



Intel® Processor-based Server Selection Guide

Finding the Right Servers for Your Business Computing Needs

Guide

Intel® Xeon® processor-based servers

Intel® Itanium® processor-based servers



Every IT organization has to satisfy a unique mix of server purchase requirements (high performance, reliability, technology headroom, etc.), while working within a variety of data center constraints, including budget, floor space, power/thermal capacity and many others. Your servers need to fit your data center deployment strategy (scale up vs. scale out), while delivering optimized support across a broad range of business, technical and infrastructure applications. They must also provide a flexible foundation for current and future virtualization strategies, so you can simplify and consolidate your infrastructure, drive down your energy and operating costs, adopt new usage models, and improve your service levels – even as you continue to add new capabilities to grow your business.

Whatever your data center requirements may be, you can take comfort in knowing that Intel, the world leader in server technology, has server platforms based on advanced, proven technology to help your IT department deliver more efficient, dependable and responsive solutions for business. This guide helps you select from the broad range of Intel® processor-based servers.

The Intel® Xeon® Processor Family

The latest Intel® Xeon® processors usher in a new era of intelligent performance that takes energy-efficiency and compute density to new heights, while delivering best-in-class support for virtualization and consolidation. Servers based on these processors can help you create a standardized, reliable IT infrastructure that helps you drive down data center space, power, cooling and management costs, while providing exceptional performance and reliability, even for your most data-demanding infrastructure applications.

Automated Energy-Efficient Multi-Core Computing

Since 2006, Intel® multi-core processors have provided industry-leading performance for mainstream servers, and the most recent generation delivers 40 percent more performance per watt than previous generations.¹ These intelligent processors adapt to your workloads, automatically increasing processor frequency when high performance is needed and reducing power consumption when workloads are light. With systems ranging from 1- to 256-sockets, Intel Xeon processor-based servers provide exceptional flexibility and value for growing data center capacity while reducing footprints and power requirements.

Flexible Virtualization

Virtualization allows one server to act like many, which can greatly expand your usable performance capacity without increasing your costs. Intel® Virtualization Technology[†] (Intel® VT) provides extensive hardware assists for core virtualization functions so you can consolidate more applications on fewer servers with better performance and greater confidence. Intel VT comes standard on multi-core Intel Xeon processor-based servers to help you improve asset utilization and IT flexibility, while reducing costs and power consumption. In fact, the latest generation Intel Xeon processor-based servers deliver up to 15x performance per server over 2-socket single-core servers, enabling 15:1 server consolidation ratios;² and Intel® FlexMigration also helps you create a flexible pool of virtualized server resources across current and future server generations, so you can implement workload balancing, high availability and disaster recovery solutions more easily and affordably.

Stable and Reliable

Intel Xeon processor-based systems are built with advanced performance and reliability features that give you the headroom, reliability and compatibility you need to keep pace with the changing business environment. And if you're building a data center from the ground up, next-generation virtualization with Intel® Trusted Execution Technology[®] also provides hardware-based resistance to malicious software attacks before the virtual machine boots.

2-Processor Systems: Intel® Xeon® Processor 5000^A Sequence

As the world's most widely deployed server architecture, Intel Xeon processor-based servers deliver proven support for the broadest range of business needs, including e-mail, departmental applications, Java application servers, financial applications and more. Based on Intel® Microarchitecture Nehalem, the latest processors deliver up to 40 percent more performance per watt than previous-generation processors¹ and up to 95 percent lower operating costs.² They offer best-in-class performance and manageability in virtualized environments and deliver dramatic increases in system bandwidth. They are also platform-compatible with their quad-core and dual-core predecessors, providing investment protection and delivering the ultimate in business and IT flexibility – all on a single, stable technology platform.

Intel® Xeon® Processor 5600 Series

The Intel® Xeon® processor 5600 series helps IT meet the performance, power, and innovation requirements of the growing data center by delivering a new generation of processors built on 32nm technology that can automatically regulate power consumption and intelligently adjust server performance according to your application needs – delivering the performance you need with a minimum of power. Use servers based on these processors to achieve up to 15:1 consolidation ratios during server refreshes, with up to 95 percent lower operating costs and an estimated 5-month return on investment.

Intel® Xeon® Processor 5500 Series

These intelligent processors adapt automatically to workloads, maximizing performance when and as needed by increasing frequency (Intel® Turbo Boost Technology[®]) and handling more simultaneous software threads per core (Intel® Hyper-Threading Technology[®]), while always maintaining processor and memory resources at the lowest available energy states that do not compromise performance. They also feature large caches and new Intel® QuickPath Technology, which increases system bandwidth for memory and I/O-intensive applications. Their breakthrough performance and energy-efficiency can help you achieve next-generation application performance, while reducing your operating costs and extending the life of your data center.

Intel® Xeon® Processor 5400 Series

As the industry's first 45nm quad-core processor,³ the Intel® Xeon® processor 5400 series provides excellent performance and capabilities per watt in powerful, dense and energy-efficient general-purpose servers.

4-Processor to 2-256-Processor Large Memory Systems Systems: Intel® Xeon® Processor 7000^A Sequence

The Intel® Xeon® processor 7000 sequence is your ideal choice for demanding enterprise applications and for virtualization and consolidation, where maximum performance, scalability and reliability are critical. With their expandable designs and ability to host more virtual machines per system, these servers increase business and IT agility, and can help you dramatically drive down data center costs. They typically feature more processors, memory, I/O and redundancy than standard 2-socket systems and are well suited for data- and transaction-intensive applications. While primarily aimed at workloads requiring systems of 4 sockets or more, there is an emerging interest in 2-socket systems based on the Intel Xeon processor 7000 class. Such systems will be in the market starting with the Intel Xeon processor 7500 series.

Intel® Xeon® Processor 7500 Series

With enhanced 45nm technology, Intel Microarchitecture Nehalem, and Intel Virtualization Technology, the Intel® Xeon® processor 7500 series-based servers help drive your data-demanding enterprise applications faster. Delivering a quantum leap in enterprise computing, the Intel Xeon processor 7500 series features 8 cores supporting 16 threads and 24 MB of cache per processor, and 4 advanced, high-bandwidth Intel® QuickPath Interconnect links that allow multiple processors to be directly connected to each other. Now you can be more productive and deliver more computing power and performance without increasing footprint or power demands. Scaling from 2 to 256 sockets, and with 4x the memory capacity and more than 20 new advanced reliability features, the Intel Xeon processor 7500 series is uniquely architected for data-demanding and mission-critical applications, such as business processing (database, ERP, CRM), business intelligence, large-scale virtualization, and large-node technical computing, letting you deploy increasingly powerful business tools to track your marketplace and identify previously hidden opportunities.

Intel® Xeon® Processor 7400 Series

The Intel® Xeon® processor 7400 series features up to 6 cores and up to 16 MB of shared on-die cache, providing an ultra-fast on-chip memory space that is ideal for business intelligence, large databases and enterprise resource planning. Servers based on these processors deliver industry-leading performance and scalability, plus more reliability features than other Intel Xeon processor-based servers and competitive alternatives. With more cores, up to 256 GB of memory capacity and unique data traffic optimization features, they let you confidently consolidate more virtual machines, while maintaining superior application responsiveness during peak demands, even for the most unpredictable workloads.² This processor is also platform-compatible with the prior-generation Intel Xeon processor 7300 series.

Also available in compatible platforms are prior-generation Intel Xeon processor 7300 series and Intel Xeon processor 7200 series.

A Dynamic Resource Pool Built-in Support for Flexible Virtualization and Changing Usage Models

Virtualization usage models are evolving quickly. For example, the ability to migrate running virtual machines (VMs) between physical servers delivers fundamental benefits in IT flexibility, including simpler and more cost-effective failover, load balancing and disaster recovery solutions. To provide better support, Intel has added extensive enhancements to Intel® Virtualization Technology (Intel® VT) in all 32nm and 45nm Intel® Xeon® processors and supporting platform components.

- **Intel® VT FlexMigration** enables seamless VM migrations between current and future Intel Xeon processor-based servers. This cross-generational compatibility increases IT flexibility, giving you the power to choose best-fit server platforms to optimize data center capability and cost – while maintaining a single pool of virtualized server resources.
- **Extensive I/O enhancements** accelerate the flow of data throughout the server platform and enable direct assignments between I/O devices and virtual machines. More data- and network-intensive applications can be consolidated per server, with better responsiveness, fewer I/O bottlenecks, increased reliability and faster live migrations.



Intel® Xeon® Processors at a Glance

	Intel® Xeon® Processor 5600 ^A Series	Intel® Xeon® Processor 7500 ^A Series
Summary	Outstanding 2-socket performance , energy efficiency, and IT value with leading microarchitecture and platform designs featuring high performance, density and versatility with 32nm multi-core processors.	Maximize the reliability, performance, and scalability of your standard high-volume servers. Ideal for the most demanding, mission-critical database, ERP, server virtualization, and reducing server footprint through data center consolidation.
Advantages Over Prior Generation	Delivers up to 40 percent more performance per watt than the Intel® Xeon® processor 5500 series! ¹	Up to 3.7x better virtualization performance than the Intel® Xeon® processor 7400 series. ⁴
Advantages Over Competition	<p>Extends the industry-leading performance, energy-efficiency and compute density of Intel Xeon processor-based servers, while delivering best-in-class support for virtualization and support for hardware-assisted virtualization with features such as Intel® VT-c and Intel® VT-d.</p> <p>Adapts automatically to deliver high performance when needed, and low energy consumption when workloads are light with Intel® Turbo Boost Technology which dynamically and automatically maximizes server application performance by increasing core frequencies, and Intel® QuickPath Technology which delivers scalable shared memory architecture with high-speed, point-to-point processor interconnects.</p> <p>Stable and reliable: Common technology platform scales from dual-core to quad-core and delivers more server reliability and advanced technology features than competitive offerings.</p>	<p>Extends Intel's industry-leading enterprise performance on multi-socket (MP) processor-based servers.</p> <p>Advanced reliability features (including 20 new ones) that keep your mission-critical workloads running.</p> <p>Socket scaling that allows systems supporting up to 256 processors enable scalable performance for the largest and most data-demanding workloads.</p> <p>Virtualization technologies across the entire platform that result in near native VM performance, and the economical use of multi-generational Intel Xeon processor-based systems in a single virtualization pool.</p>
IT Benefits	<p>Outstanding virtualization headroom in a 2-socket platform: Achieve up to 15:1 consolidation ratios² when refreshing servers based on single-core processors, with up to 95 percent lower operating costs² and an estimated 5-month return on investment²</p> <p>Lower Operating Costs: Intelligently manages processor resources to optimize performance and energy-efficiency across all workloads.</p>	<p>Ideal for the highest levels of server consolidation, virtualization, and data-demanding enterprise applications⁵</p> <p>Most virtualization headroom...period. 8-core processing allows you to virtualize more, resulting in the highest consolidation ratios of any Intel Xeon processor platform.</p> <p>System power and OS licensing cost savings of over 90 percent via 20:1 consolidation of older 4-socket systems using single-core processors⁵</p>
Sockets	2	2-256
Number of Cores	4 or 6	4, 6, or 8
Frequency	Up to 3.33 GHz 6C (3.46 GHz 4C)	Up to 2.26 GHz
On Die Cache	Up to 12 MB shared L3	Up to 24 MB shared L3
Interconnect Type and Speed	Quick Path Interconnect (up to 6.4 GT/s)	Quick Path Interconnect (up to 6.4 GT/s)
Memory Type	DDR3	DDR3
Max Memory Capacity	Up to 288 GB	64 slots (up to 1 TB) for 4 sockets
I/O Type	PCIe Gen 2 and PCIe	PCIe Gen 2 and PCIe
I/O Capacity	Better	Best
Microarchitecture	Intel® Microarchitecture (Nehalem)	Intel® Microarchitecture (Nehalem)
Intel® Turbo Boost Technology [§]	Yes (select processors)	Yes (select processors)
Intel® Hyper-Threading Technology [®]	Yes (select processors)	Yes (select processors)
Intelligent Power Technology [†]	Yes	Yes
Intel® Virtualization Technology [†]	Yes (with FlexMigration)	Yes (with FlexMigration)
System Level Reliability	Better	Best
System Expandability and Scalability	Better	Best

The Intel® Itanium® Processor 9300^A Series

Itanium®-based servers deliver powerful and scalable performance for UNIX* and mainframe environments, plus world-class availability for mission-critical applications. Their proven performance, power efficiency and standards-based architecture provide a robust and cost-effective alternative to proprietary RISC architectures. These systems are ideal for today's most demanding workloads, including database applications, data warehousing, large-scale ERP and business analytics.

The latest Intel® Itanium® processor 9300 series delivers more than double the performance of the previous generation, plus up to six times more memory bandwidth, up to nine times more interconnect bandwidth, and up to eight times more memory capacity.⁷ It provides incredible scalability and a powerful, flexible and energy-efficient foundation for data center virtualization, consolidation and workload management.

- Scalable performance for enterprise workloads with up to 64 processors and support for up to 1,024 terabytes of RAM, plus 30 MB on-die cache, dual integrated memory controllers, Intel® Scalable Memory Interconnect and Intel QuickPath Interconnect Technology.
- World-class reliability, availability and serviceability (RAS) to protect critical applications, with Intel® Cache Safe Technology and Advanced Machine Check Architecture.
- A powerful platform for data center consolidation with Intel Virtualization Technology, flexible partitioning, and dynamic resources management.
- Lower TCO and better investment protection.

A Compelling Alternative to RISC Better Value with Standards-based Servers

According to IDC, over 85 percent of higher end workloads are now running on industry-standard servers, including business intelligence, data warehousing, database and enterprise resource planning applications.⁸ In the current economic environment there is increased pressure on IT to reduce TCO while supporting business growth requirements. IT managers have a strong desire to eliminate the high costs and inflexibility of proprietary RISC architectures. Many are now migrating away from RISC-based systems to industry-standard solutions based on Intel® Xeon® processor-based servers for a broad range of applications and to both Intel Xeon processor 7500 series-based servers and Intel® Itanium® processor-based servers for their mission-critical solutions where the highest levels of scalability and availability are required. Servers based on the Intel Xeon processor 5600 series and Intel Xeon processor 7500 series are offered at significantly lower prices and provide significantly better price/performance than servers based on the Sun UltraSPARC* T2+ processor, the Fujitsu SPARC64VII* processor and the IBM POWER 6* processor.⁹



More Server Choices from Intel Basic Small Business Server

The Intel® Xeon® processor 3300 series is ideal for first-time small business server computing needs. Intel's newest quad-core processor for single-processor servers delivers a new level of energy-efficient performance with 45nm process technology and the enhanced Intel® Core™ microarchitecture, which is optimized for low-power, multi-core 64-bit computing.

Combined with the Intel® S3000 chipset family and ECC DDR2 memory technology, new Intel Xeon processor 3300 series-based platforms are expected to deliver up to 1.6 times the performance of the Intel® Pentium® processor E2160, with 61 percent better performance per dollar.¹⁰

Platforms based on the Intel Xeon processor 3000 sequence make it simple for small businesses to get the reliability, availability and serviceability they need for their server environments.



Matching the Server to the Job and the Data Center

Selecting the right architecture and server platform for your data center pays dividends today, as well as over time. Maximum IT value is achieved by balancing critical purchase criteria such as performance, cost, reliability, and power consumption to best fit your application requirements and desired deployment model.

Step 1: What Do Your Applications Demand of Your Servers?

IT applications and the users who rely on them vary in their requirements for compute technology. Infrastructure applications such as e-mail, networking, and office databases demand cost-effective capacity, while enterprise applications such as analytics and ERP require higher performance and data bandwidth in the server. The first step in server selection is to select the most cost-effective server that meets the needs of your application. The table below shows which Intel processor sequence offers the best value for infrastructure and enterprise applications.

Requirement	Applications	Best Value
Mission-Critical Computing Highly scalable, most reliable computing platform for mission-critical IT workloads	<ul style="list-style-type: none"> ▪ Large database applications ▪ Data warehousing ▪ Large-scale ERP ▪ Large-scale business analytics ▪ Real-time transaction systems 	Highest Scalability/Availability Intel® Itanium® processor 9000 ^A sequence-based servers and Intel® Xeon® processor 7000 ^A sequence-based servers
Data Demanding Compute power and headroom for data- and transaction-intensive applications	<ul style="list-style-type: none"> ▪ Server consolidation/virtualization ▪ Enterprise databases ▪ Business Intelligence (BI) ▪ ERP ▪ SCM ▪ Decision support ▪ CRM ▪ Transaction-intensive applications such as e-Commerce 	Powerful Intel® Xeon® processor 7000 sequence-based servers
Standard Infrastructure Cost-effective, easy-to-manage performance and capacity for standard business applications	<ul style="list-style-type: none"> ▪ Infrastructure virtualization ▪ Mail and web ▪ Networking ▪ File/print ▪ Office or department databases ▪ Line-of-business applications ▪ Rendering farms ▪ Application servers ▪ Technical computing ▪ Scale-out of financial service and Java applications 	Versatile Intel® Xeon® processor 5000 ^A sequence-based servers

Step 2: Optimize Data Center Value

Servers need to fit your data center deployment model and budget, as well as the applications they host.

The following table matches Intel processor-based servers to data center needs:

Feature	Benefit	2-Processor Servers: Intel® Xeon® Processor 5000 ^A Sequence	4- to 2-256-Processor Servers: Intel® Xeon® Processor 7000 ^A Sequence	Intel® Itanium® Processor 9000 ^A Sequence
Reliability, Data Security	Always-on server availability and unique architectural and platform security features aimed at protecting and verifying real-time accuracy of business-critical data	●	●	●
Performance, Memory and I/O Scalability	Support for more processors, memory and I/O in the same system. Higher scalability usually means more application performance per server	●	●	●
		2 CPU 288 GB memory	2-256 CPU 1 TB memory (4 socket)	2- 512 CPU 1 024 TB memory ¹¹
Server Deployment Model	Companies choose server deployment models that best fit their business model and IT strategy	Scale OUT provides a rapid method of adding incremental smaller IT resources to meet business growth demands Pedestal, Rack, Blade	Scale UP enables the deployment of fewer, more powerful servers with the capability to handle more demanding applications and built-in headroom to handle peak periods and business growth Rack and Blade	Scale UP enables the deployment of fewer, more powerful servers with the capability to handle more demanding applications and built-in headroom to handle peak periods and business growth Pedestal, Rack, Blade
Application Migration Versatility	64- and 32-bit application and operating system support for the broadest array of today's leading mainstream and mainframe-class operating systems	Predominantly Windows* and Linux* with support for Solaris*	Predominantly Windows* and Linux* with support for Solaris*	Windows,* Linux* PLUS mission-critical UNIX*

Good ● Better ● Best ●

High Performance Computing (HPC) and Technical Computing

High Performance Computing and technical computing applications vary widely in their response to different server architectures.

Intel® Itanium® Processor 9000 Sequence: Scalable performance featuring massive 64-bit execution resources that are ideal for bio simulation, climate research and other life sciences applications. Provides support for enormous physical memory (up to 1 Petabyte) with the highest levels of system scalability.

Intel® Xeon® Processor 7000 Sequence: Expandable 4-socket servers are designed specifically to deliver scalable performance for data-demanding transaction-intensive technical computing workloads requiring individual or clusters of systems based on large memory, high core-count supernodes. Featuring up to 8 cores per processor, with 24 MB of shared on-die cache, up to 1 TB of memory capacity and unique data traffic optimization features, the Intel Xeon processor 7500 series is an excellent option for accelerating performance on complex, time-critical calculations.

Intel® Xeon® Processor 5000 Sequence: Purpose-built 2-socket HPC servers for CPU and memory bandwidth intensive workloads where high performance and performance/watt are critical.

Compelling features for HPC are designed into the processor, including an integrated 3-channel memory controller that supports DDR3 memory with speeds up to 1333 MHz, and Intel® QuickPath Interconnect, which provides up to 25.6 GB/s of bandwidth per link for very low-latency processor-to-processor communications. The Input/Output Hub (IOH) supports second-generation PCI Express* for high-bandwidth interconnect with minimal node-to-node latency. Other intelligent performance features include Intel Turbo Boost Technology and Intel Hyper-Threading Technology to deliver even greater performance for HPC workloads. These well-balanced servers are ideal for most technical computing solutions, including seismic modeling, digital content, financial or design analysis, fluid dynamics, life sciences and more.

Intel® Xeon® Processor 3000 Sequence: For deployments seeking lowest cost and highest density. Small form factor single-processor servers offer cost-sensitive buyers great performance for 64-bit applications, such as web farms and financial analysis, and for extending HPC into existing density-challenged corporate data centers.

To learn more about Intel® Xeon® processor-based servers, go to www.intel.com/xeon or speak to your local Intel reseller.

To learn more about Intel® Itanium® processor-based servers, go to www.intel.com/itanium.

¹ Intel 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.

¹ 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.

² No computer system can provide absolute security under all conditions. Intel® Trusted Execution Technology is a security technology under development by Intel and requires for operation a computer system with Intel® Virtualization Technology, an Intel Trusted Execution Technology-enabled processor, chipset, BIOS, Authenticated Code Modules, and an Intel or other compatible measured virtual machine monitor. In addition, Intel Trusted Execution Technology requires the system to contain a TPMv1.2 as defined by the Trusted Computing Group and specific software for some uses. See <http://www.intel.com/technology/security/> for more information.

³ 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. Check with your platform manufacturer on whether your system delivers Intel Turbo Boost Technology. For more information, see <http://www.intel.com/technology/turboboost>.

⁴ 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.

⁵ 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.

⁶ Up to 40% higher performance/watt compared to Intel® Xeon® Processor 5500 Series claim supported by performance results on a server side java benchmark in conjunction with power consumption across a load line. Intel internal measurement (Jan 15, 2010).

Baseline platform: Intel preproduction server platform with two Quad-Core Intel® Xeon® processor X5570, 2.93 GHz, 8 MB L3 cache, 6.4QPI, 8 GB memory (4x2GB DDR3-1333), 1 PSU, Microsoft Windows® Server 2008 Enterprise SP2. Intel internal measurement as of January 15, 2010.

New platform: Intel preproduction server platform with two Intel® Xeon® Processor X5670 (12M Cache, 2.93 GHz, 6.40 GT/s Intel® QPI), 8 GB memory (4x2 GB DDR3-1333), 1 PSU, Microsoft Windows® Server 2008 Enterprise SP2. Intel internal measurement as of January 15, 2010.

⁷ 15:1 consolidation and 5 month ROI claim estimated based on comparison between 2S Single Core Intel® Xeon® processor 3.80 with 2M L2 Cache and 2S Intel® Xeon® processor X5680 series-based servers. Calculation includes analysis based on performance, power, cooling, electricity rates, operating system annual license costs and estimated server costs. This assumes 8kW 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 \$7200 based on estimated list prices and estimated server utilization rates. All dollar figures are approximate. Performance and power comparisons are based on measured server side java benchmark results (Intel Corporation Feb 2010). Platform power was measured during the steady state window of the benchmark run and at idle. Performance gain compared to baseline was 15x.

Baseline platform: Intel server platform with two 64-bit Intel Xeon Processor 3.80GHz with 2M L2 Cache, 800 FSB, 8x1GB DDR2-400 memory, 1 hard drive, 1 power supply, Microsoft Windows® Server 2003 Ent. SP1, Oracle JRockit™ build P27.4.0-windows-x86_64 run with 2 JVM instances

New platform: Intel server platform with two Intel® Xeon® Processor X5680 (12M Cache, 3.33 GHz, 6.40 GT/s Intel® QPI), 24 GB memory (6x4GB DDR3-1333), 1 SATA 10krpm 150GB hard drive, 1 800w power supply, Microsoft Windows Server 2008 64 bit SP2, Oracle JRockit™ build P28.0.0-29 run with 4 JVM instances.

⁸ Of standard, high volume server processors.

⁹ Intel comparison replacing one X7460 based server with one new X7560 processor based server. Consolidation Performance on VMmark® benchmark Comparison based on Intel internally measured as of 12 February 2010. 4S Intel® Xeon® processor X7460 series-based platform details IBM System x® 3850M2 server system with four Intel Xeon processors X7460 (16M cache, 2.66 GHz, 6.4GT/s Intel QPI, 6C), 128 GB (32x4 GB PC2-5300 667MHz Registered ECC DDR2 DIMMs, VMware ESX® 3.5.0 U3 GA. Referenced as published at 20.2 @ 14 tiles. For more information, see: <http://www.vmware.com/files/pdf/vmmark/VMmark-IBM-2009-03-24-x3850M2.pdf>. 4S Intel® Xeon® processor X7560 series-based platform details Intel® 7500 Chipset-based reference server platform with four Intel® Xeon® Processor X7560 (8-Core, 2.26 GHz, 24 MB L3 cache, 6.4 GT/s QPI), Intel EIST enabled, Turbo Boost enabled, Hyper-Threading enabled, NUMA enabled, Prefetchers enabled, 512GB (64x 8GB DDR3-1066) memory, VMware ESX® 4.0 Update 1 patch X, 2x Intel® 10 Gb CX4 Dual-Port Server Adapter, FC SAN 2x QLogic QL2462, 16x32 GB SSD disk storage system. Source: Intel internal testing as of February 2010 referenced as estimated score of 75 @ 50 tiles.

¹⁰ As compared to Dual-Core Intel® Xeon® processor 7100 series-based systems.

¹¹ Claim based on comparison between 4S Intel® Xeon® MP CPU 3.3GHz (Single core w/ HT, 1MB L2, 8MB L3, Potomac) and 4S Intel® Xeon® processor X7560 (8 core, 2.26GHz) series-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 3.3GHz 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. 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), 2 hard drives, 1 power supply, using Redhat EL 5.3 x86_64 operating system. New platform (measured score of 705): Intel internal reference server with four Intel® Xeon® Processor X7560 (24M Cache, 2.26 GHz, 6.40 GT/s Intel® QPI, Intel Hyper-Threading Technology, Intel Turbo Boost Technology), 256 GB memory (64x4 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.

¹² Based on Intel internal measurements.

¹³ Source: IDC's Server Workloads 2008, June 2008.

¹⁴ HP DL580 Intel® Xeon® processor X7460 2.66 GHz 4P/24C, 32 GB memory, SAP®-SD 2 Tier 5155 SDs at system price \$26,233 compared to SUN UltraSPARC®T2+ T5240, 128 GB memory, SAP®-SD 2 Tier 4170 SDs at system price \$64,795, compared to SUN UltraSPARC®T2+ T5440, 128 GB memory, SAP®-SD 2 Tier 7520 SDs at system price \$129,995.

¹⁵ Based on performance tests conducted by Principled Technologies and commissioned by Intel Corporation. Performance gain reflects normalized test results across three benchmarks: WebBench®, Microsoft Exchange Server 2003 Load Simulator* (LoadSim) and SysBench*. Prices reflect information for test systems as of August 12, 2008. For test and configuration details, see the Principled Technologies Test Report: Performance of four Intel®- and AMD®-based SMB servers using WebBench, LoadSim, and Sysbench, August 2008. www.principledtechnologies.com/Clients/Reports/Intel/SMB_Multi0808.pdf.

¹⁶ Up to 512 CPUs are supported by the Intel® Xeon® processor 9100 sequence-based system by select system vendors.

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