



Keeping It Lean and Competitive: Server Virtualization with Hyper-V™ R2

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Introduction

The efficiencies and economies of virtualization promise to change forever how — and how many — servers are used in organizations. Even in midsize organizations.

These days, savvy IT managers are making their server environments far more cost-effective by consolidating their growing number of often underutilized physical servers. This is possible because the server operating system resident in each physical machine enables it to host several *virtual* machines (VMs) that function just like independent servers.



When you choose to accomplish your server consolidation with a virtualization-ready server operating system like industry-leading Microsoft® Windows Server® 2008 R2, you'll see substantial payoffs, including:

- Lower acquisition costs, since you need fewer physical servers.
- Reduced power consumption, because running fewer servers at higher capacity costs a lot less than running more servers at lower capacity levels.
- Simplified management, since you can manage both physical and virtual servers with centralized software.
- Quicker deployment of operating environments (i.e., getting from test to live faster), because deploying virtual servers eliminates the need to qualify new physical server platforms.
- Enterprise-scale availability at midmarket costs, thanks to the advanced virtualization features at your fingertips.

>> Time to upgrade!

Free support for Windows Server® 2003 ended last July, making now the perfect time to upgrade to the powerful, next-generation functionality of Windows Server® 2008 R2 with its feature-rich Hyper-V™.

Configuring for Efficient Virtualization

Virtualization with Windows Server® 2008 R2 is at its most powerful when it's running on leading-edge servers such as Dell's PowerEdge™ R715, which takes advantage of the powerful virtualization and energy-efficiency features built into the new AMD Opteron™ 6100 Series processors.

This configuration enables you to maximize control over your IT infrastructure. You'll enjoy unprecedented availability and easier management, leading to a more efficient, secure, reliable, and robust server environment. Not surprisingly, this approach costs less to operate and can help drive the agility and competitiveness your business needs.

What Hyper-V™ R2 Delivers

At the heart of Windows Server® 2008 virtualization is the Hyper-V™ hypervisor, which provides the software infrastructure and basic management tools you'll need to create and manage VMs. Windows Server® 2008 R2 with Hyper-V™ makes creating dynamic virtual server environments easier than ever, thanks to:

Live migration. A VM can be moved between two virtualization host servers *without any interruption of service*. You can even migrate VMs between different CPU versions within a given vendor's processor family.

Hot plug-in and hot removal of storage. VMs can be quickly reconfigured to meet changing workload requirements. And Cluster Share Volumes (CSV) makes storage management easier and improves cluster node connectivity fault tolerance.

Better management of virtual server environments. In tandem with Microsoft® System Center Virtual Machine Manager 2008, you'll be able to manage multiple Hyper-V™ servers.

Improved networking. Virtual Machine Queue (VMQ) reduces host machine CPU utilization, increases network throughput, and improves the scalability of Hyper-V™ R2 servers.



Simplified deployments. With Hyper-V™ R2, .vhd files and pass-through disks attached to a virtual SCSI controller on a running VM can be added and removed without rebooting. And you can boot a computer from a .vhd file stored on a local hard disk — so preconfigured .vhd files can be used for deploying virtual and physical computers.

Microsoft® and AMD: Working Together

Running Windows Server® 2008 R2 with Hyper-V™ on the AMD Opteron™ 6100 Series processor makes it even more effective. That's because Microsoft® and AMD have worked closely together on product specifications to optimize key aspects of Windows Server® 2008 R2, including:

- Supporting large core counts and memory footprints.
- Enabling Live Migration features with Hyper-V™ R2 across the AMD Opteron™ processor family via AMD's Extended Migration.
- Supporting AMD-V™ Rapid Virtualization Indexing and Second Level Address Translation (SLAT) to lower hypervisor CPU time and save VM memory.
- Supporting Core Parking in R2, so VMs can be scheduled on a single server, cores can be "parked" or put to sleep (in deep C states), and CPU power consumption can be reduced.

Microsoft® built a number of features in Windows Server® 2008 R2 to take advantage of the power management features in AMD processors. So with AMD Opteron™ processors and Windows Server® 2008 R2 with Hyper-V™, you can:

Lower your total cost of ownership. AMD Opteron™ processors are designed to extend server lifecycle. When Windows Server® 2008 R2 runs on AMD Opteron™ processors, the time needed for provisioning servers and applications shrinks from days to minutes. Windows Server® 2008 R2 running on AMD Opteron™ processors can also simplify server environment management chores by enabling you to manage both physical and virtual assets from a single management console.

Boost your power efficiency. Windows Server® 2008 R2 Hyper-V™ fully supports AMD's PowerNow!™ technology power management tool, which can adjust processor power consumption according to usage — without hampering performance.

Get the memory support your virtualized environments need. The memory controller integrated into AMD Opteron™ processors provides Windows Server® 2008 R2 Hyper-V™ with the fast and secure memory access that is so critical in virtualized environments.

Benefit from hardware-enabled virtualization. AMD-V™ — AMD's hardware-assisted virtualization technology that is built into AMD Opteron™ processors — is utilized by Windows Server® 2008 R2 with Hyper-V™ to help eliminate much of the processor overhead normally associated with software-only virtualization solutions.

Strengthen your business continuity and disaster recovery. Enhanced virus protection from AMD helps protect against malicious software, while Windows Server® 2008 R2 provides support for disaster recovery using dispersed clustering capabilities.



Take advantage of broad OS support. Here's your chance to get support for different types of operating systems running simultaneously — including 32- and 64-bit systems resident on different server platforms.

AMD Opteron™ Processors: Powering Windows Server® 2008 R2 Virtualization

The new AMD Opteron™ 6100 Series processors offer up to twice as many cores, up to two times the memory bandwidth, and almost twice the I/O bandwidth as previous-generation AMD Opteron™ processors. Key innovations built into the AMD Opteron™ 6100 minimize the performance overhead and complexity of virtualization, allow for increased machine density, and provide greater overall virtualization efficiency and performance.

The result: AMD Opteron™ processors can deliver near-native application performance, which in turn produces a satisfying experience for organizations deploying Windows Server® 2008 R2. Several AMD Opteron™ processor capabilities make this possible:

AMD Opteron™ Direct Connect Architecture 2.0 enables scalability that seamlessly handles heavy workloads, can improve resource utilization, and helps improve VM application performance.

HyperTransport™ Assist helps reduce the latency inherent in inter-processor communication, improve throughput, and increase 4P system memory bandwidth.

AMD-V™ Rapid Virtualization Indexing technology eliminates overhead in the hypervisor and accelerates the performance of many virtualized applications.

AMD-P technology delivers leading-edge power management already incorporated in Windows Server® 2008 R2:

- AMD PowerNow!™ technology, which delivers significant energy savings, is turned on by default in Windows Server® 2008 R2.
- Windows Server® 2008 R2 supports AMD Cool'n'Quiet™ 2.0 technology to help reduce system noise and extend PC life.
- Windows Server® 2008 R2 includes a number of group policy settings that allow centralized management of power consumption of computers running Microsoft Windows® 7.

Dell's PowerEdge™ R715 Server: Optimized for EnergySmart Performance

The Dell PowerEdge™ R715 server is equipped with up to 24 AMD Opteron™ 6100 Series processor cores and 16 DIMM slots in a dense, two-socket 2U platform, giving you the processing and memory you need to efficiently tackle intensive workloads and the challenges of virtualization.

The PowerEdge™ R715 server is designed to optimize performance, reliability, energy efficiency, advanced systems management, and ease of use. The R715 incorporates such features as robust metal hard-drive carriers, industrial-quality materials, embedded diagnostics, and an interactive LCD screen. It also includes an internal dual-SD module to provide hypervisor-level failover.



>> **Saving Energy Through Virtualization**

Tests by Microsoft® of Windows Server® 2008 R2 with Hyper-V™* show that multiple virtual machines can run on a single physical machine without consuming significantly more power than a standalone server — while maintaining comparable throughput.

These results scale impressively: Running four virtual machines means saving the equivalent power output of three physical servers; running 10 virtual machines means saving the equivalent power output of nine physical servers.

Add in Dell's EnergySmart design and power management capabilities as well as AMD's PowerNow!™ technology — which can deliver significant energy savings and is turned on by default in Windows Server® 2008 R2 — and it's easy to see how virtualization can make a real difference in server environment energy savings.

* See

<http://www.microsoft.com/windowsserver2008/en/us/power-savings.aspx>

Built with Dell's EnergySmart technologies, the PowerEdge™ R715 server features highly efficient fans that respond to server workload demands. The R715's internal shrouding and internal component layout help cool the server. Power management features include programmable voltage regulators, power-regulating processors, and an interactive LCD screen for easy access to power-consumption information.

AMD, Microsoft®, and Dell: Easing the Burdens of IT Management

Virtualization efficiencies notwithstanding, VMs still need to be managed, especially as they proliferate in your server room. So it's important that your server OS minimizes the burdens of managing and maintaining physical and virtualized IT environments.

With Windows Server® 2008 R2 and Microsoft® System Center, a single platform centralizes management of physical and virtual IT infrastructure, increases server utilization, and dynamically optimizes resources across multiple virtualization platforms. You'll be able to take advantage of end-to-end capabilities that allow you to plan, deploy, manage, and optimize your virtual infrastructure.

Features in Windows Server® 2008 R2 that help you manage a virtual server environment — including the Hyper-V™ Management Console and PowerShell, as well as Microsoft® System Center Virtual Machine Manager 2008 — are in turn supported by both AMD and Dell.

Dell™ Lifecycle Controller. All new-generation PowerEdge™ servers come with Dell Lifecycle Controller, a set of embedded tools that simplify provisioning, deployment, patching and updates, servicing, and user customization.

Because Dell's embedded Lifecycle Controller functionality has been integrated with the Microsoft® System Center Configuration Manager, you can remotely install PowerEdge™ servers out of the box and manage them across all phases of server provisioning for their entire lifecycle. And Lifecycle Controller's persistently stored logs, service images, crash dumps, etc., are accessible out-of-band, even when a server is on standby power.

AMD's Extended Migration and Power Management. Getting the most from Hyper-V™ R2 Live Migration means being able to move VMs across physical machines with ease. With AMD Extended Migration, Hyper-V™ Live Migration can reach across generations of AMD processors.

By intelligently managing power consumption in several ways, AMD Opteron™ processors conserve energy during low-utilization cycles. AMD PowerNow!™ technology helps reduce processor power consumption based on each core's utilization level, AMD CoolCore™ technology turns off unused parts of a processor, and the C1E power state decreases the power draw of select system functions when they're not in use.

And since the AMD Opteron™ 6100 Series processors' single architecture stretches from entry-level systems to high-performance computing clusters, your servers require fewer software images and drivers to manage, and you can minimize pre-production testing.



AMD 

Microsoft[®]

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Keeping It Lean and Competitive

There's no question that server virtualization delivers significant savings and efficiencies. And the more up to date your virtualization environment, the more cost-effective your data center will be.

Investing in Windows Server[®] 2008 R2 with Hyper-V[™] running on AMD Opteron[™]-powered Dell PowerEdge[™] R715 servers is one of the best ways to keep your server environment lean and competitive.