Product Brief

Dual-Core Intel® Xeon® Processor 5100 Series

Dual-Core Intel® Xeon® Processor 5100 Series

Driving Energy-efficient Performance in New Dual-Processor Platforms

Intel's newest dual-core processor for dual processor (DP) servers and workstations delivers a new level of energy-efficient performance from the innovative Intel® Core™ microarchitecture, optimized for low-power, dual-core, 64-bit computing.

The 64-bit Dual-Core Intel® Xeon® processor 5100[1] series enables next-generation platforms that can drive energy-efficient infrastructures to optimize data center density, reduce total cost of ownership (TCO), and improve business continuity, redefining what DP servers and workstations should deliver to help businesses be more efficient, dependable, and agile.

The Dual-Core Intel Xeon processor 5100 series is ideal for intense computing environments, 32-bit and 64-bit business-critical applications and high-end workstations. Combined with the Intel® 5000 chipset family and Fully Buffered DIMM (FBDIMM) technology, the new Dual-Core Intel Xeon processor 5100 series-based platforms are expected to deliver up to 3 times the performance and over 3 times the performance/watt of previous-generation single-core Intel® Xeon® processors. The new Dual-Core Intel Xeon processor 5100 series-based platforms are expected to deliver up to 2 times the performance and over 2 times the performance/watt of previous-generation dual-core Intel Xeon processors.[2]

Intel® Core™ microarchitecture delivers industry-leading performance and helps build energy-efficient infrastructures with Dual-Core Intel® Xeon® Processor 5100 series

New Intel Core microarchitecture is an innovative microarchitecture, enabling you to build industry-leading dual-core performance and performance-per-watt server and workstation platforms for the data center. This new microarchitecture integrates a more efficient pipeline and memory architecture design for greater processor throughput with power management technologies that reduce power consumption without impeding performance.

Platforms based on the Dual-Core Intel Xeon processor 5100 series also support many new Intel® advanced server technologies that help companies enhance operations, reduce costs, and improve business continuity:

- Intel® Virtualization Technology[3] (Intel® VT) provides hardware assistance to virtualization software, increasing its efficiency and enabling new capabilities including 64-bit guest OS support. The new Dual-Core Intel Xeon processor 5100[4] includes new Intel VT extensions to further optimize and accelerate virtualization on Intel architecture.
- Intel® I/O Acceleration Technology[5] (Intel® I/OAT), hardware- and software-supported I/O acceleration that improves data throughput.

Confidently deliver more services with hardware-assisted virtualization and enhanced reliability in a 64-bit, dual-core platform

The Dual-Core Intel Xeon processor 5100 series matched with Intel advanced server technologies help IT operations deliver more services in the same power envelope and work more efficiently. Enhanced processor reliability, PCI Express* and FBDIMM memory technology reliability features, and virtualization hardware assistance from Intel Virtualization Technology let you confidently build effective virtual environments. Enhanced virtualization and density optimization allow businesses to concentrate more services in less space and fewer systems.

Proven 64-bit computing of the Dual-Core Intel Xeon processor 5100 series gives you additional application headroom, memory flexibility, and increased security. By supporting larger data sets and both 32- and 64-bit applications, new Dual-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-generation of computing.

For more information on performance, please visit
www.intel.com/performance/server/xeon

For more information on Intel® Core™ microarchitecture, please visit
http://www.intel.com/technology/architecture-silicon/core/index.htm

Intel Xeon Processor 5100 Series Overview

Dual processor servers and workstations based on the Dual-Core Intel Xeon processor 5100 series deliver energy-efficient performance, reliability, versatility, and low ownership costs at a variety of price-points.

Features	Benefits
Dual-core processing	▪ Significant performance headroom, especially for multi-threaded applications, helps boost system utilization through virtualization and application responsiveness.
Intel® Core™ microarchitecture	▪ Better performance on multiple application types and user environments at a substantially reduce power envelope.
Majority of SKUs at 65W	▪ Significantly lower power (compared to previous generation) helps improve data center density and power/thermal operating costs.
Ultra-dense, ultra low-power SKUs at 40W	▪ Low-voltage SKU available at reduced power envelopes will deliver even higher performance per watt – helps reduce power/thermal operating costs and improve data center density.
4 MB shared L2 cache	▪ Increases efficiency of L2 cache-to-processor data transfers, maximizing main memory to processor bandwidth and reducing latency. ▪ Entire L2 cache can be allocated to one core.
1066 and 1333 MHz system bus	▪ Faster system bus speeds than previous generations for increased throughput.
Intel® Virtualization Technology[3]	▪ 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 Dual-Core Intel® Xeon® processor 5100[1,4] includes new Intel® VT extensions around interrupt handling that will further optimize virtualization software efficiency.
Intel® 64 architecture[5]	▪ 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.

What is the 5000 Sequence?

At Intel, our processor series numbers help differentiate processor features beyond front-side bus speed and brand name. New advancements in our processors – other than bus speed – like 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

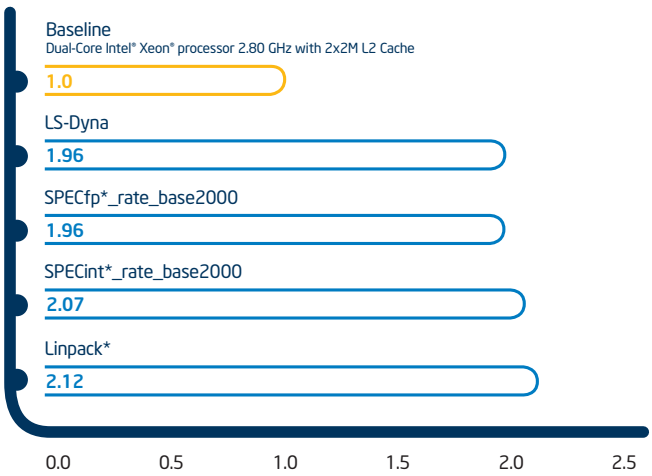
Processor Sequence[1]	Used For
Dual-Core and Quad-Core Intel® Xeon® processor 3000 sequence	Small business, entry, or first server
Dual-Core and Quad-Core Intel® Xeon® processor 5000 sequence	Volume DP servers/workstations based on the Intel Xeon processor
Dual-Core Intel® Xeon® processor 7000 sequence	Greater scalability than DP platforms with MP enterprise servers based on the Intel Xeon processor MP
Intel® Itanium® 2 processor 9000 sequence	Maximum performance and scalability for RISC replacement usage

Dual-Core Intel Xeon Processor 5100 Series

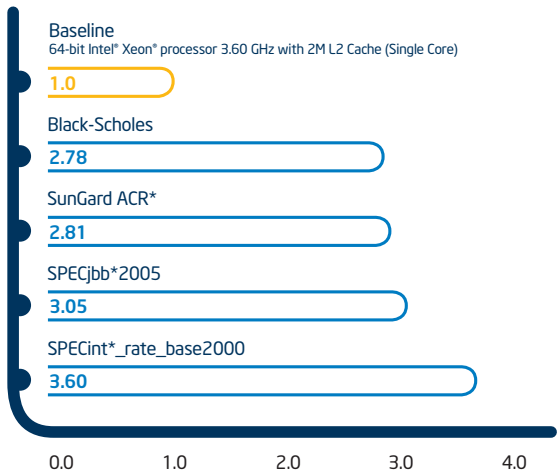
Processor Number[1]	Speed	Cache Size	Front-Side Bus	Total Dissipated Power	Virtualization Technology[3]	Intel® 64 Architecture[6]	Demand-Based Switching	Package
Dual-Core Intel® Xeon® processor 5160	3.00 GHz	4M	1333 MHz	65W	Yes	Yes	Yes	LGA 771
Dual-Core Intel® Xeon® processor 5150	2.66 GHz	4M	1333 MHz	65W	Yes	Yes	Yes	LGA 771
Dual-Core Intel® Xeon® processor LV 5148	2.33 GHz	4M	1333 MHz	40W	Yes	Yes	Yes	LGA 771
Dual-Core Intel® Xeon® processor 5140	2.33 GHz	4M	1333 MHz	65W	Yes	Yes	Yes	LGA 771
Dual-Core Intel® Xeon® processor 5130†	2.00 GHz	4M	1333 MHz	65W	Yes	Yes	No	LGA 771
Dual-Core Intel® Xeon® processor 5120	1.86 GHz	4M	1066 MHz	65W	Yes	Yes	No	LGA 771
Dual-Core Intel® Xeon® processor 5110	1.60 GHz	4M	1066 MHz	65W	Yes	Yes	No	LGA 771

†Available in boxed version only

Superior Performance and Performance Per Watt with New Dual-Core Intel® Xeon® Processor 5100 Series



Server and HPC Performance



Performance Per Watt Comparison

Benchmarks for Server and HPC Performance

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: Published/Measured results as of June 2007.

Dual-Core Intel® Xeon® Processor 2.80 GHz-based platform details: Intel preproduction software development platform with two Dual-Core Intel® Xeon® processors 2.80 GHz with 2x2 MB L2 Cache and 800 MHz system bus and 8 GB (8x1024 MB) DDR2-400 memory; Red Hat Enterprise Linux* 3, Update 3, Intel® EM64T, Intel Linpack 2.1.2.

Dual-Core Intel® Xeon® Processor 5160-based platform details: Intel preproduction customer reference board with two Dual-Core Intel® Xeon® Processor 5160, 3.00 GHz with 4 MB L2 Cache, dual 1333 MHz system bus, 8 GB (8x1 GB) 667 MHz FBDIMM memory; Red Hat Enterprise Linux* 4, Update 2, Intel® EM64T, Intel Linpack 3.0.1.

Benchmark Description for SPECint*_rate_base2000: SPECint*_rate_base2000 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 – Published results as of June 2006.

Dual-Core Intel® Xeon® Processor 2.80 GHz-based platform details: IBM eServer xSeries* 346 Server platform with two Dual-Core Intel® Xeon® processors 2.80 GHz with 2x2 MB L2 Cache and 800 MHz system bus 8 GB (8x1 GB) DDR2 memory, Microsoft Windows Server*2003, standard Edition. SPEC binaries built with Intel C/C++ Compiler 9.0. Referenced as published at 59.5. For more information see http://www.spec.org/cpu2000/results/res2005q4/cpu2000-20051006-04904.html.

Dual-Core Intel® Xeon® Processor 5160-based platform details: Dell PowerEdge* 2950 Server platform with two Dual-Core Intel® Xeon® Processor 5160, 3.00 GHz with 4M L2 Cache, 1333 MHz system bus, 8 GB (8x1GB) DDR2 FB-DIMM memory, Microsoft Windows Server 2003. SPEC binaries built with Intel® C/C++ Compiler 9.1. Referenced as published at 123. For more information see http://www.spec.org/osg/cpu2000/results/res2006q2/cpu2000-20060501-05940.html.

Benchmark Description for SPECfp*_rate_base2000: SPECfp*_rate_base2000 is a compute-intensive benchmark that measures the floating point throughput performance of a computer system carrying out a number of parallel tasks.

Configuration Details for SPECfp*_rate_base2000: Data Source–Published results as of June 2006.

Dual-Core Intel® Xeon® Processor 2.80 GHz-based platform details: FSC Primergy RX300* S2 Server platform with two Dual-Core Intel® Xeon® processors 2.80 GHz with 2x2 MB L2 Cache 800 MHz system bus, 4 GB DDR2, 64-Bit Red Hat Enterprise Linux* AS release 4 update 1 Kernel 2.6.9-11.ELsmp on an x86_64 Intel C++ and Fortran Compiler 9.0 for Intel® EM64T Build 20050914 (for 64-bit applications). Referenced as published at 42.5. For more information see http://www.spec.org/cpu2000/results/res2005q4/cpu2000-20051004-04899.html.

Dual-Core Intel® Xeon® Processor 5160-based platform details: Dell PowerEdge* 2950 Server platform with two Dual-Core Intel® Xeon® Processor 5160, 3.00 GHz with 4 MB L2 Cache, 1333 MHz system bus, 8 GB (8x1GB) FB-DIMM memory, Red Hat Enterprise Linux* 4 Advanced Server Update 3 Intel® EM64T. SPEC binaries built with Intel C/C++ Compiler 9.0. Referenced as published at 83.4. For more information see http://www.spec.org/osg/cpu2000/results/res2006q3/cpu2000-20060626-06269.html.

Benchmark Description for LS-DYNA: LS-DYNA is a commercial engineering application used in finite element analysis such as a car collision. The workload used in these comparisons is called 3 Vehicle Collision.

Configuration Details: Data Source – Published/Measured results as of June 2006.

Dual-Core Intel® Xeon® Processor 2.80 GHz-based platform details: Intel preproduction software development platform with two Dual-Core Intel® Xeon® processors 2.80 GHz with 2x2 MB L2 Cache and 800 MHz system bus and 8 GB (8x1024 MB) DDR2-400 memory; Red Hat Enterprise Linux* 3, Update 3, Intel® EM64T, LS-DYNA mpp970.5434a*.

Dual-Core Intel® Xeon® Processor 5160-based platform details: Intel® preproduction customer reference board with two Dual-Core Intel® Xeon® Processor 5160, 3.00 GHz with 4M L2 Cache, dual 1333 MHz system bus, 8GB (8x1GB) 667MHz FB-DIMM memory; Red Hat Enterprise Linux 4, Update 2, EM64T, LS-DYNA mpp970.5434a. Result at http://www.topcrunch.org/benchmark_details.sfe?query=2&id=562.

Benchmarks for Performance Per Watt Comparison

Benchmark Description for Black-Scholes: The Black-Scholes kernel workload is based on a financial modeling algorithm for the pricing of European-style options. The benchmark consists of a kernel that implements a derivative of the Black and Scholes technique.

Configuration Details: Data Source–Results published by Principled Technologies at http://www.principledtechnologies.com/clients/reports/Intel/WBlack_Scholes_0506.pdf as of May 23, 2006.

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Platform Solutions

The following chipsets are optimized for the Dual-Core Intel Xeon Processor 5100 series. Compared to previous-generation chipsets, they deliver higher throughput with dual independent buses, faster memory and I/O bandwidth, and FBDIMM support. In addition, support for Intel® Active Server Manager[7] and Intel I/OAT help improve overall system performance and manageability.

DP server-supported chipsets

Two chipset versions enable server configuration flexibility for unique business needs and market segments.

- **Intel® 5000P chipset:** For performance and volume server platforms, this chipset supports dual independent buses for dual-processor applications, 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 dual independent buses for dual-processor applications, 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.

DP workstation-supported chipset

DP workstations based on the Dual-Core Intel Xeon processor 5100 series are ideal for today's demanding applications in computer aided engineering (CAE), electronic design automation (EDA), digital media, financial analysis, oil and gas exploration, and software engineering. With its large 4M cache size, Dual-Core Intel Xeon processor 5100 series-based workstations provide superior performance for multi-threaded applications.

- **Intel® 5000X chipset:** For performance and volume workstation platforms, this chipset supports dual independent buses for dual-processor applications, 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 high-end workstations and front-end, small/medium business, enterprise, and high-performance computing (HPC) server deployments, allowing right-sized solutions for today's environments while helping to protect investment in design, integration, and support.

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

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Intel® Xeon® Processor 3.60 GHz-based platform details: Intel preproduction Server platform with two 64-bit Intel® Xeon® processors 3.60 GHz with 2 MB L2 Cache and 800 MHz system bus and 8 GB (8x1024 MB) DDR2-400 memory, Microsoft Windows Server* x32 Enterprise Edition. Black-Scholes 64-bit version kernel workload.

Dual-Core Intel® Xeon® Processor 5160-based platform details: Intel preproduction Server platform with two Dual-Core Intel Xeon Processor 5160, 3.00 GHz with 4 MB L2 Cache, dual 1333 MHz system bus, 8 GB (8x1 GB) 667 MHz FBDIMM memory; Microsoft Windows Server* x32 Enterprise Edition. Black-Scholes 64-bit version kernel workload.

Benchmark Description for SunGard: SunGard ACR* is a financial services application. This workload analyzes a large portfolio of client assets and generates a credit risk evaluation.

Configuration Details: Data Source: Results published by Principled Technologies at http://www.principledtechnologies.com/clients/reports/Intel/WSunGard_ACR_0506.pdf as of May 23, 2006.

Intel® Xeon® Processor 3.60 GHz-based platform details: Intel preproduction Server platform with two 64-bit Intel® Xeon® processors 3.60 GHz with 2 MB L2 Cache and 800 MHz system bus and 8 GB (8x1024 MB) DDR2-400 memory, Microsoft Windows Server* x32 Enterprise Edition. SunGard Adaptiv* Credit Risk 64-bit version workload.

Dual-Core Intel® Xeon® Processor 5160-based platform details: Intel preproduction Server platform with two Dual-Core Intel Xeon Processor 5160, 3.00 GHz with 4 MB L2 Cache, dual 1333 MHz system bus, 8 GB (8x1 GB) 667 MHz FBDIMM memory; Microsoft Windows Server* x32 Enterprise Edition. SunGard Adaptiv* Credit Risk 64-bit version workload.

Configuration Details for SPECjbb2005*: Data Source–Results published by Principled Technologies at http://www.principledtechnologies.com/clients/reports/Intel/WSPECjbb2005_0506.pdf as of May 23, 2006.

Intel® Xeon® Processor 3.60 GHz-based platform details: Intel preproduction Server platform with two 64-bit Intel® Xeon® processors 3.60 GHz with 2 MB L2 Cache and 800 MHz system bus and 8 GB (8x1024 MB) DDR2-400 memory, Microsoft Windows Server* x32 Enterprise Edition. BEA JRockit* 5.0 P26.0.0.

Dual-Core Intel® Xeon® Processor 5160-based platform details: Intel preproduction Server platform with two Dual-Core Intel Xeon Processor 5160, 3.00 GHz with 4 MB L2 Cache, dual 1333 MHz system bus, 8 GB (8x1 GB) 667 MHz FBDIMM memory; Microsoft Windows Server* x32 Enterprise Edition. BEA JRockit* 5.0 P26.0.0.

Configuration Details for SPECint_rate_base2000: Data Source–Results published by Principled Technologies at http://www.principledtechnologies.com/clients/reports/Intel/WSPECint_rate_0506.pdf as of May 23, 2006.

Intel® Xeon® Processor 3.60 GHz-based platform details: Intel preproduction Server platform with two 64-bit Intel® Xeon® processors 3.60 GHz with 2MB L2 Cache and 800 MHz system bus and 8GB (8x1024 MB) DDR2-400 memory, Microsoft Windows Server* x32 Enterprise Edition. SPEC binaries build with Intel compiler 9.0.

Dual-Core Intel® Xeon® Processor 5160-based platform details: Intel preproduction Server platform with two Dual-Core Intel Xeon Processor 5160, 3.00 GHz with 4 MB L2 Cache, dual 1333 MHz system bus, 8 GB (8x1 GB) 667 MHz FBDIMM memory; Microsoft Windows Server* x32 Enterprise Edition. SPEC binaries build with Intel compiler 9.0.

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.

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.

SPECint2000/2006 and SPECfp2000/2006 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] Source: Intel Internal Measurement, May 2006. For more information about server or workstation performance, visit www.intel.com/performance/server or www.intel.com/performance/workstation.

[3] 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.

[4] G step processor only.

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

[6] 64-bit computing on Intel architecture requires a computer system with a processor, chipset, BIOS, operating system, device drivers and applications enabled for Intel® 64 architecture. Performance will vary depending on your hardware and software configurations. Consult with your system vendor for more information.

[7] Intel® Active Server Manager requires the computer to have additional hardware and software, connection with a power source, and a network connection. Check with your PC manufacturer for details.

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