



Intel® Xeon® Processors for Workstations

Enabling better designs and faster time to market



In many industries, the demand for faster time to market, design optimization, and cost reduction is driving the rapid adoption of workstation products. Not long ago, workstations were reserved for high-end design work such as complex mechanical assemblies, architecture, and aerospace design. Today, workstations are used in every major industry for tasks ranging from financial modeling to medical diagnostics. Workstations have become standard equipment for engineers, content creators, analysts, and others who need the highest levels of performance, visualization, and data integrity.

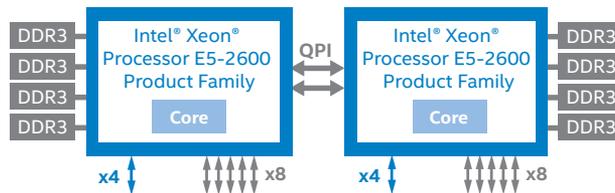
Increasingly, design professionals and engineers are using Intel® Xeon® processor-based workstations to create, test, and modify new ideas almost as fast as they can think of them. Derived from server processors, workstation processors typically are optimized for higher frequency, improved graphics, and application certification for better performance and reliability.

Selecting the Right Platform

MORE FEATURES, MORE PERFORMANCE

Intel® Xeon® Processor E5-2600 Family

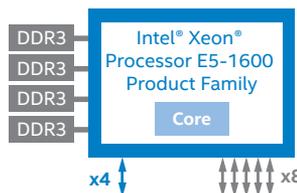
Highest Performance and Maximum Memory
Accelerate discovery and improve your innovation throughput.



The Intel® Xeon® processor E5-2600¹ product family is designed to solve your biggest problems fast. With support for two processors, it can power integrated design software that combines creation with analysis, simulation, rendering or ray-tracing requirements.

Intel® Xeon® Processor E5-1600 Family

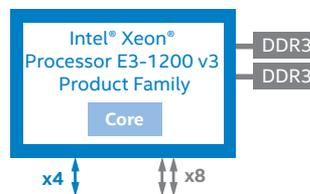
Increased Expandability, Incremental Performance
Supplying the bandwidth and capacity you need to explore larger projects.



The Intel® Xeon® processor E5-1600¹ product family is Intel's most robust processor for single-processor workstations. It offers larger cache, more cores, more memory and more I/O than any other Intel® Xeon® processor designed for a single-socket workstation.

Intel® Xeon® Processor E3-1200 v3 Family

Expanded Feature Set vs. Desktop
The workstation advantage that just replaced your business desktop.



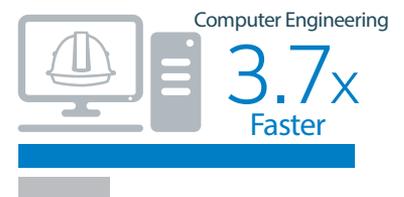
The Intel® Xeon® processor E3-1200¹ v3 product family brings entry-level workstation performance² to designers, engineers, and others who thought such capabilities were out of reach. With Intel® HD Graphics P4600³ built in, this processor delivers the visual performance and quality demanded for professional-grade CAD and media/entertainment applications.

Moving Data – Processing More – Helping You Innovate Faster

What makes Intel Xeon processor-based workstations so powerful? It is not just about adding more computational cores, it is about a powerful infrastructure that accelerates the opportunity for processors and cores to act on data and change it into actionable information faster than ever before. The Intel® Xeon® processor E3 and E5 product families include the following technologies:

FEATURE	IMPACT AND BENEFIT
Bi-directional on processor die high-bandwidth/low-latency cache buses	<ul style="list-style-type: none"> Accelerate data availability to the processing cores.
Larger L3 caches	<ul style="list-style-type: none"> Help accelerate the accessibility of constantly used data.
Intel® Data Direct I/O (Intel® DDIO) ⁴	<ul style="list-style-type: none"> Build on Intel® IIO to allow Intel® Ethernet controllers to route I/O traffic directly to processor cache, saving power and improving Intel® I/O latency by up to 2.3x.
Intel® Integrated I/O (Intel® IIO) ⁴	<ul style="list-style-type: none"> Intel® Integrated I/O saves power, reduces latency, and delivers data to the processor up to 30% faster.⁵ More than twice the available PCIe* lanes provides greater flexibility for I/O devices and provides support for PCI Gen 3 that can increase I/O performance by up to 2x.⁶
Intel® Advanced Vector Extensions (Intel® AVX) ⁷	<ul style="list-style-type: none"> Improved floating point performance of image, video, audio processor applications, and 3D modeling apps by up to 2x.⁸
Intel® Rapid Storage Technology ⁹	<ul style="list-style-type: none"> Improved performance of disk-intensive retrieval applications such as simulation and video editing.
Intel® Turbo Boost Technology 2.0 ¹⁰	<ul style="list-style-type: none"> Dynamically increased core frequencies beyond rated values during peak workloads for additional performance.
Intel® HD Graphics P4600 ³ (Intel® Xeon® processor E3-12X5 v3 family)	<ul style="list-style-type: none"> Enhanced graphics capability for CAD and high-performance video editing professionals when processor and graphics are integrated on top of the same processor die.
Intel® Advanced Encryption Standards- New Instructions ¹¹ (Intel® AES-NI)	<ul style="list-style-type: none"> Intel AES-NI accelerates and strengthens encryption to enable faster and more secure online transactions and improved data protection. Implement encryption pervasively to protect your business using compatible software from leading vendors such as Oracle, Microsoft, and McAfee.

Speeds up to 4x faster than your 4-year-old workstation¹²



Comparisons based on Intel® Xeon® processor E5-1600 v3-based workstation vs. 4-year-old machine

These technologies deliver overall value by engineering complete, highly optimized platform solutions. The Intel® C600 series chipset and Intel® 10 Gigabit Ethernet solutions, for example, help to ensure high performance across diverse workloads and provide advanced functionality, such as integrated serial attached SCSI (SAS) and Fiber Channel over Ethernet (FCoE). Explore more what-if scenarios and arrive at new insights faster than ever before.

When Your Work Really Matters, Protect It with ECC Memory

Recent studies from Google and others suggest that as many as one in three computers will experience a memory error. Lambda Diode suggests that a computer has as much as a 96% percent chance of having a bit error in three days without ECC RAM.¹³

The impact of a memory error can vary from hardly noticeable to catastrophic:

- A memory error changes the tone of one pixel of color —no big deal.
- A memory error causes a program to crash — annoying hours of lost productivity as you recreate your work

- A memory error corrupts irreplaceable customer data or design details – disaster!

Intel® vPro™ Technology

Now, the entire line of Intel Xeon processor-based workstations offers the hardware-assisted security and manageability of Intel® vPro™ technology.¹⁴ Protecting workstations and securing data are among the great challenges facing modern businesses. Intel vPro technology is built into these Intel Xeon processors, Intel® chipsets, and network adapters serving the workstation market to simplify and accelerate these critical IT functions.

Where Intel® Xeon® Processors E5-2600/E5-1600 Product Families and Intel® Xeon® Processor E3-1200 v3 are Different

WORKSTATION	DUAL PROCESSOR	SINGLE PROCESSOR MAINSTREAM	SINGLE PROCESSOR ENTRY-LEVEL
Processor Type	Intel® Xeon® Processor E5-2600 Product Family	Intel® Xeon® Processor E5-1600 Product Family	Intel® Xeon® Processor E3-1200 v3 Product Family
Product Positioning	Intel's highest performing dual processor for workstations optimized for experts. ^{7,8} The Intel Xeon processor E5-2600 product family-based expert workstation: Moves data faster for processor-intensive simulation, rendering, and ray-tracing tasks.	Professional-grade performance for demanding workloads. The Intel Xeon processor E5-1600 product family-based professional workstation: A more robust single-processor workstation.	Step up to a workstation and watch your innovation take off. The Intel Xeon processor E3-1200 v3 product family-based workstation: Built-in graphics capabilities for CAD and media applications ³
Intel® QuickPath Interconnect	Two	None	None
Max Memory Channels	8 (requires 2 processors)	4	2
Max Memory Footprint	768 GB (requires 2 processors)	384 GB	32 GB
Max L3 Cache	20 MB	15 MB	8 MB
MEMORY TYPE			
Max PCI3* Gen 3 I/O Lanes	80	40	20
Intel® HD Graphics P4600³	No	No	Yes
Max Intel® Hyper-Threading Technology threads¹⁵	32 threads (requires 2 processors)	16 threads	8 threads
Intel® Integrated I/O⁴ (Intel® IIO)	Yes	Yes	N/A
Intel® Data Direct I/O⁴ (Intel® DDIO)	Yes	Yes	N/A

Intel® Xeon® Processor E3-1200 v3 Product Family with Intel® HD Graphics P4600

The Intel Xeon processor E3-1200 v3 product family-based entry-level workstation brings workstation performance to designers, engineers, and others who might have thought this level of speed and capacity was out of reach. This processor product family is built on Intel's industry-leading 22nm process using 3D Tri-Gate transistor technology with graphics capabilities built right into the processor. Intel® HD Graphics P4600³ supports 2.5x more execution units than were used in the Intel® HD Graphics P3000 to deliver the visual performance and quality demanded by professional-grade CAD and media/entertainment applications. Intel HD Graphics P4600 processor-based graphics will support Microsoft's DirectX11* standard, OpenGL 4.0 and OpenCL 1.2. This new processor also includes memory technology (Error-Correcting Code) that improves data integrity and uptime. In addition to

setting new standards for performance and capability, this entry-level workstation based on the Intel Xeon processor E3-1200 v3 product family includes Intel vPro technology for secure manageability to match any PC in your organization.

Many hotel chains prefer to centrally manage signage systems to ensure uniformity and reduce onsite technical personnel. This lowers maintenance costs, creating uniformity across systems. AOpen's MP57-D* with Intel vPro technology provides such capabilities. Using a third-party vendor's central management console, the AOpen solution using Intel® Active Management Technology¹⁶ (Intel® AMT) can remotely discover computing assets, heal systems regardless of state, and protect against malicious software attacks. The advanced management capabilities of an Intel vPro technology-enabled AOpen system can help lower power consumption, reduce the number of expensive onsite repairs, and track inventory without physical interaction.

Learn More

Choosing the right workstation is a smart investment that can accelerate how you create, test, and optimize your ideas. Find more information and resources at www.intel.com/go/workstation.

- ¹ 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/
- ² Intel® Performance comparison using geometric mean of SPECint*_rate_base2006, SPECfp*_rate_base2006, STREAM*_MP Triad, and Linpack* benchmark results. Baseline geometric mean score of 166.75 on prior generation 2S Intel® Xeon® Processor X5690 platform based on best published SPECrate* scores to www.spec.org and best Intel internal measurements on STREAM*_MP Triad and Linpack as of 5 December 2011. New geometric mean score of 306.74 based on Intel internal measured estimates using an Intel® Rose City platform with two Intel® Xeon® processor E5-2690, Turbo and EIST Enabled, with Hyper-Threading, 128 GB RAM, Red Hat® Enterprise Linux Server 6.1 beta for x86_64, Intel® Compiler 12.1, THP disabled for SPECfp*_rate_base2006 and enabled for SPECint*_rate_base2006.
- ³ Intel® HD P4600 introduces 12 l execution beyond the first generation Intel® HD P3000 to 20 in the Intel HD P4600. Optimized Intel® HD Graphics P4600 only available on select models of the Intel® Xeon processor E3-1200 v3 product family. For more information, www.intel.com/go/workstation.
- ⁴ Features only available on Intel® Xeon® processor E5-1600/2600 product families.
- ⁵ Intel measurements of average time for an I/O device read to local system memory under idle conditions. Improvement compares Xeon processor E5-2600 product family (230 ns) vs. Xeon processor 5500 series (340 ns). Baseline Configuration: Green City system with two Intel® Xeon processor E5520 (2.26GHz, 4C), 12GB memory @ 1333, C-States Disabled, Turbo Disabled, SMT Disabled, Rubicon* PCIe* 2.0 x8. New Configuration: Meridian system with two Intel® Xeon processor E5-2665 (C0 stepping, 2.4GHz, 8C), 32GB memory @1600 MHz, C-States Enabled, Turbo Enabled. The measurements were taken with a LeCroy* PCIe* protocol analyzer using Intel internal Rubicon (PCIe* 2.0) and Florin (PCIe* 3.0) test cards running under Windows* 2008 R2 w/SP1.
- ⁶ 8 GT/s and 128b/130b encoding in PCIe 3.0 specification enables double the interconnect bandwidth over the PCIe 2.0 specification. Source: http://www.pcisig.com/news_room/November_18_2010_Press_Release/.
- ⁷ Source: Performance comparison using SPECfp*_rate_base_2006 benchmark. Based on Intel internal measured estimates using an Intel® Rose City platform with two Intel® Xeon® processor E5-2690, Turbo and EIST Enabled, with Hyper-Threading, 64 GB RAM, Red Hat® Enterprise Linux Server 6.1 beta for x86_64, Intel® Compiler 12.1. For more details, see: <http://www.spec.org/cpu2006/results/res2011q1/cpu2006-20110131-14172.html>
- ⁸ Software and workloads used in performance tests may have been optimized for performance only on Intel® microprocessors. Performance tests, such as SYSmark* and MobileMark*, are measured using specific computer systems, components, software, operations, and functions. Any change to any of those factors may cause the results to vary. You should consult other information and performance tests to assist you in fully evaluating your contemplated purchases, including the performance of that product when combined with other products.
- ⁹ Intel® Rapid Storage Technology requires the computer have an Intel RST-enabled Intel chipset, RAID controller in the BIOS enabled and the Intel Rapid Storage Technology software driver installed. Please consult your system vendor for more information.
- ¹⁰ Requires a system with Intel® Turbo Boost Technology capability. Intel Turbo Boost Technology 2.0 is the next generation of Turbo Boost Technology and is only available on 2nd gen Intel® Core™ processors. Consult your PC manufacturer. Performance varies depending on hardware, software, and system configuration. For more information, visit <http://www.intel.com/technology/turboboost>.
- ¹¹ Intel® AES-NI requires a computer system with an AES-NI enabled processor, as well as non-Intel software to execute the instructions in the correct sequence. AES-NI is available on Intel® Core™ i5-600 Desktop Processor Series, Intel® Core™ i7-600 Mobile Processor Series, and Intel® Core™ i5-500 Mobile Processor Series. For availability, consult your reseller or system.
- ¹² Software and workloads used in performance tests may have been optimized for performance only on Intel microprocessors. Performance tests, such as SYSmark and MobileMark, are measured using specific computer systems, components, software, operations and functions. Any change to any of those factors may cause the results to vary. You should consult other information and performance tests to assist you in fully evaluating your contemplated purchases, including the performance of that product when combined with other products. Intel does not control or audit the design or implementation of third party benchmark data or Web sites referenced in this document. Intel encourages all of its customers to visit the referenced Web sites or others where similar performance benchmark data are reported and confirm whether the referenced benchmark data are accurate and reflect performance of systems available for purchase.
- ¹³ Source: <http://lambda-diode.com/opinion/ecc-memory>.
- ¹⁴ Intel® vPro™ Technology is sophisticated and requires setup and activation. Availability of features and results will depend upon the setup and configuration of your hardware, software and IT environment. To learn more visit: <http://www.intel.com/technology/vpro>.
- ¹⁵ Requires an Intel® HT Technology enabled system, check with your PC manufacturer. Performance will vary depending on the specific hardware and software used. Not available on Intel® Core™ i5-750. For more information including details on which processors support HT Technology, visit <http://www.intel.com/info/hyperthreading>.
- ¹⁶ Requires activation and a system with a corporate network connection, an Intel® AMT-enabled chipset, network hardware and software. For notebooks, Intel AMT may be unavailable or limited over a host OS-based VPN, when connecting wirelessly, on battery power, sleeping, hibernating or powered off. Results dependent upon hardware, setup and configuration. For more information, visit <http://www.intel.com/technology/platform-technology/intel-amt>.
- 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 www.intel.com/software/products.

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