

Product Brief

Quad-Core Intel® Xeon® Processor 5300 Series



Quad-Core Intel® Xeon® Processor 5300 Series

Maximize Energy Efficiency and Performance Density in Two-Processor, Standard High-Volume Servers and Workstations



Another Intel First

With the industry's first quad-core processor for standard high-volume two-processor server platforms, Intel offers IT departments further leaps in performance and performance/watt, building on proven industry leadership by breaking the current performance records held by the Dual-Core Intel® Xeon® processor 5100¹ series.





A More Efficient Data Center

Two-processor platforms based on the Quad-Core Intel® Xeon® processor 5300¹ series and the Intel® Core™ microarchitecture help companies maximize data center performance and density, while reducing cooling challenges. Platforms based on Intel's new quad-core technology make it easier to deliver more business services in existing facilities, or condense applications for more efficient operations at lower total cost of ownership (TCO).

Two-processor platforms based on the Quad-Core Intel Xeon processor 5300 series deliver 8-thread, 32- and 64-bit processing capabilities with 8 MB of L2 cache per processor,² providing more computing for threaded applications in a variety of deployments. The Quad-Core Intel Xeon processor 5300 series is ideal for the densest of computing environments where best performance and performance per watt are key requirements. Supported by the Intel® 5000 chipset family and Fully Buffered DIMM (FBDIMM) technology, Quad-Core Intel Xeon processor 5300 series-based platforms are expected to deliver breakthrough performance with better power efficiency, delivering up to 1.5 times the performance compared to leading Dual-Core Intel® Xeon® processor 5100 series in the same power envelope and up to 2.4 times the performance compared to the best published results of AMD Opteron® Model 2222.³

Maximize performance, performance/watt, and data center density with the industry's first quad-core technology

With 4 cores, large 8 MB of on-die L2 cache,² and the performance-enhancing and energy-efficient technologies of the Intel Core microarchitecture, the Quad-Core Intel Xeon processor 5300 series helps IT departments maximize performance and density with fewer cooling challenges. Many server applications are well-threaded as a result of years of running in symmetric multi-processing environments. Well-threaded server applications will benefit from more cores, larger cache, and higher throughput and memory capacity of Quad-Core Intel Xeon processor 5300 series-based servers and the Intel Core microarchitecture. Find out more about Intel Core microarchitecture at <http://www.intel.com/technology/architecture-silicon/core/index.htm>.

Platforms based on the Quad-Core Intel Xeon processor 5300 series also support many Intel® advanced server technologies that help companies enhance operations, reduce costs, and improve business continuity:

- Intel® Virtualization Technology⁴ (Intel® VT) provides hardware assistance to virtualization software, increasing its efficiency and enabling new capabilities including 64-bit guest OS support. The new Quad-Core Intel Xeon processor 5300⁵ includes new Intel VT extensions to further optimize and accelerate virtualization on Intel® architecture.
- Intel® I/O Acceleration Technology⁶ (Intel® I/OAT) provides, hardware- and software-supported I/O acceleration that significantly improves data throughput.

Virtualize confidently with more performance headroom, enhanced reliability, and industry-wide commitment and support.

Quad-Core Intel Xeon processor 5300 series delivers the most headroom and performance of any two-processor general-purpose server, so you can confidently consolidate applications onto fewer systems using proven industry-standard virtualization solutions. With the highest performance per watt of our Intel® Xeon® processors, you can virtualize environments onto dense 1U rack and blade form factors with fewer cooling challenges, giving you more performance and services per square foot.

Quad-Core Intel Xeon processor 5300 series integrates virtualization hardware support with Intel Virtualization Technology, which enables more efficient virtualization solutions and greater capabilities including 64-bit guest operating system support. The new Quad-Core Intel Xeon processor 5300 includes new Intel VT extensions around interrupt handling that will further optimize virtualization software efficiency.⁵ A growing number of independent software vendors (ISV) and original equipment manufacturers (OEM) support virtualization on Intel Virtualization Technology-enabled platforms through the Intel and VMware Virtualize ASAP program, the industry's first and only collaborative, global effort to deliver optimized virtualization solutions and practices to IT professionals and companies.

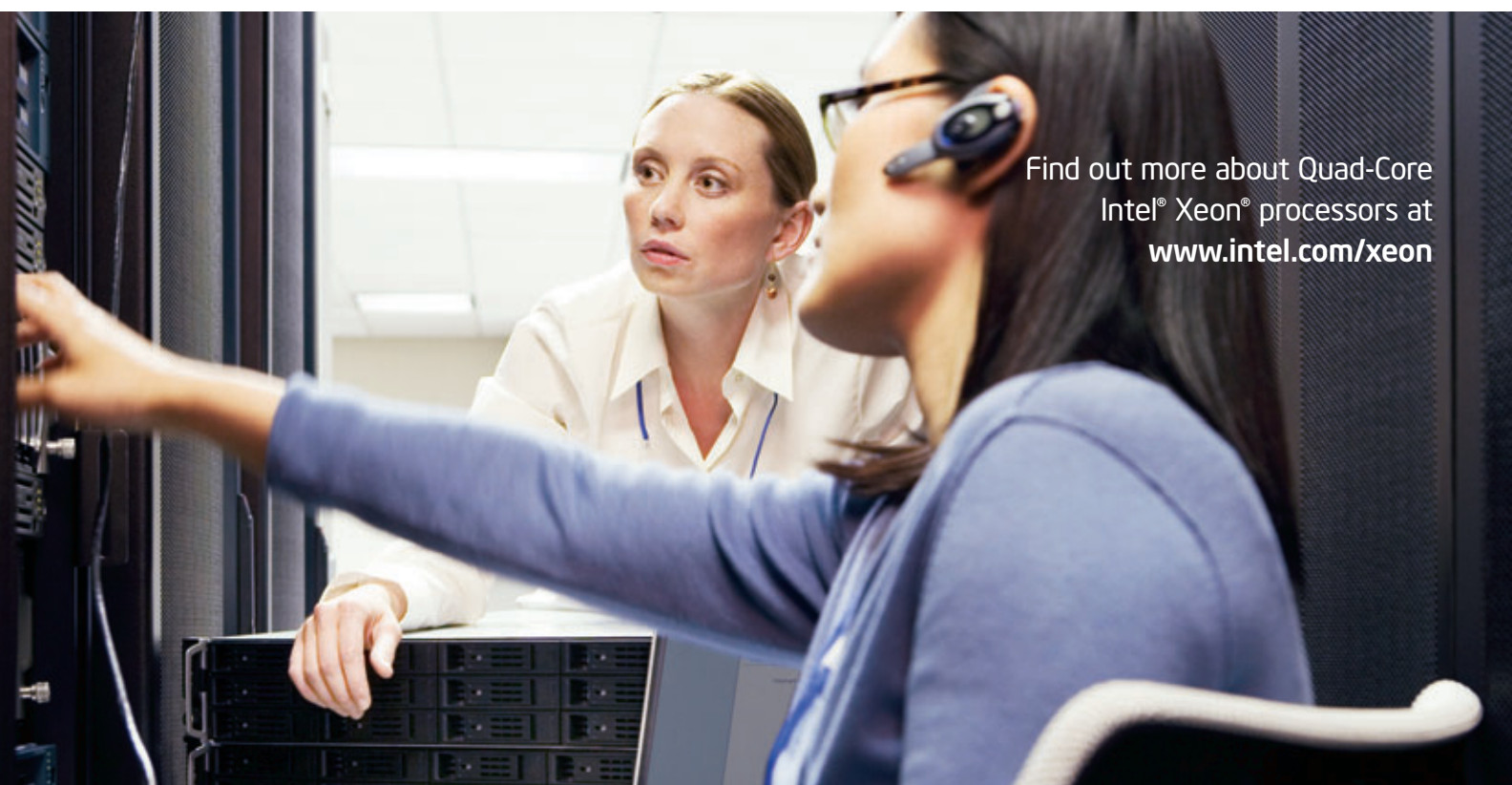
The 64-bit computing of the Quad-Core Intel Xeon processor 5300 series gives you additional application headroom, memory flexibility, and increased security for virtual and dedicated environments. By supporting larger data sets and both 32- and 64-bit applications, Dual-Core and Quad-Core Intel Xeon processor-based servers and workstations allow the smooth migration of your business to 64-bit applications. And, with millions of 64-bit processors already shipped, you know you can depend on Intel's proven track record to help you make a smooth transition to the next level of computing.



Quad-Core Intel® Xeon® Processor 5300 Series Overview

Two-processor servers and workstations based on the Quad-Core Intel Xeon processor 5300 series maximize performance and efficiency, with reliability, versatility, and low ownership costs.

Features	Benefits
Quad-core processing	▪ Maximizes performance and performance/watt for greater performance per square foot for data center infrastructures and highly dense deployments. ▪ Increases performance and threading headroom for multi-threaded applications and heavy multi-tasking scenarios, plus helps boost system utilization through virtualization and application responsiveness.
Intel® Core™ microarchitecture	▪ Better performance on multiple application types and user environments, while reducing cooling challenges, enabling more capable, denser data center deployments.
Large 8 MB of on-die L2 cache ²	▪ Increases efficiency of L2 cache-to-core data transfers, maximizing main memory to processor bandwidth and reducing latency. ▪ Up to 4 MB of L2 cache can be allocated to one core.
1066 and 1333 MHz system bus	▪ Fast, dedicated front-side buses for increased throughput.
Intel® Virtualization Technology ⁴	▪ A processor hardware enhancement that assists virtualization software, enabling more efficient virtualization solutions and greater capabilities including 64-bit guest operating system support. The new Quad-Core Intel® Xeon® processor 5300¹⁵ includes new Intel® VT extensions around interrupt handling that will further optimize virtualization software efficiency.
Intel® 64 architecture ⁷	▪ Flexibility for 64-bit and 32-bit applications and operating systems.
Demand-Based Switching (DBS) with Enhanced Intel SpeedStep® technology	▪ Helps reduce average system power consumption and potentially improves system acoustics.



Find out more about Quad-Core
Intel® Xeon® processors at
www.intel.com/xeon

What is the 5000 Sequence?

At Intel, our processor series numbers help differentiate processor features beyond front-side bus (FSB) speed and brand name. New advancements in our processors – other than bus speed – like number of cores, architecture, cache, power dissipation, and embedded Intel technologies, contribute significantly to performance, power efficiency, and other end-user benefits. Our processor sequences will help developers decide on the best processor for their platform designs, and help end-users understand all the characteristics that contribute to their overall experience.

Intel offers four processor number sequences for server applications

Processor Sequence ¹	Used For
Dual-Core and Quad-Core Intel® Xeon® processor 3000 sequence	One-processor servers for small business, entry, or first server
Dual-Core and Quad-Core Intel® Xeon® processor 5000 sequence	Two-processor general-purpose, standard high-volume servers and workstations based on the Intel Xeon processor
Dual-Core Intel® Xeon® processor 7000 sequence	Greater scalability with 4- to 32-processor enterprise servers based on the Intel Xeon processor
Dual-Core Intel® Itanium® 2 processor 9000 sequence	Maximum performance and scalability for RISC replacement usage with 2- to 512-processor servers

Quad-Core Intel Xeon Processor 5300 Series

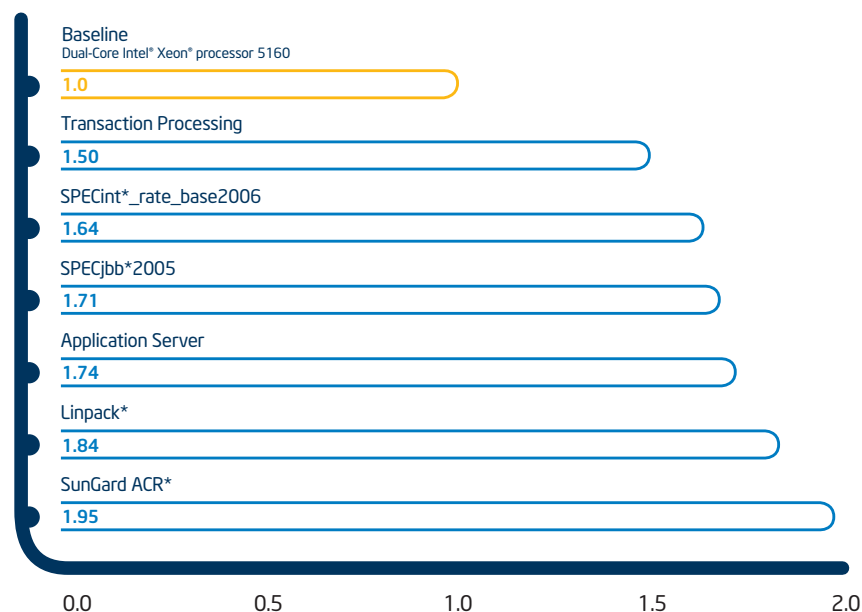
The Quad-Core Intel Xeon processor 5300 series is available in a range of FSB speeds and power ratings to match different computing demands. All processors integrate Intel Virtualization Technology and Intel 64 architecture, and are available in the LGA771 packaging.

Processor Number ¹	Speed	Cache Size	Front-Side Bus	Power	Demand-Based Switching
Quad-Core Intel® Xeon® processor X5365	3.00 GHz	8 MB	1333 MHz	120W	Yes
Quad-Core Intel® Xeon® processor X5355	2.66 GHz	8 MB	1333 MHz	120W	Yes
Quad-Core Intel® Xeon® processor E5345	2.33 GHz	8 MB	1333 MHz	80W	Yes
Quad-Core Intel® Xeon® processor E5335	2.00 GHz	8 MB	1333 MHz	80W	No
Quad-Core Intel® Xeon® processor E5320	1.86 GHz	8 MB	1066 MHz	80W	Yes
Quad-Core Intel® Xeon® processor E5310	1.60 GHz	8 MB	1066 MHz	80W	No
Quad-Core Intel® Xeon® processor L5335	2.00 GHz	8 MB	1333 MHz	50W	No
Quad-Core Intel® Xeon® processor L5320	1.86 GHz	8 MB	1066 MHz	50W	No
Quad-Core Intel® Xeon® processor L5310	1.60 GHz	8 MB	1066 MHz	50W	No

Maximize Performance with Quad-Core Intel® Xeon® Processor 5300 Series

Get performance per watt information on the Quad-Core Intel Xeon processor 5300 series at

www.intel.com/performance/server/xeon/ppw.htm



Server and HPC Performance

Benchmark Description for SunGard ACR*: SunGard ACR is a financial services application. Per SunGard, "SunGard Adaptiv Credit Risk (ACR) provides a total, real-time credit risk solution for counterparty credit exposure aggregation, global limit management, credit risk analytics and collateral management." This workload analyzes a large portfolio of client assets and generates a credit risk evaluation. The more quickly the workload completes, the more quickly the user receives the evaluation, so improving performance can improve productivity. SunGard developed the Adaptiv Credit Risk workload and supplied the computational engine and financial data.

Configuration Details: Data Source: Intel internal measurement August 2007.

Dual-Core Intel® Xeon® Processor 5160-based platform details: Intel Server pre-production platform with two Dual-Core Intel® Xeon® Processor 5160, 3.00 GHz with 4M L2 Cache, 1333 MHz system bus, 8 GB (8x1 GB) 667 MHz FB-DIMM memory, Microsoft Windows Server 2003 Enterprise x64 Edition, SunGard Adaptiv Credit Risk 64-bit version workload.

Quad-Core Intel® Xeon® Processor X5365-based platform details: Intel Server pre-production platform with two Quad-Core Intel® Xeon® Processor X5365, 3.0 GHz with 2x4M L2 Cache, 1333 MHz system bus, 8 GB (8x1 GB) 667 MHz FB-DIMM memory, Microsoft Windows Server 2003 Enterprise x64 Edition, SunGard Adaptiv Credit Risk 64-bit version workload.

Benchmark Description for Linpack*: Linpack is a floating-point benchmark that solves a dense system of linear equations in parallel. The metric produced is Giga-FLOPS or billions of floating-point operations per second. The benchmark is used to determine the world's fastest computers at the website <http://www.top500.org/>.

Configuration Details: Data Source: Intel internal measurement August 2007.

Dual-Core Intel® Xeon® Processor 5160-based platform details: Intel Server pre-production platform with two Dual-Core Intel® Xeon® Processor 5160, 3.0 GHz with 4M L2 Cache, dual 1333 MHz system bus, 8 GB (8x1 GB) 667 MHz FB-DIMM memory, Red Hat Enterprise Linux AS Release 4 (Nahant update 3) Linux Kernel version 2.6.9-34.el5mp on x86_64, 5Kx5K through 30Kx30K matrix sizes used. Intel Linpack.

Quad-Core Intel® Xeon® Processor X5365-based platform details: Intel Server pre-production platform with two Quad-Core Intel® Xeon® Processor X5365, 3.0 GHz with 2x4M L2 Cache, 1333 MHz system bus, 8 GB (8x1 GB) 667 MHz FB-DIMM memory, Red Hat Enterprise Linux Server 5 Linux Kernel version 2.6.18-8.el5 on x86_64, 5Kx5K through 30Kx30K matrix sizes used; Workload Type: Scalar. Intel Linpack.

Benchmark Description for Application Server: This workload measures the performance of a Java Application Server in a multi-tier environment with a Database backend server and a Java Application server.

Configuration Details: Data Source: Intel internal measurement August 2007.

Dual-Core Intel® Xeon® Processor 5160-based platform details: Intel Server pre-production platform with two Dual-Core Intel® Xeon® Processor 5160, 3.00 GHz with 4M L2 Cache, 1333 MHz system bus, 16 GB (8x2GB) 667 MHz FB-DIMM memory, RedHat® Enterprise Linux 5 OS, BEA WebLogic® Server 10.0 Application Server.

Quad-Core Intel® Xeon® Processor X5365-based platform details: Intel Server pre-production platform with two Quad-Core Intel® Xeon® Processor X5365, 3.0 GHz with 2x4M L2 Cache, 1333 MHz system bus, 16 GB (8x2GB) 667 MHz FB-DIMM memory, RedHat® Enterprise Linux 5 OS, BEA WebLogic® Server 10.0 Application Server.

Benchmark Description for SPECint*_rate_base2006: SPECint*_rate_base2006 is a compute-intensive benchmark that measures the integer throughput performance of a computer system carrying out a number of parallel tasks.

Configuration Details: Data Source: Intel internal measurement August 2007.

continued on page 8

Flexibility and Stability with Intel® 5000 Series Chipsets

The following chipsets for the Dual-Core and Quad-Core Intel® Xeon® processor 5000 sequence-based two-processor platforms enable highly balanced systems, with up to 21 GB/s throughput from processor to memory and I/O, matching the improved processor performance and advanced FBDIMM memory technology. These chipsets incorporate dual independent, dedicated FSBs, FBDIMM support for up to 64 GB of memory capacity with advanced reliability and data availability features, and up to 16 lanes (x16) of PCI Express*.

Server chipsets

Two chipset versions for the Quad-Core Intel Xeon processor 5300 series enable server configuration flexibility for unique business needs and market segments where maximum performance and performance/watt are key requirements.

- **Intel® 5000P chipset.** Designed for performance and volume server platforms, this chipset supports 1066 and 1333 MHz system bus speeds, three PCI Express x8 links (each configurable as two x4 links), FBDIMM 533 and 667 technology, point-to-point connection for Intel® 6321 ESB I/O Controller Hub at 2 GB/s, and Intel® 6700PXH 64-bit PCI hub.
- **Intel® 5000V chipset.** For value platforms, this chipset supports 1066 and 1333 MHz system bus speeds, one PCI Express x8 link (configurable as two x4 links), FBDIMM 533 and 667 technology, point-to-point connection for Intel 6321 ESB I/O Controller Hub at 2 GB/s, and Intel 6700PXH 64-bit PCI hub.

Workstation chipset

Two-processor workstations based on the Quad-Core Intel Xeon processor 5300 series are ideal for highly threaded applications that scale with the additional processing cores as well as user workflows with multiple applications being used simultaneously. Quad-core technology-based workstations are ideal for demanding applications in computer aided engineering (CAE), electronic design automation (EDA), digital media, financial analysis, oil and gas exploration, and software engineering.

- **Intel® 5000X chipset.** For performance and volume workstation platforms, this chipset supports 1066 and 1333 MHz system bus speeds, one PCI Express x8 link (configurable as two x4 links) and one configurable x16 link for graphics support, FBDIMM 533 and 667 technology, point-to-point connection for Intel 6321 ESB I/O Controller Hub at 2 GB/s, and Intel 6700PXH 64-bit PCI hub.

These platform configurations provide flexibility and headroom for future growth in multiple deployments:

- High-end workstations
- Enterprise infrastructures
- Front-end servers
- High-performance computing (HPC)
- Small and medium business data centers

Quad-Core Intel Xeon processor 5300 series enables companies, designers, manufacturers, and resellers to deploy right-sized solutions for today's environments. Genuine Intel® architecture and new Intel 5000 series chipsets give you reliability you can count on, while a single platform design supporting dual-core and quad-core processors help ensure investment protection and stability in your IT environment over the long term.

continued from page 6

Dual-Core Intel® Xeon® Processor 5160-based platform details: SuperMicro X7DB8+ Server platform with two Dual-Core Intel® Xeon® Processor 5160, 3.00 GHz with 4M L2 Cache, 1333 MHz system bus, 8 GB (8x1 GB) 667 MHz FB-DIMM memory, 64-Bit SUSE LINUX Enterprise Server 10, Kernel. SPEC binaries built with Intel C++ Compiler for Linux32 version 10.0 Build 20070426 Package ID: L_cc_p_10.0.023. Referenced as published at 60. For more information see <http://www.spec.org/cpu2006/results/res2007q2/cpu2006-20070528-01173.html>.

Quad-Core Intel® Xeon® Processor X5365-based platform details: Fujitsu Siemens PRIMERGY® RX300 S3 Server platform with two Quad-Core Intel® Xeon® Processor X5365, 3.0 GHz with 2x4M L2 Cache, 1333 MHz system bus, 8 GB (8x1 GB) PC2-5300F FB-DIMM memory, 64-Bit SUSE LINUX Enterprise Server 10, Kernel. SPEC binaries built with Intel C++ Compiler for Linux32 version 10.0 Build 20070308 Package ID: L_cc_p_10.0.023. Referenced as published at 98.9. For more information see <http://www.spec.org/cpu2006/results/res2007q3/cpu2006-20070710-01409.html>.

Benchmark Description for SPECjbb*2005: SPEC Java Business Benchmark 2005. Written in Java, this multi-threaded benchmark emulates an order processing environment in a company with multiple warehouses serving multiple customers. Measures average transaction throughput of a heavily loaded server. Performance reported in Business Operations per Second (BOPS).

Configuration Details: Data Source: Data Source: Published/measured results as of August 2007.

Dual-Core Intel® Xeon® Processor 5160-based platform details: Fujitsu Siemens Computers PRIMERGY BX620 S3 platform with two Dual-Core Intel® Xeon® Processor 5160, 3.00 GHz with 4M L2 Cache, 1333 MHz system bus, 8 GB (8x1 GB) 667 MHz FB-DIMM memory, Windows 2003 Enterprise Edition. BEA JRockit® 5.0 P27.2.0 (build P27.2.0-19-82330-1.5.0_10-20070213-1010-windows-x86_64). Referenced as published at 138,388 bops and 138,388 bops/jvm. For more details see <http://www.spec.org/osg/jbb2005/results/res2007q1/jbb2005-20070213-00254.html>.

Quad-Core Intel® Xeon® Processor-based platform details: Fujitsu Siemens Computers PRIMERGY RX200 S3 platform with two Quad-Core Intel® Xeon® Processor X5365, 3.0 GHz with 2x4M L2 Cache, 1333 MHz system bus, 16 GB (8x2 GB) 667 MHz FB-DIMM memory, Windows 2003 Enterprise Edition. BEA JRockit® 5.0 P27.2.0 (build P27.2.0-19-82330-1.5.0_10-20070515-1627-windows-x86_64). Referenced as published at 236,416 bops and 59,104 bops/jvm. For more details see <http://www.spec.org/osg/jbb2005/results/res2007q3/jbb2005-20070717-00324.html>.

Benchmark Description for Transaction Processing: This application evaluates the capacity of a database server in supporting transaction processing. It simulates execution of user transactions against a database in an order-entry environment. Performance measured in transactions per second.

Configuration Details: Data Source: Intel internal measurement August 2007.

Dual-Core Intel® Xeon® Processor 5160-based platform details: Intel Server pre-production platform with two Dual-Core Intel® Xeon® Processor 5160, 3.00 GHz with 4M L2 Cache, 1333 MHz system bus, 64 GB (16x4 GB) 667 MHz FB-DIMM memory, Microsoft Windows 2003 Enterprise Edition.

Quad-Core Intel® Xeon® Processor-based platform details: Intel Server pre-production platform with two Quad-Core Intel® Xeon® Processor X5365, 3.0 GHz with 2x4M L2 Cache, 1333 MHz system bus, 64 GB (16x4 GB) 667 MHz FB-DIMM memory, Microsoft Windows 2003 Enterprise Edition.

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, reference http://www.intel.com/performance/resources/benchmark_limitations.htm or call (U.S.) 1-800-628-8686 or 1-916-356-3104.

All dates and products specified are for planning purposes only and are subject to change without notice.

Relative performance for each benchmark is calculated by taking the actual benchmark result for the first platform tested and assigning it a value of 1.0 as a baseline. Relative performance for the remaining platforms tested was calculated by dividing the actual benchmark result for the baseline platform into each of the specific benchmark results of each of the other platforms and assigning them a relative performance number that correlates with the performance improvements reported.

64-bit Intel® Xeon™ processors with Intel® EM64T requires a computer system with a processor, chipset, BIOS, OS, device drivers and applications enabled for Intel EM64T. Processor will not operate (including 32-bit operation) without an Intel EM64T-enabled BIOS. Performance will vary depending on your hardware and software configurations. Intel EM64T-enabled OS, BIOS, device drivers and applications may not be available. Check with your vendor for more information.

SPECint2006 and SPECfp2006 benchmark tests reflect the performance of the microprocessor, memory architecture and compiler of a computer system on compute-intensive, 32-bit applications. SPEC benchmark tests results for Intel microprocessors are determined using particular, well-configured systems. These results may or may not reflect the relative performance of Intel microprocessor in systems with different hardware or software designs or configurations (including compilers). Buyers should consult other sources of information, including system benchmarks, to evaluate the performance of systems they are considering purchasing.

¹ Intel® processor numbers are not a measure of performance. Processor numbers differentiate features within each processor series, not across different processor sequences. See http://www.intel.com/products/processor_number for details.

² Each pair of cores integrates 4 MB of L2 Intel® Advanced Smart Cache.

³ 1.5 times or 50% performance claim based on performance with measured SPECint*_rate_base2000 benchmark results comparing Quad-Core Intel® Xeon® Processor 5345 and Dual-Core Intel® Xeon® Processor 5160. Published/measured results as of Sept 21, 2006. 2.4 times or 140% over Opteron performance claim based on published results on SPECjbb*2005 benchmark on Quad-Core Intel Xeon processor 5365 and AMD Opteron® Model 2222SE. Results are best published as of August 7, 2007. For more information about server performance, visit www.intel.com/performance/server.

⁴ Intel® Virtualization Technology requires a computer system with a processor, chipset, BIOS, virtual machine monitor (VMM) and applications enabled for virtualization technology. Functionality, performance or other virtualization technology benefits will vary depending on hardware and software configurations. Virtualization technology-enabled BIOS and VMM applications are currently in development.

⁵ G step processor only.

⁶ Intel® I/O Acceleration Technology (Intel® I/OAT) requires an operating system that supports Intel I/OAT.

⁷ 64-bit Intel® Xeon® processors with Intel® 64 architecture requires a computer system with a processor, chipset, BIOS, OS, device drivers and applications enabled for Intel 64 architecture. Processor will not operate (including 32-bit operation) without an Intel 64 architecture-enabled BIOS. Performance will vary depending on your hardware and software configurations. Intel 64 architecture-enabled OS, BIOS, device drivers and applications may not be available. Check with your vendor for more information.

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