



A New Standard for Virtualization

Windows Server® 2008 Hyper-V™ and the Intel® Xeon® Processor 7400 Series

SOLUTION BRIEF

IT is evolving and expanding its use of virtualization to address a variety of challenges: business agility, data security and business continuity, data center sprawl, and rising energy costs. To achieve the highest payoff from these virtualization initiatives, IT needs virtualization platforms that provide optimal performance and headroom for consolidation, energy and space savings plus manageability to minimize data center costs, and the advanced features to support a wide range of virtualization usage models.

Now, Windows Server® 2008 Hyper-V™ and servers based on the Intel® Xeon® processor 7400^A Series set a new standard for virtualization, enabling IT organizations to achieve maximum benefits from virtualization initiatives with:

- Greater consolidation potential with the industry's highest virtualization performance and headroom in the smallest footprint.
- Lower data center and IT costs through leading performance/watt and an integrated, robust set of tools for managing virtual and physical servers.
- Complementary software and hardware capabilities that support high availability, disaster recovery, load balancing, server maintenance and other advanced virtualization usage models.



Solution Overview

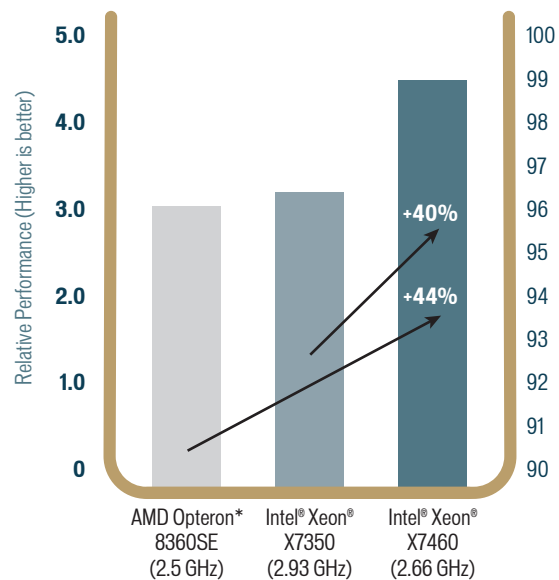
Together, Hyper-V™ and servers based on the multi-core Intel® Xeon® processor 7400^A Series provide a leading foundation for virtualization with improved performance, increased flexibility, higher reliability and lower TCO.

Headroom, Performance, and Flexibility with the Intel® Xeon® 7400 Series Processor

With architecture built specifically for virtualization, the Intel Xeon processor 7400 Series gives you better performance than previous generations – within the same power envelope. Intel® Virtualization Technology¹ (Intel® VT) provides hardware assistance to boost asset utilization and IT flexibility while reducing costs and data center power consumption. Whether your goal is to deploy more virtual machines than ever before, or to deliver agile, high availability solutions for disaster recovery and real-time workload balancing, the Intel Xeon processor 7400 Series is specifically built to be your virtualization standard.

- **Higher performance:** With up to 40% better performance in a virtualized environment than previous-generation Intel Xeon processor platforms² and 44% better than competing processors, the Intel Xeon processor 7400 Series brings 24 cores on a 4-socket system along with 16 MB of shared L3 cache per processor, offering the performance and headroom to achieve new levels of data center consolidation. Performance is enhanced by features such as Intel® VT FlexPriority, which optimizes virtualization software efficiency by improving interrupt handling.³
- **Energy efficiency:** Backed by the power management capabilities of Windows Server® 2008, Hyper-V is the most power-aware hypervisor solution on the market.

Virtualization Performance vCon with Microsoft® Hyper-V™²



- **Reliable uptime:** With advanced, enterprise-class RAS features such as enhanced memory ECC, memory mirroring and sparing, and fully buffered DDR2 DIMM, Intel-based servers have the highest record of uptime in Windows® environments.
- **Network and chipset enhancements:** Additional processor, chipset, and NIC features further enhance virtualization performance and availability.

More Versatile Virtualization with Hyper-V™

Hyper-V is a thin layer of software that sits between the hardware and the operating system. It allows multiple unmodified operating systems to run simultaneously on a host computer. It also enables simple partitioning, maintains strong isolation between partitions, and is inherently secure because it does not contain any third-party device drivers. Hyper-V has been designed to run on servers with hardware-assisted virtualization technology, and it is optimized to take advantage of Intel Virtualization Technology.

Hyper-V overcomes many of the challenges faced by previous, purely software-based virtualization technologies:

- **Reduced complexity:** Hyper-V supports non-Microsoft and legacy virtual machines, including Windows, Linux,* and Xen-enabled Linux, without modifying the operating systems.
- **Improved performance:** Virtual machines can use larger amounts of physical resources, including up to 64 GB of memory per virtual machine. Hyper-V also supports pass-through disk access and allows up to four processor cores to be assigned to each virtual machine. Further, Hyper-V uses page sharing to optimize memory use by maintaining a single copy of identical memory pages shared by multiple virtual machines, thus reducing resource utilization on the physical machine.
- **Increased functionality:** With Hyper-V, a single physical machine can simultaneously run virtualized versions of 32-bit and 64-bit operating systems. Hyper-V also offers advanced networking capabilities for each virtual machine, including VLAN, network address translation, firewall, the ability to quarantine individual virtual machines, and the option to add or remove virtual NICs without downtime.
- **Improved reliability and protection:** Hyper-V leverages the clustering functionality in Windows Server 2008 to provide host and guest clustering for failover and load balancing across LANs and WANs. IT administrators can cluster multiple physical servers all running virtual machines to minimize the impact of one server failing, as well as migrate loads from one node to another in a cluster for easy maintenance and management.

Hyper-V is complemented by a robust set of tools for physical and virtual machine management. These tools are all components of Microsoft System Center:

- **Microsoft System Center Data Protection Manager 2007** provides live backup and virtual machine snapshots to support business continuity.
- **Microsoft System Center Operations Manager 2007** allows advanced monitoring and service reporting for consolidation, configuration, utilization, and growth projections.
- **Microsoft System Center Virtual Machine Manager 2008** enables centralized management of the virtual infrastructure, while providing support for both ESX* and Hyper-V-based environments.

Solutions for All Your Virtualization Needs

The flexibility and power of Hyper-V coupled with the hardware assistance available in Intel Xeon processor 7400 Series presents a powerful combination for a variety of virtualization strategies.

Server Consolidation

Consolidation seeks to lower TCO and improve IT flexibility by converting physical servers to virtual machines and running the virtual machines on fewer, highly scalable, and reliable enterprise-class servers. Intel Xeon processor 7400 Series-based servers provide leading performance and headroom, and Hyper-V with System Center Virtual Machine Manager provides a robust set of features and tools for smoothly executing each step of a server consolidation project.

- Intel Xeon processor 7400 Series and Hyper-V both provide greater interoperability by supporting multiple virtual machines with different operating systems (Windows, Linux, Xen-based Linux) as well as 32-bit and 64-bit workloads on the same physical server.
- Virtual Machine Manager helps identify consolidation candidates by analyzing historical performance data stored in the Microsoft System Center Operations Manager database, and Intelligent Placement helps administrators select appropriate virtual server hosts using historical data on workload requirements and physical host utilization.
- Virtual Machine Manager provides integrated, time-saving tools for physical-to-virtual machine conversion. Server VMM can manage both VMware ESX and Hyper-V virtualized environments from a single console, and Volume Shadow Copy Service lets IT administrators create virtual machines without interrupting the source physical server.
- Virtual machines running on the same physical server are isolated from each other because they run in separate partitions, and administrators can create virtual machines that run a Windows Server 2008 Server Core installation and apply role-based security, further enhancing security and availability.

Business Continuity

Business continuity is a comprehensive process that includes disaster and business recovery as well as planning to minimize downtime, both scheduled (maintenance and backup) and unscheduled (unanticipated outages). Intel Xeon processors with Intel VT and Hyper-V include powerful business continuity features to support a variety of business continuity scenarios:

- **Disaster recovery:** Businesses can architect warm standby solutions based on Windows Server 2008 clustering capabilities that allow virtual machines to

automatically fail over to any remote server running Hyper-V. To guard against virtual machine failures, they can set up failover among duplicate virtual machines on a single server or among clustered physical servers, enabling increased business continuity on fewer platforms and for lower cost.

- **Load balancing:** The load-balancing tools and clustering capabilities of Hyper-V and Windows Server 2008, coupled with flexible migration support in Hyper-V and the Intel® Core™ microarchitecture, give IT administrators powerful capabilities for balancing virtual workloads across physical hosts to maximize application performance and business continuity.
- **Scheduled maintenance:** With Hyper-V virtual machine replication services and Quick Migration enabled by Intel® architecture, IT administrators can quickly move virtual workloads among physical machines, keeping applications running while physical hosts are down for scheduled maintenance.

Summary

Virtualization technology plays an increasingly critical role in IT strategy for all kinds and sizes of organizations. Multi-core Intel Xeon processors with the Intel Core microarchitecture and Intel VT form a hardware foundation for running and managing virtual servers by improving performance, increasing flexibility, providing higher reliability, and lowering TCO. Hyper-V and System Center Virtual Machine Manager offer an integrated set of robust virtualization and management tools for creating and maintaining virtual servers. Together, these technologies provide a powerful virtualization solution that enables businesses to be more agile in their IT deployments and realize significant time and cost-savings benefits.

Benefits

Intel® Xeon® processors combined with Hyper-V™ and System Center tools provide businesses with a powerful, complementary hardware and software solution for virtualization.

Benefits	Features	
	Intel® Xeon® Processor 7400 Series	Microsoft® Hyper-V™
“Near native” performance	<ul style="list-style-type: none"> Up to 40% better performance in a virtualized environment than previous-generation Intel Xeon processor platforms. Intel® VT reduces need for compute-intensive translation between guest and host operating systems. Intel® Core™ microarchitecture speeds virtual machine entry and exit times by 25% to 75%. 	<ul style="list-style-type: none"> Each virtual machine can use up to 4 processor cores and up to 64 GB of memory plus pass-through disk access. Uses page sharing to optimize memory access for virtual machines and reduce physical resource utilization.
Lower TCO	<ul style="list-style-type: none"> 50% more cores and 2x the memory capacity of previous platforms enable greater consolidation in the same footprint. Up to 54% better performance/watt than previous-generation processors. 24 cores on a 4-socket system along with 16 MB of shared L3 cache per processor yield performance and headroom for new levels of data center consolidation. 	<ul style="list-style-type: none"> Unified management for virtual and physical servers streamlines operations and lowers data center costs. Virtual Machine Manager and Intelligent Placement tools plus Windows Server® 2008 clustering enable optimal server utilization.
Interoperability	<ul style="list-style-type: none"> 64-bit computing with support for 32-bit applications provides a smooth migration path. Intel VT provides highly performant support for legacy operating systems. 	<ul style="list-style-type: none"> Hyper-V supports Microsoft and legacy virtual machines, including Windows®, Linux* and Xen-enabled Linux without OS modification. Hyper-V supports 64-bit and 32-bit applications.
Flexibility	<ul style="list-style-type: none"> More cores and higher per-core performance give IT administrators greater choice and flexibility in assigning virtualized workloads. 	<ul style="list-style-type: none"> Virtual Machine Manager and Intelligent Placement tools plus Windows Server 2008 clustering enable analysis for optimal load balancing. Quick Migration lets administrators easily move virtual machines between physical servers.
Security	<ul style="list-style-type: none"> Microsoft Windows uses the Trusted Platform Module feature to provide a protected space for key operations and other security-critical tasks. The hardware-based Execute Disable Bit security feature helps reduce exposure to viruses and malicious-code attacks and prevents harmful software from executing and propagating on the server or network. 	<ul style="list-style-type: none"> Virtual machines are isolated because they run in separate partitions on the physical server. Virtual machines can use roles-based security on Windows Server 2008 Server Core installations.
High Availability	<ul style="list-style-type: none"> Unique RAS features, including support for Windows Hardware Error Architecture (WHEA) reduce the cost and complexity of high availability solutions in virtualized environments. Intel-based servers provide the highest levels of uptime in Windows environments. 	<ul style="list-style-type: none"> Leverages Windows Server 2008 clustering for failover and load balancing across LANs and WANs. Quick Migration helps with disaster recovery strategies.

For More Information

To read more about virtualization solutions from Intel and Microsoft, visit www.intelalliance.com/microsoft/virtualization

To learn more about multi-core Intel® Xeon® processor-based servers, visit www.intel.com/products/processor/xeon7000/

To visit the Intel Virtual Solutions Partner page: www.microsoft.com/virtualization/partner-profile-intel.msp

To find out more about Microsoft Hyper-V, visit www.microsoft.com/hyper-v/

¹Intel® Virtualization Technology requires a computer system with an enabled Intel® processor, BIOS, virtual machine monitor (VMM) and, for some uses, certain platform software enabled for it. Functionality, performance or other benefits will vary depending on hardware and software configurations and may require a BIOS update. Software applications may not be compatible with all operating systems. Please check with your application vendor.

²Results of benchmarks run by Principled Technologies.

Benchmark:
· vConsolidate 2.0 – Profile 2
· VMM: Windows Server 2008 Hyper-V
· Guest O/S's: Windows Server 2003 SP2 (32 and 64-bit)
· Processor comparison:
– Intel® Xeon® processor X7460 (4-Sockets, 24 Cores Total)
– Intel® Xeon® processor X7350 (Intel Xeon 7300 Series processor) (4-Sockets, 16 Cores Total)
– AMD Opteron® processor 8350SE (4-Sockets, 16 Cores Total)

See <http://www.principledtechnologies.com/Clients/Reports/Intel/vConHV2Sys0908.pdf> for additional details.

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³Not supported in the first release of Hyper-V.

⁴Intel processor numbers are not a measure of performance. Processor numbers differentiate features within each processor family, not across different processor families. See www.intel.com/products/processor_number for details.

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