

# New Power for Turbo-Charging the Efficient Data Center

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A Dell™ Technical White Paper

Dell | Intel

Dell PowerEdge™ Servers with Intel® Xeon® 7500 Series Processors and VMware® vSphere4™



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March 2010

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## Solution Brief

Dell has partnered with industry leaders, Intel and VMware, to deliver a state-of-the-art virtualization solution to power the Efficient Data Center. Dell is focused on delivering the right balance of processor, memory, and I/O to help our customers get the most out of virtualization. Our servers are designed with features to enable rapid virtualization deployment, simplified integration, and low maintenance.

Customers can run additional workloads on Dell™ PowerEdge™ servers with Intel® Xeon® 7500 series processors, embedded hypervisors and balanced memory architectures. Dell has received accolades for our virtualization performance in the past, and is excited to offer even better performing servers with this release.

Dell, Intel, and VMware are delivering the performance, scalability, and availability needed to virtualize mission-critical applications and to increase consolidation ratios across the data center.

The value of data center virtualization continues to grow. Not long ago, VMware® vSphere™ 4 running on the Intel Xeon 5500 series processor (based on the Intel Microarchitecture Nehalem) delivered world record performance for two-socket servers on the VMmark benchmark, with a remarkable 160 percent increase versus previous generation solutions.<sup>i</sup> The Intel Xeon 7500 series processor extends that high performance to a new family of enterprise-class servers which provide the capacity and reliability needed to virtualize even the most demanding enterprise workloads.

In combination with Dell PowerEdge servers with the Intel Xeon 7500 series processors, VMware® vSphere™ allows you to achieve:

- **Dramatically higher consolidation ratios** to reduce requirements for data center space, power, cooling, and related maintenance costs and to increase efficient use of available LAN and SAN ports.
- **Near-native application performance in a virtual environment**, with the scalability to support the full range of enterprise applications, including large databases, and high-volume transactional and productivity applications.
- **Rock-solid support for mission-critical computing needs** with more than 20 new, high availability features, plus dial-up control of service levels through automated virtual machine failover across LANs and WANs.

VMware vSphere is the leading platform for building cloud computing infrastructures which give IT organizations simple, comprehensive control of systems, workloads, and service levels. With scalable servers based on the Intel Xeon 7500 series processors, IT organizations can now extend these benefits further into the enterprise data center to drive down total costs and to improve business and IT agility. The cost benefits of virtualization can be magnified by achieving consolidation ratios that have never before been possible on affordable, industry-standard servers.

## Enjoy Near-Native Performance in a Virtualized Environment

The Intel Xeon 7500 series processors have been shown to dramatically increase database performance with comparable gains across a wide range of workloads. Next-generation Intel Virtualization Technology<sup>ii</sup> (Intel VT) extends this exceptional performance into virtual environments by providing comprehensive hardware assists for core virtualization functions.

In tandem with software optimizations in VMware vSphere, Intel VT:

- Reduces performance overhead to as low as 2 percent (typically 2-10 percent)<sup>iii</sup>
- Enables near-native I/O performance through direct assignment of I/O devices to meet the demanding throughput requirements of large databases and transactional applications.

This enterprise-class virtualization platform provides the scalability you need to host heavy workloads. With VMware vSphere, a single virtual machine can be configured with up to eight virtual CPUs and 255GB of memory and can support up to 30 GB/s of network bandwidth and more than 300,000 I/O operations per second. With these resources, all but the most extreme enterprise workloads can be successfully virtualized. If you are moving applications from older dedicated servers, you can expect dramatic improvements in application throughput and response times.

### Magnify Your Cost Savings through Higher Consolidation Ratios

Dell PowerEdge servers equipped with Intel Xeon 7500 series processors and VMware vSphere provide the scalable capacity to consolidate large numbers of applications per server. Individual processors have up to eight high-performance cores and 24MB of cache. The processors also support Intel Hyper-Threading Technology<sup>iv</sup> and Intel Turbo Boost Technology<sup>v</sup>. Hyper-threading technology doubles the number of execution threads per server and Turbo Boost Technology delivers higher performance on demand for peak workloads. The processors also offer a nine times increase in memory bandwidth and four times the memory capacity of the previous generation Intel Xeon 7400 series processors.

With these advancements, a single four-socket server now provides up to 32 high-performance cores, 64 execution threads, and a full terabyte of memory. These systems provide enormous capacity for consolidation. An internal Intel study quantified the potential benefits. Compared with widely deployed systems based on single-core processors, the newer servers supported a 20:1 consolidation ratio, which resulted in<sup>vi</sup>:

- Ninety (90) percent lower operating costs<sup>vii</sup>
- Approximately 91 percent lower estimated annual energy costs<sup>viii</sup>
- Estimated full payback in as little as 1 year.<sup>ix</sup>

VMware vSphere plays a critical role in delivering these high consolidation ratios. In most cases, system memory management is the predominant factor in determining the number of virtual machines that can run on a physical host. VMware ESX™ and ESXi™ fully support memory over-commit, with unique features such as transparent-memory page-sharing and memory-swap prioritization to reclaim idle physical memory. Available memory is used more efficiently enabling higher virtual machine densities along with the consistent performance required in production data centers.

### Achieve High Availability and Disaster Recovery Cost Effectively

As heavier workloads and more critical applications are virtualized and consolidated per server, you need systems and solutions you can rely on to maintain uninterrupted service. The Dell PowerEdge servers with Intel Xeon 7500 series processors provide more than 20 new reliability, availability, and serviceability (RAS) features to enable levels of system resilience and data integrity never before seen in high-volume, industry-standard servers. These new RAS features provide or enable:

- **Advanced error detection, correction, and containment** across all major components and communication pathways

- **Dynamic addition and replacement of components** in running systems to prevent downtime and to scale resources in support of growth and unexpected workload spikes
- **Static Hard Partitioning** to provide advanced workload isolation and to enable maintenance without bringing down the system.

VMware vSphere complements these hardware capabilities by providing fully automated control over workloads and service levels. VMware Enhanced VMotion™ and Intel VT FlexMigration offer a proven, enterprise-ready live migration solution for moving workloads without downtime among current and future Intel Xeon processor-based servers. This capability has been extensively tested with diverse systems and demanding workloads, both in laboratory settings and across thousands of production deployments in mission-critical customer environments. It lets you grow a unified pool of virtualized resources and continue to add new Dell PowerEdge servers with Intel Xeon 7500 series processors. The solution creates a foundation for a complete array of high availability and disaster recovery solutions by providing:

- **VMware High Availability** automatically monitors and restarts virtual machines on servers that have spare capacity. It minimizes downtime and IT service disruption, while eliminating the need for dedicated stand-by hardware.
- **VMware Fault Tolerance** takes high availability to the next level, by providing fully mirrored operation with continuous availability to eliminate even the smallest IT service disruption or data loss.
- **VMware vCenter™ Site Recovery Manager** allows automated failover for an entire data center. Not only is this far simpler and more cost-effective than traditional disaster recovery solutions, but it is also more reliable, as it eliminates error-prone manual processes and is easily tested without disrupting the production environment.

## Lower Costs through Higher Virtual Machine Density and Automated Power Management

VMware vSphere and the Dell PowerEdge servers with Intel Xeon 7500 series processors enable higher consolidation ratios to drive down space, power, and cooling requirements in your data center. Savings is increased by intelligently tailoring energy consumption to match workloads. Intel Intelligent Power Technology<sup>x</sup> can reduce power consumption up to 18 percent per server by independently optimizing the power consumption of each core. VMware Distributed Power Management extends power management across the entire data center by automatically redistributing virtual machines onto a smaller number of servers when workloads are light and by shutting down the unneeded systems.

## Higher Value through Comprehensive Data Center Virtualization

Virtualization on industry-standard servers has transformed IT service delivery, enabling companies to dramatically consolidate infrastructure and reduce costs, while implementing high availability and disaster recovery more cost effectively and across a wider range of applications. Dell PowerEdge servers with Intel Xeon 7500 series processors and VMware vSphere take these benefits to new heights by furnishing an enterprise-class virtualization platform which rivals the scalability and availability of high-end RISC systems, at a fraction of the cost and with better performance and energy-efficiency.

Together, Dell, Intel, and VMware are delivering end-to-end virtualized infrastructure solutions that deploy quickly, provide significant CAPEX and OPEX savings, are easy to manage, and powerful enough to run the most demanding applications. Dell delivers all the required building blocks, in a one-stop-

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shop, to create a customer's virtualized infrastructure inclusive of PowerEdge servers with Intel Xeon 7500 series processors, factory-installed VMware software, integrated VMware and Dell EqualLogic storage, robust professional services, and support. These proven virtualization solutions, from the desktop to the data center to the cloud, help customers achieve a simplified, efficient, flexible, cost-effective, and service-oriented IT environment.

There is no better platform for optimizing your consolidation ratios, extending virtualization across your entire data center, and maximizing value at all points to achieve the Efficient Data Center.

Learn more today by contacting your Dell representative.

Performance tests and ratings are measured using specific computer systems and/or components and reflect the approximate performance of Intel products as measured by those tests. Any difference in system hardware or software design or configuration may affect actual performance. Buyers should consult other sources of information to evaluate the performance of systems or components they are considering purchasing. For more information on performance tests and on the performance of Intel products, visit [www.intel.com/performance/resources/limits.htm](http://www.intel.com/performance/resources/limits.htm).

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<sup>i</sup> For a description of the VMmark benchmark and for complete test configurations and results, visit: <http://www.vmware.com/products/vmmark/overview.htm>.

<sup>ii</sup> Intel 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.

<sup>iii</sup> Source: VMware Capacity Planner assessments.

<sup>iv</sup> Hyper-Threading Technology requires a computer system with an Intel processor supporting Hyper-Threading Technology and an HT Technology-enabled chipset, BIOS, and operating system. Performance will vary depending on the specific hardware and software you use. See <http://www.intel.com/info/hyperthreading> for more information including details on which processors support HT Technology.

<sup>v</sup> Intel Turbo Boost Technology requires a platform with a processor with Intel Turbo Boost Technology capability. Intel Turbo Boost Technology performance varies depending on hardware, software and overall system configuration. For more information, see <http://www.intel.com/technology/turboboost>.

<sup>vi</sup> Intel consolidation based on replacing 20 5-year-old single-core Intel Xeon processor 3.33GHz based servers with one new Intel Xeon processor X7560 based server while maintaining performance as measured by SPECjbb2005 business operations per second. Performance tests and ratings are measured using specific computer systems and/or components and reflect the approximate performance of Intel products as measured by those tests. Any difference in system hardware or software design or configuration may affect actual performance. Buyers should consult other sources of information to evaluate the performance of systems or components they are considering purchasing. For more information, visit [www.intel.com/performance/server](http://www.intel.com/performance/server).

<sup>vii</sup> Intel comparison replacing 20 5-year-old single-core Intel Xeon processor 3.33 GHz based servers with one new Intel Xeon processor X7560 based server. Costs have been estimated based on internal Intel analysis and are provided for informational purposes only.

<sup>viii</sup> Based on comparison between 4S Intel Xeon MP CPU 3.3 GHz (Single core w/ HT, 1MB L2, 8MB L3, Potomac) and 4S Intel Xeon X7560 (8 core, 2.26 GHz) based servers. Calculation includes analysis based on performance, power, cooling, electricity rates, operating system annual license costs and estimated server costs. This assumes 42U racks, \$0.10 per kWh, cooling costs are 2x the server power consumption costs, operating system license cost of \$900/year per server, per server cost of \$36,000 based on estimated list prices, and estimated server utilization rates. All dollar figures are approximate. SPECint\_rate\_base2006\* performance and power results are measured for X7560 and Xeon 3.3 GHz based servers. Platform power was measured during the steady state window of the benchmark run and at idle. Performance gain compared to baseline was 20x.

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- Baseline platform (measured score of 33.8): Intel server with four MP Intel Xeon processor 3.33 GHz (single core w/HT, 1 MB L2, 8 MB L3), 16 GB memory (8x2GB DDR2-400), 2 hard drives, 1 power supply, using Red Hat EL5.3 x86\_64 operating system.
- New platform (measured score of 705): Intel internal reference server with four IntelR XeonR Processor X7560 (24M Cache, 2.26 GHz, 6.40 GT/s IntelR QPI, Intel Hyper-Threading Technology, Intel Turbo Boost Technology), 256GB memory (64x 4 GB QR DDR3-1333), 1 hard drive, 2 power supplies, using SuSE LINUX 11, `cpu2006.1.1.ic11.1.linux64.binaries.nov242009.tar.bz2` binaries.

<sup>ix</sup> Intel comparison replacing twenty 5-year-old single-core Intel Xeon processor 3.33GHz servers with one new Intel Xeon processor X7560 based server. Return on investment has been estimated based on internal Intel analysis and is provided for informational purposes only.

<sup>x</sup> Intel Intelligent Power Technology requires a computer system with an enabled Intel processor, chipset, BIOS and for some features, an operating system enabled for it. Functionality or other benefits may vary depending on hardware implementation and may require a BIOS and/or operating system update.