



VMWARE VSPHERE™ 4.1 AND THE INTEL® XEON® PROCESSOR E7 FAMILY

Intel and VMware are delivering the performance, scalability, availability, and security foundation needed to support mission-critical applications.

MORE PERFORMANCE AND STRONGER SECURITY FOR MISSION-CRITICAL ENTERPRISE COMPUTING

The value of data center virtualization continues to grow. Not long ago, VMware vSphere™ 4.1 running on the Intel® Xeon® processor 7500 series delivered world-record virtualization performance,¹ while providing breakthrough scalability and high-availability for mission-critical enterprise computing on four-socket, eight-socket, and larger servers.

- **The Intel® Xeon® processor E7 family** extends those advantages with a new generation of more powerful servers that deliver even better performance and scalability for mission-critical applications, with higher consolidation ratios and additional improvements in data integrity and platform reliability. Importantly, this processor family also provides the foundation for stronger security in virtual environments, so sensitive business data can be stored and processed on virtual infrastructure with greater confidence.
 - **VMware vSphere 4.1** adds to these advantages by providing the leading virtualization platform for running mission-critical applications and delivering major improvements in live migration speed and flexibility, resource management, health monitoring, and security. Together with the Intel Xeon processor E7 family, it provides the ideal IT infrastructure for hosting the full range of enterprise applications on scalable, reliable, secure, and highly flexible data center infrastructure.
- With VMware vSphere 4.1 and the Intel Xeon processor E7 family, IT organizations can extend the benefits of virtualization, high-density consolidation, and dynamic workload management across all their applications to achieve data center efficiencies that have never before been possible using affordable, industry-standard servers. This industry-leading virtualization platform provides:
- **Dramatically higher consolidation ratios** to drive down data center space, power, and cooling requirements, reduce related maintenance costs, and improve the utilization of network and storage ports.
 - **Near-native application performance** in a virtual environment, with the scalability to support demanding enterprise applications, including large databases and high-volume transactional and productivity applications.

- **Rock-solid support for mission-critical computing needs** with main-frame-inspired high availability features, plus dial-up control of service levels through policy-based resource guarantees, enhanced health monitoring and diagnostics, and automated virtual machine failover across LANs and WANs.
- **A stronger foundation for security** with virtualization-aware application and data protection, the ability to restrict sensitive data and applications to trusted pools of virtualized infrastructure, and accelerated encryption, which enables the pervasive use of encryption to protect valuable data.
- **Scalable data center management**, with the ability to run up to 3,000 virtual machines per cluster, while managing up to 1,000 physical hosts (and 10,000 virtual machines) from a single VMware vCenter™ Server console.²

ENJOY NEAR-NATIVE PERFORMANCE IN A VIRTUALIZED ENVIRONMENT

The Intel Xeon processor E7 family offers world-record virtualization performance while delivering higher virtual machine densities than any other industry-standard server in the market today.³ It includes next-generation Intel® Virtualization Technology[®] (Intel® VT), which provides comprehensive hardware assists for core virtualization functions. In tandem with software optimizations in VMware vSphere, Intel VT dramatically reduces virtualization overhead and enables near-native performance, even for I/O-intensive applications, such as 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 255 GB of memory, and it can support up to 30 GB/s of network bandwidth and more than 300,000 I/O operations per second. All but the most extreme enterprise workloads can be successfully virtualized. If you are moving applications from older dedicated servers, you can expect to see dramatic improvements in application throughput and response times.

ESTABLISH STRONGER SECURITY IN VIRTUALIZED ENVIRONMENTS

Intel and VMware provide a strong foundation for protecting data, applications, and infrastructure in virtualized environments.

- **Intel® Trusted Execution Technology[®] (Intel® TXT)** provides assurance that physical servers and virtual machines boot only into cryptographically verified “known good states” to prevent the insertion of malware during or prior to launch. The information provided by Intel TXT can also be used to monitor and assess the security environment in real time, so customers can establish and maintain “trusted resource pools.” With this foundation, sensitive and business-critical workloads can be deployed – and migrated – with confidence.
- **Intel® Advanced Encryption Standard-New Instructions[®] (AES-NI)** accelerates the most compute-intensive steps of AES algorithms to significantly reduce the performance penalties of encryption. With this support, businesses can implement encryption pervasively to protect valuable business data more effectively,⁴ without sacrificing performance or driving up costs.
- **Intel VT** helps to protect the integrity and confidentiality of data and applications by helping to maintain strong isolation among workloads running on shared infrastructure.
- **The VMware vShield™** family of products builds on this foundation by providing virtualization-aware application and data security that helps to improve visibility and control across the entire virtualized infrastructure. These solutions integrate seamlessly with existing enterprise IT security measures, including anti-virus and anti-malware applications, to enable better-than-physical security with reduced complexity.

MAGNIFY YOUR COST SAVINGS THROUGH HIGHER CONSOLIDATION RATIOS

The Intel Xeon processor E7 family provides the scalable capacity needed to consolidate large numbers of applications per server, with more cores, more cache, and more memory and I/O capacity than the previous-generation Intel® Xeon® processor 7500 series. These processors also support Intel® Hyper-Threading Technology¹ and Intel® Turbo Boost Technology.¹ The first doubles the number of execution threads per server and the second delivers higher performance on demand for peak workloads.

A single four-socket server provides enormous capacity for consolidation, with up to 40 cores, 80 execution threads, and 2 TB of memory. Compared with widely deployed systems based on single-core processors, these newer servers can support:⁵

- Up to 29:1 server consolidation performance
- Estimated payback in as little as 8 months

Businesses can take their consolidation ratios even higher with eight-socket servers that provide up to 80 cores, 180 threads and 4 TB of memory. VMware vSphere 4.1 enables full utilization of these resources to support truly massive workload consolidation. It also provides industry-leading support for memory compression and memory over-commit, which help to eliminate memory bottlenecks to further increase virtual machine densities.

ACHIEVE HIGH AVAILABILITY AND DISASTER RECOVERY COST EFFECTIVELY

As you virtualize and consolidate critical workloads, you need systems and solutions you can count on to maintain uninterrupted service. The Intel Xeon processor E7 family provides extraordinary server reliability and data protection, with automatic detection, correction, and recovery from errors, plus dynamic reassignment of workloads across CPUs or servers in virtual environments. Leading server manufacturers build on this foundation to provide highly resilient systems designed specifically for mission-critical environments.

VMware vSphere complements these hardware capabilities by providing fully-automated control of workloads and service levels. VMware Enhanced vMotion™ and Intel® Virtualization Technology FlexMigration provide a proven, enterprise-ready live migration solution that supports a complete array of high-availability and disaster-recovery solutions.

- **VMware High Availability** monitors and restarts virtual machines on servers with spare capacity to minimize downtime and IT service disruption.
- **VMware Fault Tolerance** delivers even higher availability by providing fully-mirrored operation to completely eliminate data loss and service disruptions.

- **VMware vCenter Site Recovery Manager** allows you to automate failover for an entire data center. It is far simpler and more cost effective than traditional disaster-recovery solutions. It is also more reliable, since it eliminates error-prone manual processes and is easily tested without disrupting the production environment.

The latest version of VMware vSphere improves all these functions by migrating virtual machines up to five times faster and enabling up to eight simultaneous VMware vMotion events. It also provides deeper diagnostics and health checking, quality-of-service prioritization for storage and network I/O, and improved reporting for key storage performance statistics. With this support, IT staff can monitor, control and adapt data center infrastructure more quickly and effectively to further improve service levels.

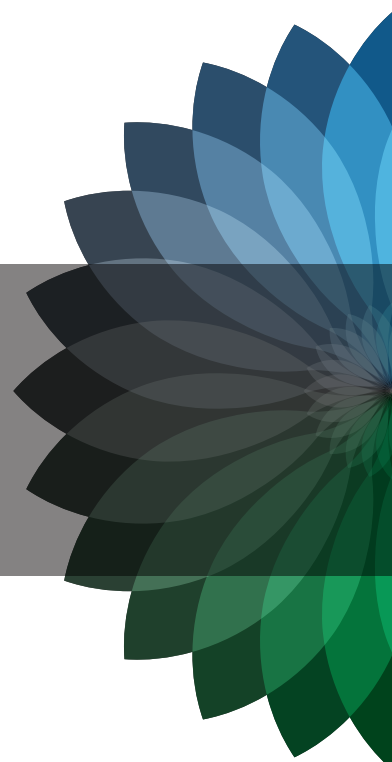
LOWER YOUR COSTS THROUGH AUTOMATED POWER MANAGEMENT

Increasing consolidation ratios with four-socket and eight-socket Intel Xeon processor E7 family-based servers is one of the most effective ways to drive down space, power and cooling costs in your data center. VMware vSphere takes advantage of Intel® Intelligent Power Technology⁹ to further reduce power consumption by consolidating workloads onto as few cores as possible.⁶ VMware® Distributed Power Management (DPM) provides similar control at the data center level, by automatically redistributing virtual machines onto a smaller number of servers when workloads are light and shutting down the unneeded systems.

AN EVOLUTIONARY PATH TO THE CLOUD

VMware and Intel are strongly invested in delivering advanced cloud computing functionality on an interoperable foundation that will help customers transition smoothly to next-generation public clouds. Intel Xeon processor-based servers provide a high-performing, scalable, energy-efficient hardware platform for public and private cloud infrastructures. The VMware vSphere platform helps to ensure broad software compatibility with diverse public cloud solutions, through new storage APIs and the new VMware vCloud™ application programming interface (API).

You can take advantage of this industry-leading virtualization platform to deploy advanced cloud computing functionality today, while keeping your options open as cloud computing models continue to evolve. There is no better way to extend virtualization across all your systems and workloads, so you can deliver better service to your business while increasing operating efficiency and driving down costs throughout your data center.



To learn how your company can take advantage of VMware virtualization running on Intel Xeon processor-based servers to improve energy-efficiency and performance visit www.vmwareintelalliance.com

² Intel® Virtualization Technology requires a computer system with an enabled Intel® processor, BIOS, virtual machine monitor (VMM). Functionality, performance or other benefits will vary depending on hardware and software configurations. Software applications may not be compatible with all operating systems. Consult your PC manufacturer. For more information, visit <http://www.intel.com/go/virtualization>

⁴ No computer system can provide absolute security under all conditions. Intel® Trusted Execution Technology (Intel® TXT) requires a computer system with Intel® Virtualization Technology, an Intel TXT-enabled processor, chipset, BIOS, Authenticated Code Modules and an Intel TXT-compatible measured launched environment (MLE). Intel TXT also requires the system to contain a TPM v1.s. For more information, visit <http://www.intel.com/technology/security>

⁶ Intel® AES-NI requires a computer system with an AES-NI enabled processor, as well as non-Intel software to execute the instructions in the correct sequence. AES-NI is available on select Intel® Xeon® processors. For availability, consult your reseller or system manufacturer. For more information, see <http://software.intel.com/en-us/articles/intel-advanced-encryption-standard-instructions-aes-ni/>

¹ Requires an Intel® HT Technology enabled system, check with your PC manufacturer. Performance will vary depending on the specific hardware and software used. Not available on Intel® Core™ i5-750. For more information including details on which processors support HT Technology, visit <http://www.intel.com/info/hyperthreading>

⁵ Requires a system with Intel® Turbo Boost Technology capability. Consult your PC manufacturer. Performance varies depending on hardware, software and system configuration. For more information, visit <http://www.intel.com/technology/turboboost>

² 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. Please check with your system vendor for details.

¹ For a description of the VMmark benchmark and for complete test configurations and results, visit: <http://www.vmware.com/products/vmmark/overview.html>

² Source: VMware Web site. <http://www.vmware.com/files/pdf/VMware-Whats-New-in-vSphere-41-ds-en.pdf>

³ World-record virtualization performance claim based on all published VMmark® 1.x results on <http://www.ideasininternational.com/Benchmark-Top-Ten/VMmark-1-x>. Top-ranked Fujitsu PRIMERGY® RX600 S5 uses four Intel® Xeon® processor X7560 (24M cache, 2.26GHz, 6.40GT/s Intel QPI).

⁴ AES-NI also reduces vulnerability to side-channel attacks, because malicious agents can no longer snoop the cache/memory for data patterns to deduce the encryption key, as they can with the traditional table lookup method.

⁵ Up to 29:1 server consolidation performance with as low as 8 months payback* claim estimated based on comparison between 4S MP Intel® Xeon® processor 3.33GHz (single-core with Intel® Hyper Threading Technology, 8M cache, 800MHz FSB, formerly code named Potomac) and 4S Intel® Xeon® processor E7-4870 (30M cache, 2.40GHz, 6.4GT/s Intel® QPI, code named Westmere-EX) 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 Intel® Xeon® processor E7-4870 and Intel Xeon processor 3.33GHz based servers. Platform power was measured during the steady state window of the benchmark run and at idle. Performance gain compared to baseline was 29x (truncated).

Baseline platform (measured score of 33.8): Intel server with four Intel® Xeon® MP CPU 3.3GHz (single core w/HT, 1MB L2, 8MB L3) processors, 16GB memory (8x2GB DDR2-400), 1 hard drive, 1 power supply, Microsoft Windows Server® 2008 Enterprise x64 Edition R2 operating system, Intel Compiler 11 built SPECcpu® 2006 November 2009 binaries.

New platform (measured score of 1,010): Intel internal reference server with four Intel® Xeon® processor E7-4870 (30M cache, 2.40GHz, 6.40GT/s Intel® QPI), 128GB memory (64x 2GB QR DDR3-1333), 1 hard drive, 3 power supplies, using SUSE® Linux Enterprise Server 11 operating system, Intel Compiler XE2011 built SPECcpu® 2006 January 2011 binaries.

⁶ For example, when workloads are light, vSphere can automatically increase the frequency of one or more cores by as much as 400 MHz, shift more workloads onto the higher performing cores, and put idle cores into low-power sleep states.

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.

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