

# Better Virtualization: Microsoft Hyper-V with AMD Opteron Processors

Technologies from AMD and Microsoft make a potent duo in the quest for virtualization ROI. By Tom Farre

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## Executive Summary

Virtualization using x64 servers can help enterprises consolidate server workloads and reduce costs, while creating a dynamic IT infrastructure that makes provisioning and managing servers, streamlining software development, and providing better business continuity easier. No wonder 54 percent of enterprises and 53 percent of small and midsize business have either implemented x86 server virtualization already or will do so in the next 12 months, according to Cambridge, Mass.-based analyst firm Forrester Research Inc.

Virtualization's advantages are especially welcome in today's difficult economy, in which IT budgets and personnel are likely to remain under pressure for some time. To achieve these benefits, however, IT executives must choose the right combination of virtualization software and host servers. That combination is Microsoft Windows Server 2008 Hyper-V™ on servers powered by Quad-Core AMD Opteron™ processors.

This white paper highlights the power of the Microsoft-AMD combination for server virtualization. In doing so, it explores the advantages of server virtualization with Hyper-V, the unique capabilities of AMD Opteron processors to optimize virtualization performance, and the partnership between AMD and Microsoft, which delivers on the promise of server virtualization—exceptional performance, scalability, availability, manageability, and cost effectiveness.

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## **Microsoft Windows Server Hyper-V: Virtualization for everyone**

Introduced in 2008 as part of Microsoft Windows Server 2008, Hyper-V delivers next-generation hypervisor-based virtualization technology. A virtualization platform that provides outstanding flexibility, Hyper-V also offers dynamic, reliable, and scalable platform capabilities. Additionally, it provides total scripted control of a set of connected virtual machines, ensuring ease of deployment, management, and use. The result is an agile and dynamic data center environment. Key features of Hyper-V include:

**Next-generation hypervisor.** Hyper-V features 64-bit hypervisor technology, which creates a “hypervisor layer” for virtual machines that runs directly on top of the hardware and below the operating system. By efficiently managing virtual machine memory, processors, I/O, and scheduling, Hyper-V delivers the highest levels of resource control and virtualization performance. In fact, Hyper-V performs so well that Microsoft uses it to power major online services that receive millions of hits each day. These include all of the Microsoft TechNet ([technet.microsoft.com](http://technet.microsoft.com)) and Microsoft Developer Network ([msdn.microsoft.com](http://msdn.microsoft.com)) Web sites and half of [microsoft.com](http://microsoft.com), which receives an average of one billion hits per month.

**Scalability.** Thanks to the efficient architecture of its hypervisor, Hyper-V has low processor overhead, leaving plenty of power to virtualize workloads. By enabling virtual machines to take advantage of the advanced capabilities in today's x64 hardware, such as multicore technology, improved disk access, and greater memory, Hyper-V maximizes scalability and performance of the virtualization platform. Hyper-V can support up to 1TB of memory on the host and up to 16 logical processors, with up to 64GB of memory per virtual machine. It can create virtual machines with up to four virtual processors to support workloads that leverage multiprocessor capabilities.

**High availability and better business continuity.** Consolidation of numerous physical servers onto one can be problematic if the host server fails. Microsoft has addressed this by building high availability into the Windows Server 2008 Hyper-V platform. The Datacenter and Enterprise editions of Windows Server include server clustering technology, which enables automatic failover of virtual machines to a different clustered system in case of hardware failure. With the multisite clustering capability of Windows Server 2008, you can set up a remote cluster so that if your primary data center or a remote office fails, you can recover to a remote data center.

**Easy manageability.** With Hyper-V you don't have to create a separate management infrastructure for your virtual environment. Hyper-V integrates with Microsoft System Center Virtual Machine Manager and Microsoft System Center Operations

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Manager, as well as with third-party management tools. This lets you manage your physical and virtual resources from a single console. Microsoft, for example, provisions new servers using Hyper-V with Virtual Machine Manager. As a result, what used to take weeks for physical server provisioning now takes less than one hour.

**Flexible deployment and licensing.** To appeal to organizations of every size and budget, Hyper-V offers flexible deployment and licensing options. Hyper-V is part of the Windows Server 2008 operating system. The Standard Edition of Windows Server 2008 comes with a license for one virtual machine; the Enterprise edition includes four virtual machine licenses; and the Datacenter edition includes unlimited virtual machine licenses. In addition, Microsoft Hyper-V Server 2008, a standalone version of Windows Server 2008 Hyper-V, is available as a free download on the Microsoft Web site (see [www.microsoft.com/servers/hyper-v-server](http://www.microsoft.com/servers/hyper-v-server)).

### **AMD Opteron processors: Optimized for virtualization**

Top virtualization performance requires host servers optimized for virtualization, such as servers powered by Quad-Core AMD Opteron processors. AMD has a long history as a leader in x64 technology, having introduced the first 64-bit server processor in 2003 and the first dual-core processor in 2004. The current range of Quad-Core AMD Opteron processors, introduced in late 2008, offer industry-leading virtualization performance and energy efficiency, thanks to key features such as these:

**Leading-edge technology.** The current generation of Quad-Core AMD Opteron processors features 45nm technology, a leading-edge fabrication process that enables enhanced transistor designs, faster interconnect circuitry, and greater energy efficiency. A larger L3 cache speeds memory-intensive applications such as virtualization, as does high-speed DDR2-800 memory. And higher clock speeds boost performance of all applications.

**Direct Connect Architecture.** All of AMD's x64 processors feature Direct Connect Architecture, which eliminates the bottleneck of a front-side bus. Instead, the processor cores are directly connected to memory, the I/O subsystem, and any other processors in the configuration by high-bandwidth HyperTransport™ links. Moreover, the memory controller is located on the processor die instead of on the motherboard. The upshot is that AMD's architecture improves scalability, reduces latency, and boosts performance of memory- and I/O-intensive virtualization applications.

**Hardware-assisted virtualization.** AMD Opteron processors feature AMD-Virtualization (AMD-V) technology, a set of hardware extensions to the x64 architecture designed to improve the efficiency and reduce the overhead of virtualization software.

- AMD-V features Rapid Virtualization Indexing (RVI), which helps accelerate

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the performance of many virtualized applications by enabling hardware-based virtual machine memory management. RVI allows virtual machines to directly manage memory utilizing hardware rather than software resources, reducing hypervisor cycles and the associated performance penalty usually associated with virtualization. The result is more virtual machines per server core.

- AMD-V speeds up “world switch time” for up to 25 percent faster switching between virtual machines.
- AMD-V Extended Migration with Windows Server 2008 R2 will provide live migration of virtual machines across all available AMD Opteron processor generations, protecting investments in AMD-powered servers and enabling a more reliable and adaptable IT environment.

**Efficient power management.** Enhanced AMD PowerNow!™ technology extends AMD’s leadership in performance-per-watt by building power management into the processor. It allows each processor core to vary its frequency based on the specific needs of the application, and decreases power consumption by enabling per-processor power management in multisocket systems.

**Broad support by server manufacturers.** Major server manufacturers such as Dell® and Hewlett-Packard utilize AMD Opteron processors in blade and rack-mount servers optimized for virtualization. Such servers offer high memory and I/O capacity to meet the needs of demanding virtualization applications.

## Conclusion

Clearly, server virtualization offers numerous benefits to enterprise IT departments. By improving IT efficiency, reducing complexity, and lowering costs for hardware, data center infrastructure, and IT management, server virtualization can help enterprises weather the storm of a difficult economy.

Microsoft Windows Server 2008 Hyper-V virtualization software running on servers powered by Quad-Core AMD Opteron processors is the smart choice for realizing these benefits.

IT executives who select the AMD-Microsoft team can choose from a wide range of virtualization-optimized blade and rack-mount servers from Dell, Hewlett-Packard, IBM, and others that have been qualified for Hyper-V. And Hyper-V’s varied licensing and deployment options are suitable for every situation and budget. What’s the bottom line? Lower ownership costs and faster return on investment for your virtualization deployments.

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## **Appendix A: For more information**

- AMD Virtualization: [www.amd.com/virtualization](http://www.amd.com/virtualization)
- Microsoft Windows Server 2008 Hyper-V: [www.microsoft.com/hyperv](http://www.microsoft.com/hyperv)

## **Appendix B: Case study: ServiceU finds the golden ticket**

ServiceU Corp. is a fast-growing, midsized provider of Web-based event management software to organizations ranging from Fortune 500 companies to nonprofits, schools, and churches. With customers based in all 50 states and 15 countries, the Memphis, Tenn.-based company can't afford to be offline for any length of time, so it needs technologies offering high IT performance and availability.

In mid-2007, ServiceU began investigating solutions to maximize infrastructure efficiencies, including power and space, and increase data center manageability, while continuing to improve performance.

"Because we host our software for our customers, the reliability and performance of our servers is mission critical," says Tim Whitehorn, ServiceU's CEO. "We can't deploy new technology just because it's new—it must provide significant benefits to our customers. That's why we chose to deploy Hyper-V on AMD [Opteron processor-based systems]. This is truly a big win for our customers and for us."

After implementing Hyper-V on AMD Opteron processor-based Dell PowerEdge™ 2970 servers at all three of ServiceU's data centers, the company reduced its number of physical servers by 35 percent. It also lowered power utilization at the Memphis data center by up to 60 percent, giving ServiceU significant capacity for future expansion.

ServiceU's IT executives were impressed by how well AMD-V technology works in concert with Hyper-V to simplify hardware infrastructure and data center management. In addition, they were pleased with Hyper-V's seamless installation and overall simplicity.

David P. Smith, chief technology officer at ServiceU, sums up the AMD-Microsoft virtualization experience this way: "We were blown away by the results we achieved, and are now firm believers in the AMD Opteron processor and Microsoft's Hyper-V technology."