PLATFORM BRIEF
Intel® Xeon® Processor 5600/5500 Series and Intel® 5520 Chipset
Embedded Computing

Intel® Xeon® Processor 5600/5500 Series Platforms for Embedded Computing

Ideal for Single- or Dual-Socket Embedded, Communications, and Storage Applications

Product Overview

The Intel® Xeon® processor 5600/5500 series, based on the latest generation Intel® microarchitecture (codenamed Nehalem), offers the first Intel Xeon processors on 32nm technology (5600 series), providing a follow-on to the Intel Xeon processor 5500 series on 45nm technology. These processors provide key embedded features such as extended lifecycle support along with options for thermally constrained applications while maintaining compatibility with enterprise platform configurations. The common microarchitecture and a common mechanical socket throughout both series provide investment protection and a simplified path to upgrades.

Utilizing second-generation High-k metal gate transistors, the 5600 series represents the next step in energy efficiency, performance and virtualization with an integrated memory controller. For example, the six-core Intel® Xeon® processor L5638[Δ] delivers a 36 percent performance gain within the same thermal profile over the previous-generation quad-core Intel® Xeon® processor L5518.[Δ,1] Additionally, the Intel Xeon processor 5600 series includes Intel® AES New Instructions (Intel® AES-NI), providing robust encryption without increased performance overhead. These new instructions lead to improved performance in AES-based communications cryptographic workloads.

All the processors feature Intel® Virtualization Technology[2] for flexible virtualization, as well as Intel® QuickPath Technology. Additionally, a number of processors in this series feature Intel® Turbo Boost Technology[3] and Intel® Hyper-Threading Technology[4] to deliver top performance for bandwidth-intensive applications.

These platforms offer processors with up to six cores, with thermal design power (TDP) ranging from 38W to 80W. Four processor options provide robust thermal profiles, ideal for the AdvancedTCA* form factor and applications requiring compliance with NEBS Level 3 thermal specifications.

Processors can be used in single- or dual-socket configurations with the Intel® 5520 chipset (see Figure 1). This chipset, consisting of the Intel® 5520 I/O Hub and Intel® I/O Controller Hub 10R, offers up to 42 lanes of PCI Express* (36 lanes PCI Express Gen 2), SATA ports and support for RAID.

This platform provides the performance, memory and I/O capabilities needed to meet a wide range of compute-intensive embedded, storage and communications applications such as:

- Communication infrastructure servers, blades and appliances
- Security servers, blades and appliances
- Storage servers, blades and appliances
- Carrier-grade rack-mount servers
- Proprietary form factors, such as router modules
- AdvancedTCA-based blades
- Medical servers, blades and appliances

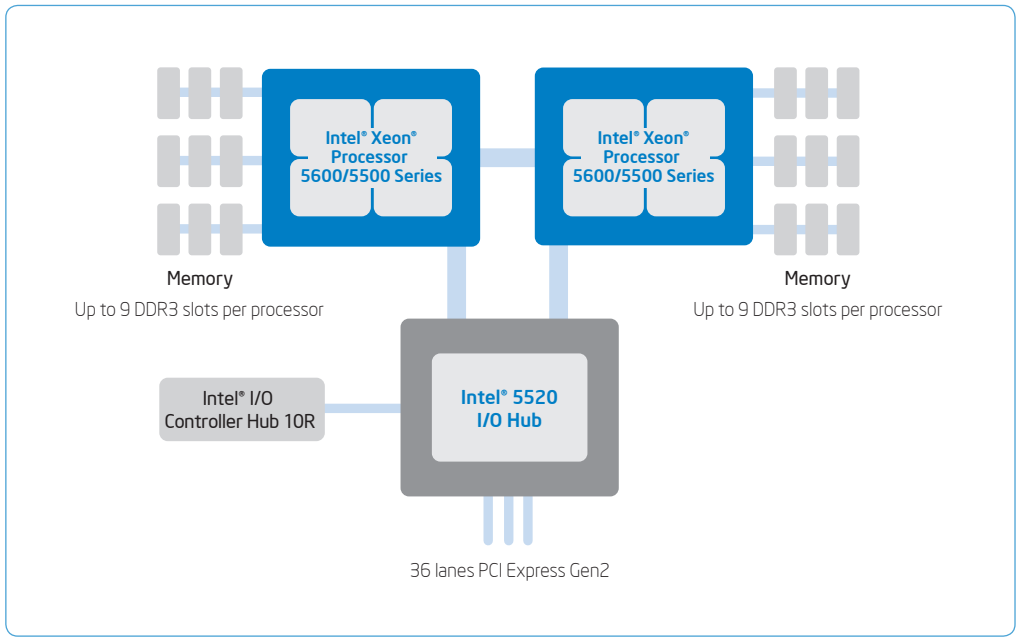

Figure 1. Dual-socket (shown) or single-socket configurations of Intel® Xeon® processor 5600/5500 series-based platforms are ideal for compute-intensive or thermally constrained embedded applications

Software Overview

The following independent operating system and BIOS vendors provide support for these platforms.

OPERATING SYSTEM	CONTACT	BIOS
Microsoft Windows* XP	Intel provides drivers[5]	American Megatrends
Microsoft Windows Server* 2008	Intel provides drivers[5]	Insyde Software
Microsoft Windows* 2003	Intel provides drivers[5]	Phoenix Technologies
Red Hat Enterprise Linux* 5	Red Hat	
SUSE Linux* Enterprise 10	Novell	
Wind River VxWorks* 6.6	Wind River	
Wind River Linux*	Wind River	

Platform Features and Benefits

FEATURES	BENEFITS
Supports key embedded platform requirements	Ideal for compute-intensive embedded applications.
Compatibility with Intel® enterprise server solutions	Potential to maximize design reuse between enterprise and embedded solutions.
Extended lifecycle product support	Protects system investment by enabling extended product availability for embedded customers.
Low-power and robust thermal profile processor options (L5638, L5618, L5508, and L5518)	Ideal for NEBS Level 3 ambient operating temperature specifications (thermal profile). Ideal for smaller form factors with thermal constraints (blades), especially solutions requiring compliance with AdvancedTCA* form factor specifications (PICMG 3.0).
Embedded ecosystem support	Along with a strong ecosystem of hardware and software vendors, including members of the Intel® Embedded Alliance (intel.com/go/eca), Intel helps to cost-effectively meet development challenges and speed time-to-market.
Intelligent performance	Automatically adapts performance to fit application and business needs.
Intel® Turbo Boost Technology[3]	Boosts performance for specific workloads by increasing processor frequency.
Intel® QuickPath Technology	Delivers bandwidth improvement for data-intensive applications.
Intel® Hyper-Threading Technology[4]	Boosts performance for parallel, multi-threaded applications.
Large memory capacity	Up to 144 GB of main memory supports higher performance for data-intensive applications.
Shared L3 cache	Boosts performance while reducing traffic to the processor cores.
Intel® AES New Instructions (Intel® AES-NI) (5600 series only)	Faster, more efficient cryptographic performance.
Intel® Trusted Execution Technology[6] (5600 series only)	Delivers a more secure boot and launch environment.
Automated Energy Efficiency	Reduces idle power consumption.
Integrated power gates	Allows idling cores to be reduced to near-zero power independent of other cores.
Automated low-power states	Puts processor, memory and I/O controller into the lowest available power states that will meet the requirements of the current workload.
Flexible Virtualization	Enhances virtualization performance.
Intel® Xeon® processor 5600/5500 series	Hardware assists boost virtualization performance by allowing OS more direct access to the hardware. Intel® Virtualization Technology[2] (Intel® VT) FlexMigration enables seamless migration of running applications among current and future Intel® processor-based servers. Intel® VT FlexPriority improves virtualization performance by allowing guest OSs to read and change task priorities without VMM intervention. Extended Page Tables provide better performance by reducing the overhead caused by page-table utilization of virtual machines.
Intel® 5520 chipset	Intel® VT for Directed I/O helps speed data movement, giving designated virtual machines their own dedicated I/O devices, thus reducing performance overhead of the VMM in managing I/O traffic.

Intel® 5520 Chipset for Embedded Computing

PRODUCT	PACKAGE	FEATURES
Intel® 5520 I/O Hub (36D)	FCBGA1295	Supports Intel® Xeon® processor 5600/5500 series at 6.4 GT/s, 5.86 GT/s and 4.8 GT/s speeds via Intel® QuickPath Interconnect Technology. Supports 36 lanes of PCI Express* 2.0 I/O, Intel® VT-c and Intel® VT-d enhancements for virtualization OS, and Intel® ICH10R; 27.1W TDP. Optional second Intel® 5520 IOH supports up to 72 lanes PCI Express* 2.0.
Intel® I/O Controller Hub (ICH10R)	PBGA676	PCI Express* 6x1; six SATA ports; Intel® Matrix Storage Technology with RAID 0, 1, 5 and 10; 12 USB ports, Integrated Gigabit LAN controller 10/100/1000; 4.5W TDP.

Intel® Xeon® Processor 5600/5500 Series for Embedded Computing

Processor Number[Δ]	Intel® Xeon® processor E5645	Intel® Xeon® processor E5620	Intel® Xeon® processor L5638	Intel® Xeon® processor L5618	Intel® Xeon® processor E5540	Intel® Xeon® processor E5504	Intel® Xeon® processor L5518	Intel® Xeon® processor L5508
Process Technology	32nm	32nm	32nm	32nm	45nm	45nm	45nm	45nm
Cores	6	4	6	4	4	4	4	2
CPU Core Frequency	2.40 GHz	2.40 GHz	2.00 GHz	1.87 GHz	2.53 GHz	2.00 GHz	2.13 GHz	2.00 GHz
L3 Cache	12 MB	12 MB	12 MB	12 MB	8 MB	4 MB	8 MB	8 MB
Thermal Design Power	80W	80W	60W	40W	80W	80W	60W	38W
Robust Thermal Profile (High Tcase)	Standard	Standard	85° C[7]	85° C[7]	Standard	Standard	85° C[7]	85° C[7]
DDR3 Memory	1333	1066	1333	1066	1066/800	800	1066/800	1066/800
Intel® Turbo Boost Technology	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Intel® Hyper-Threading Technology	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Intel® QuickPath Link Speed+	5.86 GT/s	5.86 GT/s	5.86 GT/s	5.86 GT/s	5.86 GT/s	4.8 GT/s	5.86 GT/s	5.86 GT/s
Intel® AES-NI	Yes	Yes	Yes	Yes	No	No	No	No
Package	LGA 1366	LGA 1366	LGA 1366	LGA 1366	LGA 1366	LGA 1366	LGA 1366	LGA 1366

+GT/s = giga-transfers/second

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 series, not across different processor sequences. See http://www.intel.com/products/processor_number for details.

[1] L5638 benchmarking results collected by Intel Corporation, February 2010. L5618 benchmarking results collected by Intel Corporation, January 2009.

Platform configurations:
- Intel® Xeon® processor L5518 at 2.13 GHz, 8 MB L3 Cache, 60W; Intel® 5520 chipset, 12x4 GB RDIMM DDR3-1066MHz
- Intel® Xeon® processor L5638 at 2.00 GHz, 12 MB L3 Cache, 60W; Intel® 5520 chipset, 12x4 GB RDIMM DDR3-1066MHz

Software configurations:
- Intel® Xeon® processor L5518: OS: Red Hat Linux 5.3 64 bit; Compiler: Intel® C/C+ 11.0; Benchmark CPU2006 v1.1
- Intel® Xeon® processor L5638: OS: SUSE Linux Enterprise Server 10 SP3 64 bit; Compiler: Intel® C/C+ 11.1; Benchmark CPU2006 v1.1

[2] Intel® Virtualization Technology requires a computer system with an enabled Intel® processor, BIOS, virtual machine monitor (VMM) and, for some uses, certain computer system 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.

[3] Intel® Turbo Boost Technology requires a PC 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 PC 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 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. For more information including details on which processors support HT Technology, see http://www.intel.com/products/ht/hyperthreading_more.htm.

[5] Drivers available at: downloadcenter.intel.com (enter chipset name).

[6] No computer system can provide absolute security under all conditions. Intel® Trusted Execution Technology (Intel® TXT) requires a computer system with Intel® Virtualization Technology, an Intel TXT-enabled processor, chipset, BIOS, Authenticated Code Modules and an Intel TXT-compatible measured launched environment (MLE). The MLE could consist of a virtual machine monitor, an OS or an application. In addition, Intel TXT requires the system to contain a TPM v1.2, as defined by the Trusted Computing Group and specific software for some uses. For more information, see intel.com/technology/security

[7] Not to exceed 360 hours per year.

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