

# Enabling Server and Desktop Virtualization

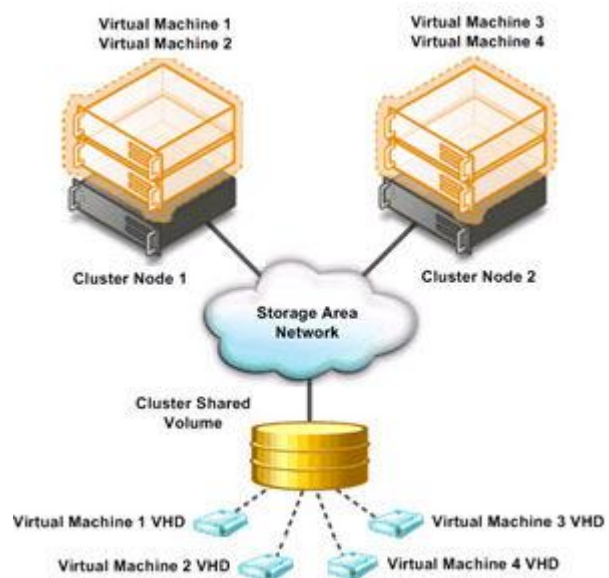
Virtualization is a major part of today's data centers. The operating efficiencies offered by virtualization allow organizations to dramatically reduce operational effort and power consumption.

Windows Server 2008 R2 provides the following virtualization types:

- **Client and Server Virtualization Provided by Hyper-V**

Hyper-V virtualizes the system resources of a physical computer. Computer virtualization allows you to provide a virtualized environment for operating systems and applications. When used alone, Hyper-V™ is typically used for server computer virtualization. When Hyper-V is used in conjunction with Virtual Desktop Infrastructure (VDI), Hyper-V is used for client computer virtualization.

Windows Server 2008 server virtualization using Hyper-V technology has been an integral part of the operating system. Windows Server 2008 R2 introduces a new version of Hyper-V. Hyper-V in Windows Server 2008 R2 includes three core areas of improvement for creating dynamic virtual data centers:



## [Increased Availability for Virtual Data Centers](#)

One of the most important aspects of any data center is providing the highest possible availability for systems and applications. Virtual data centers are no exception to the need for consolidation, high availability and most of all sophisticated management tools.

Hyper-V in Windows Server 2008 R2 includes the much-anticipated Live Migration feature, which allows you to move a virtual machine between two virtualization host servers without any interruption of service. The users connected to the virtual machine being moved might notice only a slight slowing in performance for a few moments. Otherwise, they will be unaware that the virtual machine was moved from one physical computer to another.

- **Live Migration Support through Cluster Shared Volumes**

Live Migration uses the new Cluster Shared Volumes (CSV) feature within Failover Clustering in Windows Server 2008 R2. The CSV volumes enable multiple nodes in the same failover cluster to concurrently access the same Logical Unit Number (LUN). From a VM's perspective, each VM appears to actually own a LUN; however, the .vhd files for each VM are stored on the same CSV volume.

- **Improved Cluster Node Connectivity Fault Tolerance**

Because of the architecture of CSV, there is improved cluster node connectivity fault tolerance that directly affects VMs running on the cluster. The CSV architecture implements a mechanism, known as dynamic I/O redirection, where I/O can be rerouted within the failover cluster based on connection availability.

- **Enhanced Cluster Validation Tool**

Windows Server 2008 R2 includes a Best Practices Analyzer (BPA) for all major server roles, including Failover Clustering. This analyzer examines the best practices configuration settings for a cluster and cluster nodes.

#### Improved Management of Virtual Data Centers

Even with all the efficiency gained from virtualization, virtual machines still need to be managed. The number of virtual machines tends to proliferate much faster than physical computers because machines typically do not require a hardware acquisition. Therefore, management of virtual data centers is even more imperative than ever before. Windows Server 2008 R2 includes the following improvements that will help you manage your virtual data center:

- Reduced effort for performing day-to-day Hyper-V administrative tasks by using the Hyper-V Management Console.
- Enhanced command-line interface and automated management of Hyper-V administrative tasks by using PowerShell cmdlets.
- Improved management of multiple Hyper-V servers in a virtual data center environment by using System Center Virtual Machine Manager 2008.

#### Increased Performance and Hardware Support for Hyper-V Virtual Machines

Hyper-V in Windows Server 2008 R2 now supports up to 64 logical processors in the host processor pool. This is a significant upgrade from previous versions and allows not only greater VM density per host, but also gives IT administrators more flexibility in assigning CPU resources to VMs. The new Hyper-V also adds performance enhancements that increase virtual machine performance and power consumption. Hyper-V now supports Second Level Address Translation (SLAT), which uses new features on today's CPUs to improve VM performance while reducing processing load on the Windows Hypervisor and will also consume less power by virtue of the new Core Parking feature implemented into Windows Server 2008 R2.

Hyper-V R2 also includes a new Processor Compatibility feature. Processor compatibility allows you to move a virtual machine up and down multiple processor generations from the same vendor. When a VM is started with processor compatibility mode enabled, Hyper-V normalizes the processor feature set and only exposes guest visible processor features that are available on all Hyper-V enabled processors of the same processor architecture, i.e., AMD or Intel. This allows the VM to be migrated to any hardware platform of the same processor architecture. Processor features are "hidden" by the hypervisor by intercepting a VM's CPUID instruction and clearing the returned bits corresponding to the hidden features.

#### Improved Virtual Networking Performance

The new Hyper-V leverages several new networking technologies contained in Windows Server 2008 R2 to improve overall VM networking performance. Two key examples are the new VM Chimney (also called TCP Offload) and the use of Jumbo Frames.

VM Chimney allows a VM to dump its network processing load onto the NIC of the host computer. This works the same as in a physical TCP Offload scenario, Hyper-V now simply extends this functionality into the virtual world. This benefits both CPU and overall network throughput performance, and it's fully supported by Live Migration.

VM Chimney is disabled by default in Windows Server 2008 R2, primarily for short-term hardware compatibility reasons. But combined with compatible hardware, currently including vendors like Intel, VM Chimney significantly reduces the host server's CPU burden when dealing with VM network traffic. This translates into better host system performance and a simultaneous boost to VM network throughput.

Like TCP Offloading, support for Jumbo Frames was also introduced with Windows Server 2008. Hyper-V in Windows Server 2008 R2 simply extends this capability to VMs. So just like in physical network scenarios, Jumbo Frames add the same basic performance enhancements to virtual networking. That includes up to 6 times larger payloads per packet, which improves not only overall throughput but also reduces CPU utilization for large file transfers.

#### [Simplified Method for Physical and Virtual Computer Deployments](#)

Historically, different methods have been used to deploy operating systems and applications to physical and virtual computers. For virtual computers, the .vhd file format has become a de facto standard for deploying and interchanging preconfigured operating systems and applications. Hyper-V in Windows Server 2008 R2 supports two important updates concerning .vhd files.

Administrators can now add and remove vhd files, as well as pass-through disks attached to a virtual SCSI controller on a running VM, without requiring a reboot. This offers more flexibility when it comes to handling storage growth needs without requiring additional downtime. It also provides more flexibility in data center backup scenarios as well as new scenarios in complex Exchange and SQL Server deployments.

Windows Server 2008 R2 supports the ability to boot a computer from a .vhd file stored on a local hard disk. This allows you to use preconfigured .vhd files for deploying virtual and physical computers. This helps reduce the number of images you need to manage and provides an easier method for test deployment prior to deployment in your production environment.

- **Increased Performance and Hardware Support for Hyper-V Virtual Machines**

Hyper-V in Windows Server 2008 R2 adds new performance enhancements that increase virtual machine performance and power consumption. Hyper-V now supports Second Level Address Translation (SLAT), which uses new features on today's CPUs to improve VM performance while reducing processing load on the Windows Hypervisor. New Hyper-V VMs will also consume less power by virtue of the new Core Parking feature implemented in Windows Server 2008 R2.

- **Improved Virtual Networking Performance**

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works the same as in a physical TCP Offload scenario, Hyper-V™ extends this functionality into the virtual world. This benefits both CPU and overall network throughput performance, and it's fully supported by Live Migration. Like TCP Offloading, support for Jumbo Frames was also introduced with Windows Server 2008. Hyper-V™ in Windows Server 2008 R2 simply extends this capability to VMs. So just like in physical network scenarios, Jumbo Frames add the same basic performance enhancements to virtual networking. That includes up to 6 times larger payloads per packet, which improves not only overall throughput but also reduces CPU utilization for large file transfers.

- **Presentation Virtualization**

This type of virtualization provided by Remote Desktop Services' RemoteApp (see below for more information on the Terminal Services' name change in Windows Server 2008 R2) virtualizes a processing environment and isolates the processing from the graphics and I/O, making it possible to run an application in one location but have it be controlled in another.

Terminal Services makes it possible to remotely run an application in one location but have it be controlled and managed in another. Microsoft has evolved this concept considerably in Windows Server 2008 R2, and renamed Terminal Services to Remote Desktop Services (RDS) to better reflect these new features and capabilities. The goal of RDS is to provide both users and administrators with both the features and the flexibility necessary to build the most robust access experience in any deployment scenario.

To expand the Remote Desktop Services feature set, Microsoft has been investing in the Virtual Desktop Infrastructure, also known as VDI, in collaboration with our partners, which include Citrix, Unisys, HP, Quest, Ericom and several others. VDI is a centralized desktop delivery architecture, which allows customers to centralize the storage, execution and management of a Windows desktop in the data center. It enables Windows and other desktop environments to run and be managed in virtual machines on a centralized server. RDS and VDI addresses all these challenges with the following features:

#### [Improved User Experience](#)

For both VDI and traditional remote desktop services the quality of user experience is more important than ever before. The version of VDI and remote desktop services in Windows Server 2008 improves the end user experience through new Remote Desktop Protocol capabilities. These new capabilities, enabled with Windows Server 2008 R2 in combination with Windows 7, help make the user experience for remote users almost identical to local users.

#### [Improved RemoteApp and Desktop Connections](#)

New RemoteApp & Desktop Connection (RAD) feeds provide a set of resources, such as RemoteApp programs and Remote Desktops. These feeds are presented to Windows 7 users via the new RemoteApp & Desktop Connection control panel, and resources are tightly integrated into both the Start menu and the system tray. The improved

RemoteApp and Desktop Connections features in Windows Server 2008 R2 and Windows 7 provide the following improvements:

- Extends Remote Desktop Services to provide tools to enable VDI
- Provides simplified publishing of, and access to, remote desktops and applications
- Improved integration with Windows 7 user interface
- Multimedia Redirection
- True multiple monitor support
- Audio Input & Recording
- Aero Glass support
- Improved audio/video synchronization
- Language Bar Redirection
- Task Scheduler

#### Improved RemoteApp and Desktop Management

While RAD improves the end-user experience, RAD also reduces the desktop and application management effort by providing a dedicated management interface that lets IT managers assign remote resources to users quickly and dynamically. Windows Server 2008 R2 includes the following RAD management capabilities to help reduce administrative effort:

- RemoteApp & Desktop Connections control panel applet
- Single administrative infrastructure
- Designed for computers that are domain members and standalone computers
- Always up to date
- Single sign-on experience within a workspace
- RemoteApp & Desktop Web Access

#### Improved RemoteApp and Desktop Deployment

Administrators faced with larger RAD deployment scenarios will also find additional management features in Windows Server 2008 R2's Remote Desktop Services aimed at improving the management experience for all existing scenarios previously addressed by Terminal Services as well as the new scenarios available via RAD. These improved management features include:

- PowerShell Provider
- Profile Improvements
- Microsoft Installer (MSI) compatibility
- Remote Desktop Gateway