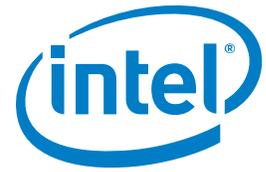


Technology Brief

Intelligent Performance



Performance that Adapts to Your Business Environment

Intel® Xeon® Processor 5500 Series Intelligently Scales Performance and Energy Use



Application performance is critical for day-to-day business operations, as well as creating new products and services, increasing competitiveness, and reaching new customers. For the past decade, IT has rapidly added low-cost hardware to accommodate business growth, and many data centers are now stretched to capacity in terms of power, cooling, and floor space. By refreshing data center infrastructure with higher performance, more adaptive, and power-conscious servers, you can deliver additional capability and scalability within the same energy and space footprint, staying ahead of increasing business demands.

Servers based on the Intel® Xeon® processor 5500^Δ series provide a foundation for IT management to refresh existing or design new data centers, achieving greater performance and energy efficiency. The Intel Xeon processor 5500 series, with the new Intel® Microarchitecture, codenamed Nehalem, brings intelligent performance to the world's most trusted server architecture. Servers based on the Intel Xeon processor 5500 series will automatically and intelligently balance performance and power consumption, enabling servers to adapt in real time to application workloads and user demands, delivering optimal performance.



Innovative Design Yields Intelligent Performance

The Intel Xeon processor 5500 series brings together a number of innovative technologies to deliver intelligent performance. Three new features are listed below:

- Intel® Turbo Boost Technology increases performance by increasing processor frequency, enabling faster speeds as conditions allow.
- Intel® Hyper-Threading Technology¹ (Intel® HT) lets today's well-threaded applications make the most of every clock cycle.
- Intel® QuickPath Technology and an integrated memory controller speed traffic between processors and I/O controllers for bandwidth-intensive applications, to deliver as much as 25.6 GB/s, up to 3.5x the bandwidth of previous-generation processors.¹

Intel® Turbo Boost Technology

Intel Turbo Boost Technology delivers performance when and where it's needed by adapting processor frequency to application needs, scaling performance to meet peak performance demands.² Intel Turbo Boost Technology allows specific cores within each processor to operate above rated frequency within a set range, increasing frequency when needed to increase execution speed (Figure 1).

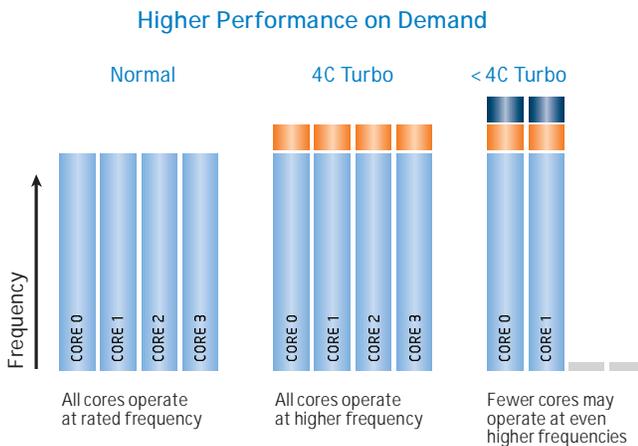


Figure 1. Intel® Turbo Boost Technology increases performance by increasing processor frequency and enabling faster speeds when conditions allow.

Intel® Hyper-Threading Technology

Many types of applications lend themselves to parallel, multi-threaded execution. Intel Hyper-Threading Technology enables simultaneous multi-threading within each processor core, up to two threads per core or eight threads on a quad-core processor (Figure 2). Hyper threading reduces computational latency, making optimal use of every clock cycle. For example, while one thread is waiting for a result or event, another thread is executing in that core, to minimize down cycles.

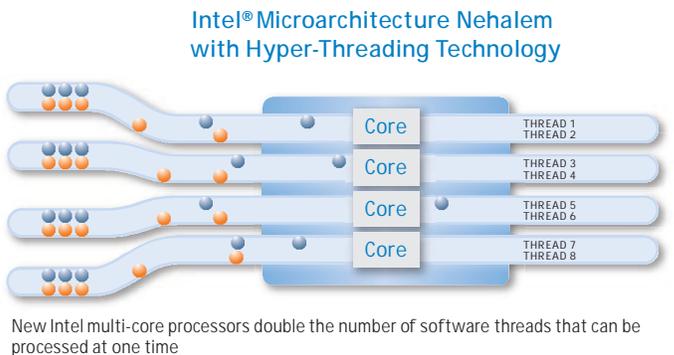
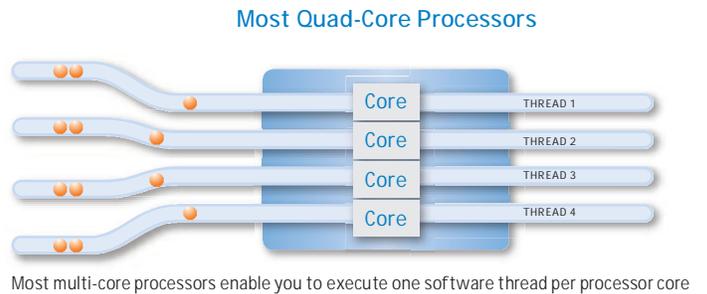


Figure 2. Intel® Microarchitecture Nehalem enables simultaneous multi-threading within each processor core.

Intel® QuickPath Technology

To achieve top application performance, you need optimal processing speed plus enough data bandwidth to keep each CPU running at capacity. To deliver top performance for bandwidth-intensive applications, the Intel Xeon processor 5500 series features new Intel QuickPath Technology. This new scalable, shared memory architecture delivers memory bandwidth leadership and up to 3.5x the bandwidth³ of previous-generation processors by connecting processors and other components with a new high-speed interconnect. Intel QuickPath Technology is designed to unleash the full performance of the Intel® Microarchitecture Nehalem and future generations of Intel multi-core processors.

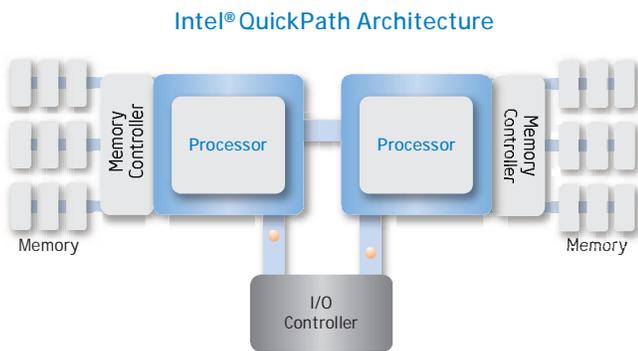


Figure 3. Intel® QuickPath Architecture with dedicated per-processor memory and point-to-point connectivity.

Intel QuickPath Technology is a platform architecture that provides high-speed, point-to-point connections between microprocessors and external memory, and between microprocessors and the I/O hub. Each processor has its own dedicated memory that it accesses directly through an Integrated Memory Controller. In cases where a processor needs to access the dedicated memory of another processor, it can do so through a coherent high-speed, low-latency Intel® QuickPath Interconnect that links all the processors and their memory.

The benefits of Intel QuickPath Architecture are enhanced with the use of the Intel Smart Cache Technology. This technology now incorporates a large inclusive shared L3 cache which boosts performance while reducing traffic to the processor cores. This eliminates unnecessary snoops, reducing latency and speeds processing.

Harnessing Intelligent Performance

Across all ranges of operating environments and industries, both large and small, IT is looking to better align computing resources with the needs of users and business. The intelligent performance of the Intel Xeon processor 5500 series enables this alignment, giving you fine-grained control to put resources where they will have the most business impact:

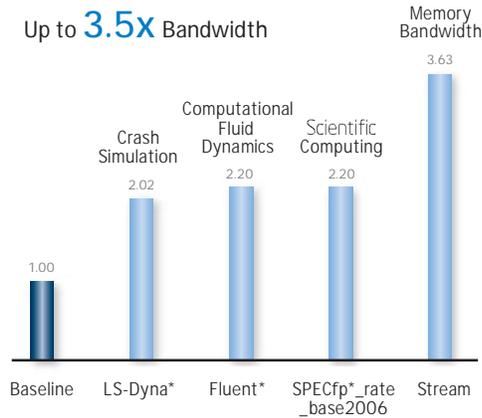
- Intel Turbo Boost Technology and Intel® Intelligent Power Technology enable policy-based control that allows processors to operate at optimal frequency and power. The operating system can make this determination automatically, or administrators can manually designate in BIOS which applications require high-frequency processing and which should be executed at lower frequencies to conserve power.⁴
- Many server and workstation applications lend themselves to parallel, multi-threaded execution. With Intel Hyper-Threading Technology, those environments will benefit from increased software throughput to deliver maximum performance for system power and data center footprint. For those environments where single-threaded applications exist, IT developers can use Intel and third-party programming tools to create multi-threaded applications that take full advantage of Intel Hyper-Threading Technology. (For more information on Intel developer tools, visit www.intel.com/software.)
- Intel QuickPath Technology, in concert with other technology enhancements like Solid State Disks (SSD) and 10GB Ethernet networking available on these new servers, work to deliver outstanding performance and throughput for individual applications. Balanced with an increased memory footprint for two-socket servers, they provide unprecedented capability to run multiple applications in a consolidated/virtualized environment.

Unmatched Business Capabilities

The Intel Xeon processor 5500 series represents a tremendous step forward in server capabilities, delivering up to 2.25x the performance for enterprise computing⁵ and 3.5x the bandwidth for technical computing.⁶ The Intel Microarchitecture Nehalem delivers exceptional gains across the board for business and HPC applications.

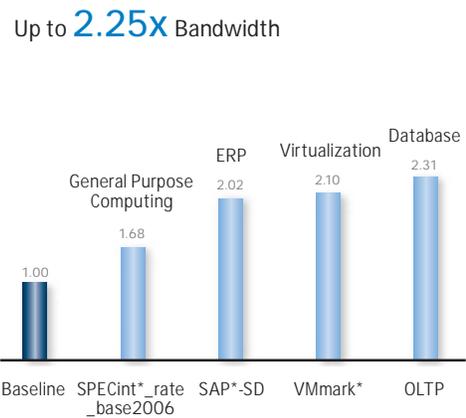
Technical Compute Servers

High Performance Computing



Mainstream Enterprise Servers

General Purpose



Baseline – Intel® Xeon® processor 5400 series

Figure 4. The Intel® Xeon® processor 5500 series delivers exceptional performance gains across a range of applications.

Configuration details: OLTP benchmark (Feb 2009).

Baseline platform: Intel preproduction server platform with two Quad-Core Intel® Xeon™ processor X5460, 3.16 GHz, 2x6MB L2 cache, 1333MHz system bus, 64GB memory (16x4GB FB DDR2-667), Microsoft Windows Server 2008 Enterprise x64 Edition OS. Performance measured in transactions per second.

New platform: Intel preproduction server platform with two Quad-Core Intel® Xeon™ processor X5570, 2.93 GHz, 8MB L3 cache, 6.4QPI, 72GB memory (18x4GB DDR3-800), Microsoft Windows Server 2008 Enterprise x64 Edition OS. Performance measured in transactions per second.

Configuration details: SPECint*_rate_base2006 benchmark (Feb 2009).

Baseline platform: Intel preproduction server platform with two Quad-Core Intel® Xeon™ processor X5470, 3.16 GHz, 2x6MB L2 cache, 1333MHz system bus, 16GB memory (8x2GB FB DDR2-800), SUSE Linux Enterprise Server 10 SP2 OS. Intel C++ Compiler for Linux32 and Linux64 version 11.0.

New platform: Intel preproduction server platform with two Quad-Core Intel® Xeon™ processor X5570, 2.93 GHz, 8MB L3 cache, 6.4QPI, 24GB memory (6x4GB DDR3-1333), SUSE Linux Enterprise Server 10 SP2 OS. Intel C++ Compiler for Linux32 and Linux64 version 11.0.

Configuration details: VMmark benchmark (Feb 2009).

Baseline platform: HP ProLiant ML370 G5 server platform with two Quad-Core Intel Xeon processors X5470 3.33GHz, 2x6MB L2 cache, 1333MHz FSB, 48GB memory, VMware ESX V3.5.0 Update 3 Published at 9.15@ 7 tiles.

New Platform: Intel preproduction server platform with two Quad-Core Intel® Xeon™ processor X5570, 2.93 GHz, 8MB L3 cache, 6.4QPI, 72GB memory (18x4GB DDR3-800), VMware ESX Build 140815. Performance measured at 19.51@ 13 tiles.

Configuration details: SAP-SD 2-Tier benchmark (Feb 2009).

Baseline platform: HP ProLiant BL460C server platform with two Quad-Core Intel Xeon processors X5470 3.33GHz, 12MB L2 cache, 1333MHz FSB, 32GB memory, Microsoft Windows Server 2003 Enterprise Edition, Microsoft SQL Server 2005, SAP ECC Release 6.0 (2005). Measured at 2518 users.

New platform: IBM System x3650 M2 server platform with two Quad-Core Intel® Xeon™ processor X5570, 2.93 GHz, 8MB L3 cache, 6.4QPI, 48GB memory (12x4GB DDR3-1066), Microsoft Windows Server 2003 Enterprise Edition, IBM DB2 9.5, SAP ECC Release 6.0 (2005). Measured at 5100 users.

VMware Disclaimer: All information in this disclosure regarding future directions and intent are subject to change or withdrawal without notice and should not be relied on in making a purchasing decision of VMware's products. The information in this disclosure is not a legal obligation for VMware to deliver any material, code, or functionality. The release and timing of VMware's products remains at VMware's sole discretion.

Configuration details: Fluent benchmark - Geomean of 6 workloads used for comparison (Feb 2009).

Baseline platform: Intel preproduction server platform with two Quad-Core Intel® Xeon™ processor X5482, 3.20 GHz, 2x6MB L2 cache, 1600MHz system bus, 16GB memory (8x2GB FB DDR2-800), RedHat Linux Enterprise 5.3 OS. Fluent 12.0.13 Beta (Preview release Fluent 12 P7).

New platform: Intel preproduction server platform with two Quad-Core Intel® Xeon™ processor X5570, 2.93 GHz, 8MB L3 cache, 6.4QPI, 24GB memory (12x2GB DDR3-1066), RedHat Linux Enterprise 5.3 OS. Fluent 12.0.13 Beta (Preview release Fluent 12 P7).

Configuration details: LS-Dyna benchmark - Comparison based on 3 Vehicle Collision workload (Feb 2009).

Baseline platform: Intel preproduction server platform with two Quad-Core Intel® Xeon™ processor X5482, 3.20 GHz, 2x6MB L2 cache, 1600MHz system bus, 16GB memory (8x2GB FB DDR2-800), RedHat Linux Enterprise 5.3 OS. LS-Dyna mpp971_s_ifort10.1_IntelMPI.R321 version used.

New platform: Intel preproduction server platform with two Quad-Core Intel® Xeon™ processor X5570, 2.93 GHz, 8MB L3 cache, 6.4QPI, 24GB memory (12x2GB DDR3-1066), RedHat Linux Enterprise 5.3 OS. LS-Dyna mpp971_s_ifort10.1_IntelMPI.R321 version used.

Configuration details: SPECfp*_rate_base2006 benchmark (Feb 2009).

Baseline platform: Intel preproduction server platform with two Quad-Core Intel® Xeon™ processor X5482, 3.20 GHz, 2x6MB L2 cache, 1600MHz system bus, 16GB memory (8x2GB FB DDR2-800), SUSE Linux Enterprise Server 10 SP2 OS. Intel C++ Compiler for Linux32 and Linux64 version 11.0.

New platform: Intel preproduction server platform with two Quad-Core Intel® Xeon™ processor X5570, 2.93 GHz, 8MB L3 cache, 6.4QPI, 24GB memory (6x4GB DDR3-1333), SUSE Linux Enterprise Server 10 SP2 OS. Intel C++ Compiler for Linux32 and Linux64 version 11.0.

Configuration details: Stream-Triad benchmark (Feb 2009).

Baseline platform: Intel preproduction server platform with two Quad-Core Intel® Xeon™ processor E5472, 3.0 GHz, 2x6MB L2 cache, 1600MHz system bus, 16GB memory (8x2GB FB DDR2-800), Red Hat Enterprise Linux Server 5.3. Stream binaries compiled with Intel compiler 11.0.

New platform: Intel preproduction server platform with two Quad-Core Intel® Xeon™ processor X5570, 2.93 GHz, 8MB L3 cache, 6.4QPI, 24GB memory (6x4GB DDR3-1333), Red Hat® Enterprise Linux Server 5.3. Stream binaries compiled with Intel compiler 11.0.

Learn More

The Intel Xeon processor 5500 series takes performance to the next level, monitoring your application behavior to deliver maximum performance and optimize power consumption, while still giving you hands-on control. With more performance per watt and per server, refreshing your IT infrastructure with servers based on this highly efficient architecture can enhance business agility and provide headroom for growth while extending the life of today's data centers.

For more information on the Intel Xeon processor 5500 series, visit www.intel.com/xeon.

For more information about the next-generation of Intel® Microarchitecture, visit www.intel.com/technology/architecture-silicon/next-gen.

⁴ 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 Hyper-Threading Technology requires a computer system with a 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.

¹ Intel internal measurement. (Feb 2009) Stream-Triad benchmark. Red Hat Enterprise Linux Server 5.3. Intel® Xeon® processor E5472, 3.0 GHz, 2x6MB L2 cache, 1600MHz system bus, 16GB memory (8x2GB FB DDR2-800) vs Intel® Xeon® processor X5570, 2.93 GHz, 8MB L3 cache, 6.4QPI, 24GB memory (6x4GB DDR3-1333).

² 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>.

³ Intel internal measurement. (Feb 2009) Stream-Triad benchmark. Red Hat Enterprise Linux Server 5.3. Intel® Xeon® processor E5472, 3.0 GHz, 2x6MB L2 cache, 1600MHz system bus, 16GB memory (8x2GB FB DDR2-800) vs Intel® Xeon® processor X5570, 2.93 GHz, 8MB L3 cache, 6.4QPI, 24GB memory (6x4GB DDR3-1333).

⁴ 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.

⁵ Compared to Xeon 5400 series. Claim supported by multiple performance results including an OLTP database benchmark and a bandwidth intensive scientific computing benchmark (SPECfp_rate_base2006). Intel internal measurement. (Feb 2009).

⁶ Intel internal measurement. (Feb 2009) Stream-Triad benchmark. Red Hat Enterprise Linux Server 5.3. Intel® Xeon® processor E5472, 3.0 GHz, 2x6MB L2 cache, 1600MHz system bus, 16GB memory (8x2GB FB DDR2-800) vs Intel® Xeon® processor X5570, 2.93 GHz, 8MB L3 cache, 6.4QPI, 24GB memory (6x4GB DDR3-1333).

This information is preliminary and subject to change. For more information, please visit www.intel.com/performance.

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