems Management Server 2003 R2—the second release of Systems Management Server 2003 and also part of the Microsoft System Center family—provides a comprehensive change and configuration management solution for Windows-based systems. In a Windows Vista Enterprise Centralized Desktop deployment, Systems Management Server is

used to facilitate the deployment of software and software updates, software inventory collection, and remote support of user desktops.

Microsoft Operations Manager 2005

Microsoft Operations Manager 2005 provides a comprehensive solution for server monitoring. In a Windows Vista Enterprise Centralized Desktop deployment, Operations Manager is used to monitor the health of the physical host system running Virtual Server as well as of the individual VMs running on that host.

DEPLOYMENT SCENARIOS

With Windows Vista Enterprise Centralized Desktop, instances of Windows Vista-based VMs execute on a server running Windows Server 2003 and Virtual Server 2005. RDP is the client access method used to deliver user desktops to either rich or thin client devices running the RDP client. Each VM consists of:

- One or more virtual hard disks, which are .vhd files that emulate hard disks.
- A .vmc file that stores the configuration of the VM environment.
- A guest operating system, which is installed on the virtual hard disk.

Given that model, Windows Vista Enterprise Centralized Desktop can be deployed in one of two ways:

- Static, in which a dedicated VM image (.vhd file) exists for each user.
- Dynamic, in which a single “master” VM image supports multiple users.

Static Deployment

In a static Windows Vista Enterprise Centralized Desktop deployment, each user has a dedicated VM image on the server, which essentially houses that user’s hard disk. All user data, settings, and applications are contained within the VM image, resulting in a one-to-one mapping of VMs to users. VMs are stored on a SAN and execute within Virtual Server; RDP is the client access method used to send user desktops to remote rich or thin clients running the RDP client.

Dynamic Deployment

In a dynamic deployment of Windows Vista Enterprise Centralized Desktop, there is only one master VM image for a group of users, and application images and individual user settings and data are stored separately. When a user requests a desktop session, the master VM image—containing only the operating system—is replicated and executed on the server, where it points to a virtualized copy of user settings and data that is stored separately from the master VM image instead of within the .vhd file. When the user clicks an application icon, the application is dynamically provisioned to the VM session.

What enables the dynamic deployment is Microsoft SoftGrid Application Virtualization technology, which supports the dynamic provisioning of applications, user data, and user settings to a common VM image. Benefits of a SoftGrid-based approach—applicable to both traditional PCs as well as deployments of Windows Vista Enterprise Centralized Desktop—include:

- Elimination of compatibility/regression testing between applications
- Elimination of installation and uninstallation of applications to VMs

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- Centralized upgrade of applications from a single point
 - Automated, policy-based provisioning of applications to users

Additional unique benefits provided by SoftGrid technology in a Windows Vista Enterprise Centralized Desktop deployment include:

- **Single image management.** Because a single VM can be used for all users, each user does not need a unique guest operating system that has been preconfigured with a unique combination of applications. Not only does this reduce the amount of disk space needed to store user-specific VMs, but it also eliminates the need to save and back up user VMs. Essentially, the VMs become “expendable” in that, with a common VM and all user data and settings stored separately, a new VM can be provisioned dynamically at any time.
- **Simplified connection management.** In the model in which each user or group has a unique image, when a client connects to Virtual Server to get its assigned VM, a “connection broker” must complete an extensive process to determine which image to copy off the SAN. With a single image, the brokering process is simplified because all users are assigned the same VM image.

Terminal Services

In either the static or dynamic model, Terminal Services can be used to provide support for applications already running within such an environment. The RDP client simply runs within the VM to access applications running on a separate terminal server; the UI for the RDP client is presented remotely to the user in the same manner as any other application.

CONSIDERATIONS AND RECOMMENDATIONS

The following are some considerations and recommendations for deploying Virtual Server 2005 in support of a solution based on Windows Vista Enterprise Centralized Desktop.

Server Sizing

Server sizing should be based on user roles and the workloads generated by those roles. For example, “task workers” typically consume fewer compute resources than “power information workers” do. Although the mix of user types and the number of users to be supported will directly reflect the hardware requirements for the physical host system, some typical starting points for sizing a system are:

- Reserve one physical processor and 1 GB of RAM for the host operating system
- Four to six users can be supported per each remaining processor core
- Each simultaneous user session requires 512 MB to 2 GB of RAM

For example, consider a deployment on a two-processor server, with each processor having four processor cores. One processor is first set aside for the host operating system, leaving one processor (and thus its four cores) for user sessions, of which 16 to 24 could be supported. Assuming 1 GB of RAM for the host operating system and an additional 1 GB per user session, the total physical memory requirement would be 17 GB for 16 users or 25 GB for 24 users.

(CPU resources and other aspects of configuring and managing Virtual Server are discussed in the Virtual Server Operations Guide at www.microsoft.com/technet/prodtechnol/virtualserver/2005/proddocs/vs_operate.mspx.)

Resource Management

Virtual Server resource weighting can be used to allocate computing resources to specific VMs, with VMs with higher weighting receiving more resources. If they are supporting multiple user types on a single physical host, system administrators can use resource weighting to prioritize resource allocation for a specific user type.

Storage

In a static deployment of Windows Vista Enterprise Centralized Desktop, storage requirements increase linearly with the number of users to be supported because each user has his or her own dedicated VM image, with the guest operating system, user programs, and all user data contained within that image. In a dynamic deployment, however, storage requirements can be significantly less because only one standard SYSPREP VM image is used, with applications delivered using SoftGrid or Terminal Services.

High Availability

Host-clustering support in Virtual Server can be used to help reduce planned downtime due to hardware and software upgrades, as well as unplanned downtime due to events such as hardware failure. Virtual Server 2005 R2 supports up to eight physical hosts in a cluster.

In a solution based on Windows Vista Enterprise Centralized Desktop, host clustering can be used to move VM images to another physical host in the cluster before applying scheduled software updates. Alternately, administrators can apply software updates and restart the server, at which time the VMs running on that server will failover automatically to another host in the cluster.

Backup

Two backup strategies are possible. Administrators can back up data directly from inside each VM using existing backup technologies, in the same way they back up user PCs today. Or, when using Virtual Server 2005 R2 with Service Pack 1, they can use backup software that utilizes the Volume Shadow Copy Service writer to back up the physical host system as well as all VMs running on it—without the need for a backup agent inside each VM.

In the case of a dynamic implementation of Windows Vista Enterprise Centralized Desktop, where no application state is maintained within the virtual machine, a copy of the latest SYSPREP desktop image should be backed up or stored in the System Center Virtual Machine Manager image library for ease of provisioning. This approach reduces the number of backups needed as well as the storage required to maintain VM file backups.

Operational Monitoring

When a single physical system supports multiple users, the availability of that system is more critical than that of a single user PC. To help maximize the availability of desktops running Windows Vista Enterprise Centralized Desktop, companies can use Microsoft Operations Manager to monitor the physical host system and host operating system as well as the individual VMs running on the host.

The Operations Manager Management Pack for Virtual Server can help companies to monitor their Windows Vista Enterprise Centralized Desktop environments for optimal availability. Based on knowledge and expertise from the Microsoft developers who built Virtual Server, it provides a set of monitoring rules with predefined thresholds, a built-in knowledge base with troubleshooting and resolution information, and scripts that can be used to resolve issues quickly and efficiently. Configurable processing rules built into Operations Manager can be set to notify IT staff by pager or e-mail that abnormal behavior was detected and a potential issue exists. Knowledge base information appended to the alert aids in problem resolution.

Licensing

Licensing of Windows Vista Enterprise Centralized Desktop is subscription based, nonperpetual, and instance based (rather than installation based). It is available to all volume licensing (VL) customers in Microsoft Enterprise Agreement (EA) and Select VL programs.

Windows Vista Enterprise Centralized Desktop can be licensed for both PCs and thin clients:

- **PC license.** In addition to Software Assurance, an annual Windows Vista Enterprise Centralized Desktop subscription purchase is required for the PC. With this annual subscription, companies can install an unlimited number of copies of the guest operating system on any number of physical servers, as long as the VMs are accessed only by licensed client devices. Users can access up to four running VM instances on up to four servers per subscription license.
- **Thin client license.** For thin clients, a single annual subscription purchase is required. With this subscription, companies can install unlimited copies of Windows Vista Enterprise or earlier operating systems, such as Windows XP Professional or Microsoft Windows 2000 Professional, on any number of physical servers, as long as the VMs are accessed only by licensed client devices. Users can access up to four running VM instances on up to four servers per subscription license. In addition, the annual subscription has Software Assurance built-in and provides for earlier versions, and well as upgrades that are made available within the license time frame.

To use desktop applications (for example, Microsoft Office Professional 2007) from the licensed device, each accessing device must be licensed for the application. Windows Vista Enterprise Centralized Desktop does not include application licenses.

SoftGrid Application Virtualization is licensed through the Microsoft Desktop Optimization Pack, which also requires that the client devices be covered by Software Assurance.

BENEFITS OF USING VIRTUAL SERVER

Although Windows Vista Enterprise Centralized Desktop can work with virtualization technology from other vendors, there are several key advantages to deploying it on Microsoft Virtual Server 2005. Provided by Microsoft as a free download, Virtual Server 2005 can help reduce initial implementation costs and provide the foundation for a robust, cost-effective desktop virtualization solution.

(Virtual Server 2005 R2 Enterprise Edition can be downloaded at www.microsoft.com/windowsserversystem/virtualserver/software/default.aspx.)

Broad Hardware Support

Virtual Server 2005 takes advantage of the broad hardware support already in place for the Windows operating system. It can be run on almost any x86-based or x64-based server supported by Windows Server 2003, giving customers a high degree of flexibility in deploying Virtual Server and helping to ensure that investments in Virtual Server do not become obsolete because of limited hardware support in the future.

Strong Supportability

Microsoft fully tests Windows Vista running on Virtual Server 2005 R2 with SP1 and provides support for it running in this configuration. Conversely, when Windows Vista is running as a guest on a virtual machine provided by another vendor, that VM is a “black box” to Microsoft. In that situation, comprehensive support is not possible because of limited visibility into all solution components, which limits the ability of Microsoft to analyze and resolve problems. For this reason, Microsoft Product Support Services policy requires that problems be reproduced on a stand-alone server before any support is provided.

(Microsoft's support policy for third-party virtual machine solutions can be found at <http://support.microsoft.com/kb/897615>.)

Standards-Based Management

Virtual Server makes use of industry-standard technologies and protocols to handle common management tasks. VM configurations are stored in XML files, and server monitoring and configuration is done through a Web browser-based interface, whereas some competitive products require their own remote client executable file. Because of these advantages, it is often easier to integrate the management of the Virtual Server 2005 solution into existing IT environments.

Extensible Management Model

Virtual Server supports a full-featured Component Object Model (COM) scripting model that allows scripts to control every aspect of the product,

resulting in greater ease of customization and automation. Because the scripting model is based on COM, users are not tied to a specific scripting language and can choose from the Microsoft Visual Basic® development system, C#, Perl, Java, and most other modern development languages. Furthermore, scripts can be “triggered” by certain events within Virtual Server.

Low Training Requirements

Virtual Server is a Windows-based solution, which can result in lower costs, better return on investment, and faster deployment. The host operating system is already familiar to administrators, and little additional training is required to implement Virtual Server 2005.

Seamless Migration Path to Windows Server Virtualization

Deploying Windows Vista Enterprise Centralized Desktop on Virtual Server 2005 R2 offers a seamless migration path to Windows Server Virtualization (formerly code-named “Viridian”). A core feature of the Windows Server code name “Longhorn” operating system, Windows Server Virtualization will include:

- Support for multiprocessor VMs
- Support for 32-bit and 64-bit VMs
- Live movement of running VMs from one physical host to another
- Support for “large” memory—at least 32 GB per VM
- The ability to add RAM or processors to VMs while they are running
- Improved host-clustering support

CONCLUSION

By providing a centralized desktop environment, Windows Vista Enterprise Centralized Desktop enables enterprises to realize significant benefits in the areas of productivity, total cost of ownership, and security, yet provide end users with the full Windows desktop experience. A deployment of Windows Vista Enterprise Centralized Desktop on Virtual Server 2005 and other Microsoft technologies can help customers to maximize those benefits because it provides a complete solution that integrates well with existing IT infrastructures and technology investments, is easy to manage and support, and offers a minimal total cost of ownership.

For More Information

For more information about Windows Vista Enterprise Centralized Desktop, Virtual Server, and the other technologies and topics presented in this paper, please contact your Microsoft account team or visit the following Web sites:

Windows Vista Enterprise Centralized Desktop

www.windowsvista.com/enterprise

Virtual Server 2005 R2

www.microsoft.com/windowsserversystem/virtualserver/default.aspx

SoftGrid Application Virtualization

www.softricity.com

Microsoft Desktop Optimization Pack for Software Assurance

www.microsoft.com/windows/products/windowsvista/buyorupgrade/optimizeddesktop.aspx

Windows Server 2003 Terminal Services

www.microsoft.com/windowsserver2003/technologies/terminalservices/default.aspx

System Center Virtual Machine Manager

www.microsoft.com/systemcenter/scvmm/default.aspx

Systems Management Server

www.microsoft.com/smserver/default.aspx

Microsoft Operations Manager

www.microsoft.com/mom/default.aspx