Product Brief

45nm Intel® Xeon® Processors

Embedded Computing

45nm Intel® Xeon® Processors 5400/5200 Series for Embedded Computing Platforms

Boost performance and energy efficiency for full-performance and bladed platforms

Product Overview

These Intel® Xeon® processors, with extended lifecycle support, utilize Intel's Hafnium-based 45nm Hi-k silicon process technology to reduce power consumption, increase switching speed, and significantly increase transistor density over previous 65nm technology to 820 million transistors. The Intel® Xeon® processor E5440Δ delivers a 27% performance gain[1] within the same thermal profile over the previous-generation Intel Xeon processor E5345Δ (see Figure 1), making it an excellent choice for compute-intensive embedded, storage and communications applications.

Lower thermal design power (TDP) and higher Tcase temperature options are ideal for low-power consumption and/or compliance with the AdvancedTCA* form factor and NEBS level-3 thermal specifications. The quad-core 5400 series supports 12 MB on-die L2 cache (2x6 MB) and the dual-core 5200 series supports 6 MB on-die L2 cache. All processors integrate Intel® Virtualization Technology[2] (Intel® VT), Intel® 64 architecture,[3] Intel® VT FlexMigration, and Intel® VT FlexPriority.

These quad- and dual-core processors utilize a common microarchitecture and common socket with the previous-generation Intel Xeon processor 5300 series and 5100 series, providing a simplified path to upgrades.

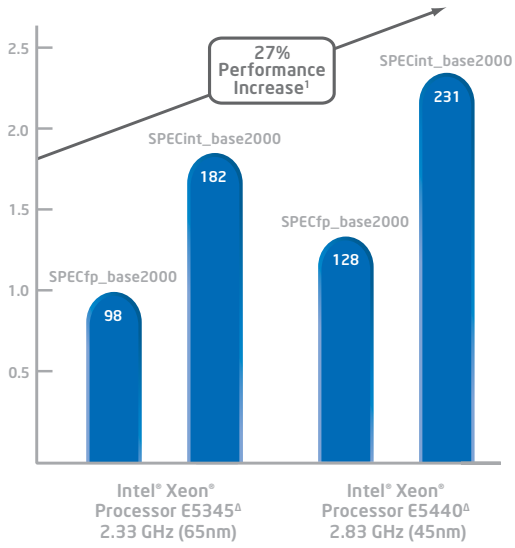

Figure 1: Performance improvements of the 45nm Intel® Xeon® processor in dual-processing configuration (eight cores per system).

Platform Configurations

These 45nm processors are validated with two different chipsets, providing a choice of flexible, dual-processor-capable platforms for a wide range of applications. These include storage area networks, network attached storage, routers, IP-PBX, converged/unified communications platforms, sophisticated content firewalls, unified threat management systems, medical imaging equipment, military signal and image processing, and telecommunications (wireless and wireline) servers.

- **Intel® 5000P chipset-based platforms** are ideal for full performance and memory-intense applications by providing a maximum FB-DIMM memory capacity of 64 GB, 28 lanes of PCI Express*, and accelerated I/O options. This platform offers quick migration for customers with existing Intel 5000P chipset-based designs due to the LGA 771 socket, common with the quad-core 5300 series and dual-core 5100 series, eliminating software tuning and minimizing hardware qualification efforts (see Figure 2).

- **Intel® 5100 Memory Controller Hub (MCH) chipset-based platforms** are ideal for bladed and dense bladed applications requiring less than 200 watts, including AdvancedTCA* and NEBS-compliant solutions. Platform power savings is derived from lower TDP in the MCH (25.7 watts TDP at 1333 MHz front-side bus [FSB] and 23.0 watts TDP at 1066 MHz FSB), the efficient next-generation Intel® I/O Controller Hub 9R at 4.3W TDP, and standard native DDR2 memory technology with a maximum capacity of 48 GB (see Figure 3).

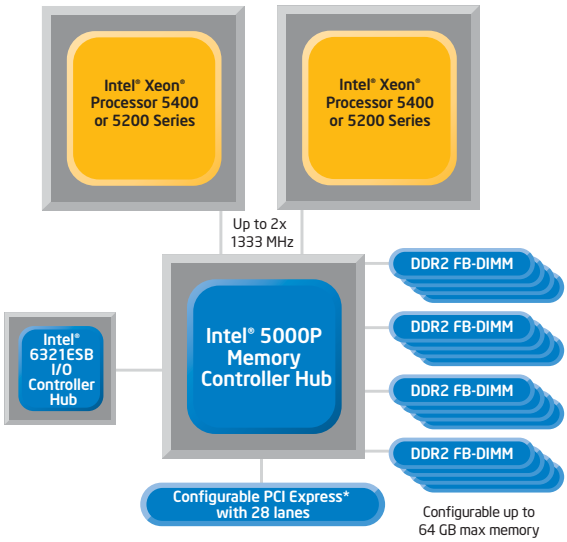

Figure 2: Intel® 5000P chipset-based platforms

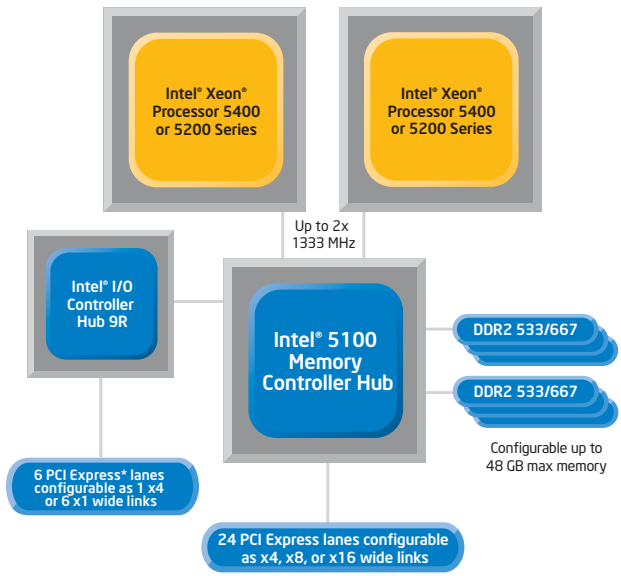

Figure 3: Intel® 5100 Memory Controller Hub chipset-based platforms

Features	Benefits
New 45nm enhanced Intel® Core™ microarchitecture	▪ Boosts performance on multiple applications/user environments and data-demanding workloads, while enabling denser deployments through improved performance-per-watt. ▪ Reduced idle processor power lowers average power consumption.
Multi-core processing	▪ Increases performance and headroom for multi-threaded applications and heavy multi-tasking scenarios. ▪ Helps boost system utilization through virtualization and application responsiveness.
5400 series: 12 MB on-die L2 cache (2x6 MB) 5200 series: 6 MB on-die L2 cache	▪ Increases efficiency of L2 cache-to-core data transfers and maximizes main memory-to-processor bandwidth. ▪ Reduces latency by storing larger data sets closer to the processor, reducing the number of trips to main memory.
Intel® Virtualization Technology[2]	▪ A suite of processor enhancements assists software to deliver more efficient virtualization solutions and greater capabilities, including 64-bit guest OS support. ▪ Intel® VT FlexPriority, a new Intel® VT extension, optimizes virtualization software efficiency by improving interrupt handling.[4] ▪ Intel® VT FlexMigration enables Intel® Xeon® processor 5400 and 5200 series-based systems to be added to the existing virtualization pool with single, 2, or 4+ socket Intel Core microarchitecture-based systems.
Intel® 64 architecture[3]	▪ Flexibility for 64-bit and 32-bit applications and operating systems.
Ultra-dense low-power processor options (L5408 at 40 W TDP)	▪ Improves performance-per-watt. ▪ Reduces power/thermal operating costs and improves density. ▪ Ideal for NEBS Level-3 ambient operating temperature specifications (thermal profile). ▪ Ideal for smaller form factors with thermal constraints (blades), especially solutions that require compliance with AdvancedTCA* form factor specifications (PICMG 3.0).
Embedded lifecycle product support	▪ Protects system investment with extended product availability.
47 new Intel® SSE4 instructions	▪ Improves performance of media and high-performance computing applications such as compiler, imaging, video and graphics applications.

Intel® Xeon® Processors for Embedded Computing Platforms

(All processors utilize the LGA 771 Package)

Processor Name[Δ]	Product Number	Core Count	Core Speed	L2 Cache	FSB Speed	TDP	Optimized for Low Power and/or ATCA/NEBS	Tcase (Highest short term/ Nominal)	Validated with Intel® 5000P chipset	Validated with Intel® 5100 MCH chipset
Intel® Xeon® processor E5440	AT80574KJ073N	Quad-Core	2.83 GHz	12 MB	1333 MHz	80 W	No	67° C	Yes	No
Intel® Xeon® processor L5410	AT80574JJ053N	Quad-Core	2.33 GHz	12 MB	1333 MHz	50 W	Yes	57° C	Yes	Yes
Intel® Xeon® processor L5408	AT80574JH046NT	Quad-Core	2.13 GHz	12 MB	1066 MHz	40 W	Yes	87° C/72° C	Yes	Yes
Intel® Xeon® processor E5240	AT80573QJ0806M	Dual-Core	3.0 GHz	6 MB	1333 MHz	65 W	No	66° C	Yes	No
Intel® Xeon® processor E5220	AT80573QJ0536M	Dual-Core	2.33 GHz	6 MB	1333 MHz	65 W	No	66° C	Yes	Yes
Intel® Xeon® processor L5238	AT80573JJ0676MT	Dual-Core	2.66 GHz	6 MB	1333 MHz	35 W	Yes	86° C/71° C	Yes	Yes

Intel in Embedded and Communications: **intel.com/embedded**

[Δ] Intel processor numbers are not a measure of performance. Processor numbers differentiate features within each processor family, not across different processor families. Go to: http://www.intel.com/products/processor_number.

[1] Benchmarking results collected by Intel Corporation, August 2007 and October 2007.
- Platform Configurations:
  - Intel® Xeon® processor E5345, 2.33 GHz, 8 MB L2 cache, 1333 MHz FSB, Intel® 5000P Chipset 8x1G-Dual-Rank-FBD-DDR2-667
  - Intel® Xeon® processor E5440, 2.83 GHz, 12 MB L2 cache, 1333 MHz FSB, Intel® 5000P Chipset 8x1G-Dual-Rank-FBD-DDR2-667
- Software Configurations:
  - Intel® Xeon® processor E5345: OS: Microsoft Windows* Enterprise Server SP1; Compiler: Intel® C/C++/FORTRAN 9.1; Benchmark: CPU2000 v1.3
  - Intel® Xeon® processor E5440: OS: Microsoft Windows* Enterprise Server SP1; Compiler: Intel® C/C++/FORTRAN 9.1; Benchmark: CPU2000 v1.3

Results have been estimated based on internal Intel analysis and are provided for informational purposes only. Any difference in system hardware or software design or configuration may affect actual performance.

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

[3] Requires a system with a 64-bit enabled processor, chipset, BIOS and software. Performance will vary depending on the specific hardware and software you use. Consult your PC manufacturer for more information. For more information, visit http://www.intel.com/info/em64t.

[4] Intel internal measurement. Platforms running 4 x Intel® Xeon® processor X7350, 32 GB memory, vConsolidate Beta 2, Virtual Iron 4.0.2 software. 1 CSU configuration, Sept 2007. Boot time improvement measured on Windows XP.* vConsolidate measurement conducted by configuring the system with Windows 2000 SP4.

Performance results are based on certain tests measured on specific computer systems. Any difference in system hardware, software or configurations will affect actual performance. For more information go to http://www.intel.com/performance.

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